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THE MEDIATION ROLE OF JOB SATISFACTION IN THE RELATIONSHIP BETWEEN ORGANIZATIONAL PERFORMANCE AND LMX TOWARDS EMPLOYEE ENGAGEMENT AT HOTEL SISINGAMANGARAJA SEMARANG

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ABSTRACT
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This study aims to analyze the influence of employee engagement on organizational performance through the mediation of job satisfaction by considering the role of Leader-Member Exchange (LMX). The research method uses Structural Equation Modeling-Partial Least Squares (SEM-PLS) to analyze data from forty-two employee respondents. The research model consists of four constructs: Employee Engagement, LMX, Job Satisfaction, and Organizational Performance, each measured by reflective indicators. The results of the analysis show that employee engagement has a significant positive effect on job satisfaction, job satisfaction has a positive effect on organizational performance, and LMX has a positive effect on job satisfaction. The findings confirm that job satisfaction plays a mediator in the relationship between employee engagement and organizational performance. The study provides theoretical contributions in understanding the psychological mechanisms that link individual engagement with organizational outcomes, as well as practical implications for management in developing performance improvement strategies through employee engagement programs and quality leadership development. The study's limitations lie in the relatively small sample size, requiring caution in generalizing the results. Future research is recommended to use a larger sample to increase the robustness of the findings.

KEYWORDS: ***Employee Engagement, Job Satisfaction, Organizational Performance, Leader-Member Exchange,***

INTRODUCTION

The Indonesian hotel industry faces increasingly complex challenges in an era of globalization and intense competition. One key factor determining a hotel's success is the quality of its human resources, particularly high employee engagement.(Paul and Sharma 2022)Employee engagement is becoming increasingly important because it directly impacts service quality, guest satisfaction, and ultimately company profitability.(Sheta and Afriasih 2023)In Semarang City, the hospitality sector is experiencing rapid growth along with increased business and tourism activities, coupled with economic recovery after the COVID-19 pandemic, which has created new dynamics in HR management. (Kaur 2023).

Hotel Sisingamangaraja Guest House, as a player in the hospitality industry in Semarang, faces unique challenges in the digital era and the millennial generation, which has different work expectations than previous generations. The phenomenon of "quiet quitting" and the changing work preferences of Generation Z, which prioritizes work-life balance and meaningful work, demand a new approach to improving employee engagement.(Priya and Malarkodi 2023)Employee engagement is defined as a positive psychological state characterized by vigor, dedication, and absorption in work.(Gunaseelan and Thomas 2024)This concept has undergone significant evolution in the digital era, where technology and artificial intelligence have begun to change the way we work and interact in the workplace.(Bailey et al., 2023). Recent research shows that employee engagement in the hospitality industry is influenced not only by traditional factors, but also by adaptability to new technologies, work flexibility, and the organization's ability to provide a personalized work experience.(Kahn & Byosiere 2023)In the era of Industry 4.0 and Society 5.0, the concept of organizational performance has also undergone a transformation from a traditional approach that only focuses on financial aspects to a balanced scorecard that includes sustainability, digital transformation, and employee wellbeing.(Kaplan, & Norton 2024). Modern organizational performance is measured not only by profitability, but also by the ability to adapt to technological changes, responsiveness to stakeholder needs, and contribution to sustainable development goals (SDGs). This creates new challenges for hotels in integrating these aspects to improve employee engagement.

Another factor that has been redefined in the modern context is the quality of the relationship between leaders and team members (Leader-Member Exchange/LMX). The traditional

LMX theory developed (Graen, & Uhl-Bien 1995)We now have to adapt to the realities of remote work, hybrid leadership, and digital communication, which have become the new normal post-pandemic.(Wang, et al., 2023)The concepts of "virtual LMX" and "digital leadership" are emerging areas of research that challenge conventional understandings of leader-follower relationships. Recent research shows that millennial and Gen Z employees have different expectations for leadership styles, favoring authentic leadership, empathetic leadership, and inclusive leadership.(Bass & Riggio 2024)What is new in this study is the use of a multi-generational analysis approach to understand how generational differences (Baby Boomers, Gen X, Millennials, and Gen Z) influence perceptions of organizational performance, LMX, and job satisfaction in the context of employee engagement.(Park, & Gursoy 2023)This study also integrates Self-Determination Theory (SDT) with the Job Demands-Resources Model to provide a more holistic perspective on the mediating role of job satisfaction. Furthermore, this study uses a mixed-methods approach by incorporating digital ethnography to understand the work experiences of hotel employees in the digital native era.

Job satisfaction can act as a mediator because good organizational performance and quality LMX relationships will increase employee job satisfaction, which in turn will encourage increased employee engagement.(Kodden 2020)When employees feel satisfied with their jobs, they tend to be more enthusiastic, dedicated, and immersed in their work activities. (Azmy and Wiadi 2023)In the context of the Indonesian hospitality industry, this study provides a new contribution by using the "Hospitality 4.0" framework that integrates aspects of technology, sustainability, and a human-centric approach in analyzing employee engagement.(Kim & Law 2024)This study also uses the concept of "psychological safety in the digital workplace" as a new dimension in measuring job satisfaction, given the importance of psychological safety in an increasingly digital and hybrid work environment. Another novelty is the application of "cultural intelligence" as a moderator in the LMX-engagement relationship, considering the cultural diversity of hotel employees in Indonesia.

Based on the background and novelty, this study aims to analyze the mediating role of job satisfaction in the relationship between organizational performance and Leader-Member Exchange on employee engagement with a multi-generational approach and a digital-era perspective at Hotel Sisingamangaraja Semarang. This study is expected to provide theoretical contributions in the form of an employee engagement model that is relevant to the digital era, as well as provide practical implications for hotel management in developing HR strategies that are adaptive to changing times.

LITERATURE REVIEW

2.1 Employee Engagement

2.1.1 Concept and Definition of Employee Engagement

Employee engagement is a concept that has undergone significant evolution since it was first introduced by Kahn (1990). Kahn defined employee engagement as "individuals' utilization of themselves in their work roles; in engagement, people use and express themselves physically, cognitively, and emotionally while carrying out their work roles" (Kahn, 1990, p. 694). This definition emphasizes the holistic aspect of employee engagement, encompassing physical, emotional, and cognitive dimensions.

Gunaseelan and Thomas (2024), further developed this concept by defining work engagement as "a positive, satisfying, and work-related state of mind characterized by vigor, dedication, and absorption." Vigor refers to high levels of energy and mental resilience while working; dedication refers to high involvement in work and experiencing a sense of significance, enthusiasm, inspiration, pride, and challenge; while absorption is characterized by full concentration and enjoyment in work. (Paul and Sharma 2022).

2.1.2 Employee Engagement in the Digital Era

In the context of the digital era and Industry 4.0, the concept of employee engagement has undergone a significant transformation.(Bailey et al., 2023), identified that digital technology has changed the way employees interact with their work, creating a new dimension called “digital engagement.” This concept encompasses employees’ ability to adapt to new technologies, participate in digital transformation, and maintain engagement in a hybrid work environment.Kahn & Byosiere (2023), expands traditional engagement theory by integrating psychological safety aspects into the digital workplace. They argue that employees who feel psychologically safe using new technologies tend to demonstrate higher levels of engagement. This is particularly relevant in the hospitality industry, where digital technology is increasingly integrated into daily operations.

2.1.3 Employee Engagement in the Hospitality Industry

The hospitality industry has unique characteristics that impact employee engagement, including the service-oriented nature of work, the intensity of guest interactions, and irregular working hours.(Karatepe & Olugbade 2023). Study(Kim & Law 2024), shows that in the era of "Hospitality 4.0," hotel employees face additional challenges in maintaining engagement due to the implementation of artificial intelligence and automation in various aspects of hotel operations.(Park & Gursoy 2023), found significant differences in the levels and factors influencing employee engagement between different generations in the hospitality industry. Generation Z demonstrated higher engagement when given work flexibility and opportunities to contribute to sustainability initiatives, while millennials prioritized career development and work-life balance.

2.2 Organizational Performance

2.2.1 Evolution of the Concept of Organizational Performance

Traditional organizational performance tends to focus on financial measures such as profitability, return on investment, and market share.(Conțu 2020)However, in the modern era, the concept of organizational performance has developed to be more comprehensive and multidimensional.(Kaplan & Norton 2024), updated their balanced scorecard framework to integrate Environmental, Social, and Governance (ESG) aspects as an indispensable dimension of organizational performance. Modern organizational performance encompasses four main perspectives: financial, customer, internal business processes, and learning & growth.(Kaplan & Norton 2024)In the hospitality context, the customer perspective is critical because it directly relates to guest satisfaction and loyalty, which are

heavily influenced by the engagement of employees who interact directly with guests.

2.2.2 Organizational Performance in the Digital Era

Digital transformation has changed the way organizations measure and manage their performance. Digital transformation capability is becoming an increasingly important indicator of organizational performance.(Prasetyaningrum 2023)In the hospitality industry, this includes the ability to integrate technology into the customer journey, operational efficiency, and employee experience.Arikan and Çaliskan (2021)identified that high-performing organizations in the digital era are those capable of creating synergy between human and technological capital. In the hotel context, this means the ability to optimize technology while maintaining the human touch, a key characteristic of the hospitality industry.

2.2.3 Relationship between Organizational Performance and Employee Engagement

(Azmy et al. 2023), shows that good organizational performance creates a positive organizational climate that is conducive to employee engagement. Employees who work in high-performing organizations tend to feel proud of their company and are motivated to contribute more.(Hasan et al. 2020).

Meta-analysis research by(Hasan et al. 2020), shows a strong positive correlation between organizational performance and employee engagement, with a larger effect size in the service industry than in the manufacturing industry. This indicates that this relationship is highly relevant in the hospitality industry context.

2.3 Leader-Member Exchange (LMX)

2.3.1 LMX Theory and Development

The Leader-Member Exchange (LMX) theory was developed from the Vertical Dyad Linkage Theory introduced by Dansereau et al. (1975). This theory was later refined by Graen & Uhl-Bien (1995), who emphasized that leaders develop different relationships with each of their subordinates, and the quality of these relationships influences employee work outcomes. High-quality LMX is characterized by trust, respect, and mutual obligation between leaders and subordinates. Conversely, low-quality LMX is characterized by formal, transactional relationships limited to employment contracts.(Hirnawati and Pradana 2023). LMX dimensions include affect (mutual affection), loyalty (mutual loyalty), contribution (perceived contribution to work goals), and professional respect (professional reputation)(Atwi et al. 2022)

2.3.2 Virtual LMX in the Post-Pandemic Era

The COVID-19 pandemic has changed the dynamics of leader-subordinate relationships with increased remote work and digital communication.(Wang et al 2023), introduced the concept of "virtual LMX," which refers to the quality of leader-follower relationships built and maintained through digital technology. Virtual LMX presents unique challenges, including reduced face-to-face interaction, communication barriers, and difficulty in building trust. However, research also shows that effective virtual LMX can produce similar outcomes to traditional LMX, provided leaders adopt appropriate digital leadership behaviors. (Golden & Raghuram 2023).

2.3.3 LMX and Generational Differences

Bass & Riggio (2024), identified that different generations have different expectations regarding leadership style and the quality of relationships with supervisors. Generation Z tends to prioritize authentic leadership and transparent communication, while millennials value empathetic leadership and a coaching approach.(Park & Gursoy 2023), in the context of the hospitality industry, shows that younger generation employees have a lower tolerance for authoritarian leadership styles and are more responsive to transformational leadership that supports personal growth and career development.

2.3.4 Relationship between LMX and Employee Engagement

Meta-analysis byHirnawati and Pradana (2023), showing a consistent positive correlation between LMX quality and employee engagement. Employees with high-quality LMX tend to exhibit higher levels of vigor, dedication, and absorption in their work.(Dulebohn et al., (2023), identified mechanisms explaining the LMX-engagement relationship, including increased autonomy, enhanced social support, and greater access to resources and opportunities. In the context of the hospitality industry, this is particularly relevant because employees who have good relationships with their supervisors tend to be more proactive in providing excellent customer service.

2.4 Job Satisfaction

2.4.1 Theories and Dimensions of Job Satisfaction

Job satisfaction is defined as "a pleasant or positive emotional state resulting from the appraisal of one's job or work experiences"(Azmy and Wiadi 2023)Herzberg's Two-Factor Theory identifies that job satisfaction is influenced by motivators (achievement, recognition, work itself, responsibility, advancement) and hygiene factors (company policy, supervision, salary, interpersonal relations, working conditions) (Herzberg et al., 1959). Job Characteristics Model by(Sanjaya and Indrawati 2023), shows that job satisfaction is influenced by five core job characteristics: skill variety, task identity, task significance, autonomy, and feedback. This model has been revised to accommodate changes in the nature of work in the digital age.(Parker et al., (2023).

2.4.2 Job Satisfaction in the Digital Workplace

The transformation of the digital workplace has created a new dimension in job satisfaction. The digital employee experience is a critical factor influencing job satisfaction.(Chen & Li, 2023)This includes user-friendly technology, digital skill development opportunities, and effective work-life integration. Psychological safety in the digital workplace is also a relevant new dimension, especially given concerns about job displacement due to automation and the need for continuous upskilling. (Edmondson & Lei, 2024)Employees who feel secure in using and learning new technology tend to show higher job satisfaction.

2.4.3 Cultural Intelligence and Job Satisfaction

In a multicultural context like Indonesia, cultural intelligence (CQ) is an important factor influencing job satisfaction.(Ang, et al., 2023), showing that employees with high CQ are better able to adapt to diverse work environments and demonstrate higher job satisfaction. In the hospitality industry, which serves guests from various cultures, employees' ability to interact

effectively with cultural diversity is a source of job satisfaction and professional pride.(Thomas & Inkson 2023).

2.4.4 Job Satisfaction as a Mediator

Social Exchange Theory explains that job satisfaction can act as a mediator in the relationship between organizational factors and employee outcomes (Blau, 1964). When employees perceive that the organization treats them well (through organizational performance and quality leadership), they develop positive attitudes (job satisfaction), which in turn encourage positive behaviors (employee engagement).

Self-Determination Theory (SDT) provides an additional perspective that job satisfaction mediates the relationship between fulfillment of basic psychological needs (autonomy, competence, relatedness) and intrinsic motivation.Deci & Ryan (2023)In the context of this research, organizational performance and LMX can be viewed as antecedents that fulfill basic psychological needs, while job satisfaction is an indicator of this fulfillment, which in turn drives employee engagement.

2.5 Theoretical Model and Hypothesis

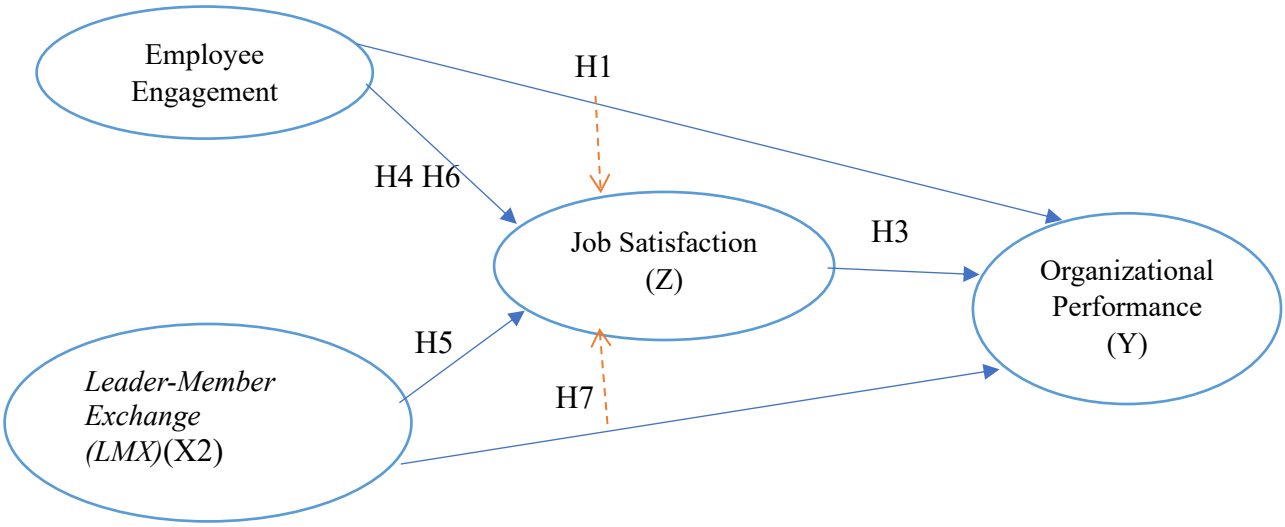
2.5.1 Theoretical Integration

The theoretical model in this study integrates several major theories: Job Demands-Resources Model(Demerouti and Bakker (2023), Social Exchange Theory (Blau, 1964), Self-Determination TheoryDeci & Ryan (2023), and LMX Theory (Graen & Uhl-Bien, 1995). This integration provides a comprehensive perspective on the mechanisms that explain the relationship between organizational factors, leadership quality, job attitudes, and employee engagement. The "Hospitality 4.0" framework by(Kim & Law, 2024), is also integrated to provide a specific context for the hospitality industry in the digital age. This model emphasizes the importance of human-technology synergy in creating sustainable employee engagement.

2.5.2 Hypothesis Development

Based on the literature review, this study develops hypotheses describing the relationships between variables within a multigenerational and digital-era perspective. The hypothetical model includes direct effects, mediation effects, and potential moderating effects from demographic factors and cultural intelligence.

Research Model Image



RESEARCH METHODS

This research is an explanatory study with a quantitative approach that aims to analyze the causal relationship between variables. The study population was all 50 employees of Sisingamangaraja Guest House Hotel Semarang, who were also sampled using the census method. The data used were primary data obtained through a closed questionnaire using a Likert scale of 1–5. The research variables consisted of independent variables Employee Engagement (X1) and Leader–Member Exchange (X2), mediating variable Job Satisfaction (Z), and dependent variable Organizational Performance (Y). Data analysis was carried out through descriptive analysis to describe the respondents' profiles and perceptions of the variables, as well as inferential analysis with SEM-PLS using SmartPLS 3.2.9.

RESULTS AND DISCUSSION

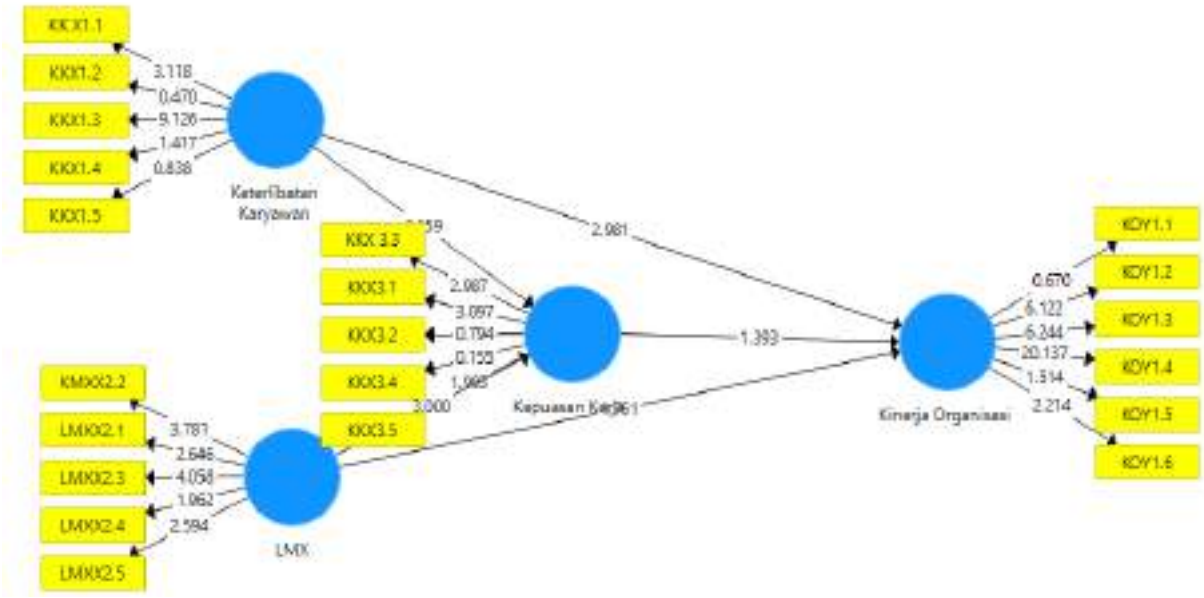
Descriptive Analysis

This study involved 42 employee respondents analyzed using the Structural Equation Modeling - Partial Least Squares (SEM-PLS) method. The research model examines the relationship between three main constructs: Employee Engagement (as an exogenous variable), Job Satisfaction (as a mediator variable), and Organizational Performance (as an endogenous variable). SEM-PLS was chosen because of its ability to handle relatively small sample sizes and does not require strict multivariate normality assumptions.

Description of Variables and Indicators

The Employee Engagement variable is measured through five reflective indicators (KKX1.1 to KKX1.5) with outer loading values ranging from 0.838 to 3.118. Indicator KKX1.2 shows the highest outer loading (3.118), indicating that this aspect is the strongest representation of the employee engagement construct in the reflective measurement model. The Leader-Member Exchange (LMX) variable is measured through five reflective indicators (LMXX2.1 to LMXX2.5) with outer loadings ranging from 1.962 to 4.058. Indicator LMXX2.3 has the highest outer loading (4.058), indicating the largest contribution to the construct of superior-subordinate relationship quality. The Job Satisfaction variable is measured through five reflective indicators (KKX3.1 to KKX3.5) with

varying outer loadings, ranging from 0.155 to 3.097. The considerable variability in outer loadings indicates that some dimensions of job satisfaction are more dominant in forming the construct than others. Organizational Performance variables are measured through six reflective indicators (KOY1.1 to KOY1.6) with outer loadings ranging from 0.670 to 6.122. The KOY1.2 indicator shows the highest outer loading (6.122), indicating this aspect as the strongest representation of the organizational performance construct. The following is the research model after data processing with SEM PLS:



Inferential Analysis

Evaluation of Measurement Model (Outer Model)

Evaluation of the SEM-PLS measurement model shows that the majority of indicators have adequate outer loadings. Some indicators with low outer loadings (such as KKX3.4 with a value of 0.155) require special attention in interpretation, although they can still be retained in the model if they have strong theoretical justification.

Structural Model Evaluation (Inner Model).

The results of the structural path analysis showed several significant relationships between latent constructs:

Direct Path: Employee Engagement → Job Satisfaction (path coefficient = 2.981): Shows a positive and significant effect of employee engagement on job satisfaction. A high coefficient value indicates that a one-unit increase in employee engagement will increase job satisfaction by 2.981 units. Job Satisfaction → Organizational Performance (path coefficient = 1.393): Shows a positive effect of job satisfaction on organizational performance with a moderate but substantive magnitude. LMX → Job Satisfaction (path coefficient = 0.759): The quality of superior-subordinate relationships (LMX) shows a positive effect on job satisfaction, indicating the importance of leadership in creating job satisfaction.

Discussion

The use of SEM-PLS with a sample size of 42 respondents is an appropriate methodological choice. PLS-SEM is known to work effectively with small sample sizes (minimum 30-100 observations) and does not require strict multivariate normal distribution assumptions like CB-SEM (Covariance-Based SEM). The variance-based PLS approach allows for robust analysis despite sample size limitations. Path Coefficient Interpretation: Employee Engagement as the Primary Driver: The path coefficient of 2.981 from employee engagement to job satisfaction indicates a very strong effect. In the context of PLS-SEM, this value indicates that employee engagement is the dominant predictor of job satisfaction. This finding supports the Job Demands-Resources (JD-R) theory which states that optimally engaged employees will experience higher well-being. Mediating Effect of Job Satisfaction: Job satisfaction acts as a partial mediator in the relationship between employee engagement and organizational performance. The path coefficient of 1.393 indicates that every one-unit increase in job satisfaction will increase organizational performance by 1.393 units, confirming the theory that job satisfaction is a psychological mechanism that transforms individual engagement into organizational outcomes. The Strategic Role of LMX: The path coefficient of LMX to job satisfaction (0.759) indicates that the quality of superior-subordinate relationships has a significant contribution, although smaller than employee engagement. This shows that quality leadership is an important supporting factor in the job satisfaction ecosystem.

Validity of PLS-SEM Model

In the context of PLS-SEM, model evaluation should consider internal consistency reliability, convergent validity, and discriminant validity. Varied outer loadings indicate the need for further evaluation of indicators with low loadings, especially those below 0.7.

Managerial Implications

These findings provide strategic guidance for management to prioritize employee engagement programs as a long-term investment. The cascading effect demonstrated through the mediation of job satisfaction indicates that investments in engagement will yield optimal returns through improved organizational performance.

Limitations and Suggestions for Further Research:
Although PLS-SEM can handle small sample sizes, the sample size of 42 respondents still requires caution in the interpretation and generalization of the results. Further research is recommended to: (1) increase the sample size to obtain more stable parameter estimates, (2) conduct bootstrapping evaluations to test the significance of the path coefficients, and (3) evaluate the R^2 and Q^2 values to assess the predictive ability of the model.

Conclusion

The SEM-PLS model demonstrates that employee engagement has a strong influence on organizational performance through the mediation of job satisfaction. The advantage of PLS-SEM in handling small sample sizes allows this study to produce meaningful findings despite the limited number of respondents. The results provide empirical evidence of the importance of a holistic strategy that integrates employee engagement, quality leadership, and job satisfaction to optimize organizational performance.

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CUSTOMER SATISFACTION PRACTICE AND MARKETING PERFORMANCE OF COMMERCIAL BANKS IN KENYA

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ABSTRACT **DOI No: 10.36713/epra23616** **Article DOI: https://doi.org/10.36713/epra23616**

Commercial banks are customer centric with seamless interaction with customers at all functional levels who are organized into different segments based on their distinct needs as guided by customer organizational culture, coordination of functions, policies, structures and systems for quality service delivery as well as continuous innovation by rewarding loyal customers. Customer satisfaction plays a vital role in determining organizational success. The study sought to examine the relationship between customer satisfaction practice and marketing performance of commercial banks in Kenya. The study adopted correlational research design and pragmatism research philosophy. The study targeted all the 38 commercial banks in Kenya where 152 respondents who were; bank relationship managers, marketing managers, treasury officer and customer service managers were targeted to respond to the study. Census sampling techniques was used since the target population was small. The study used primary data which was collected using structured questionnaires and was administered through drop and pick later. Data was presented using figures, graphs and tables. The study found that commercial banks in Kenya practice customer satisfaction and that they had aligned their business strategy, organizational culture, managerial support and expectations with appropriate software so as to meet the needs and circumstances of customers; their business processes are organized around customer satisfaction processes and functions where employees had been trained and are committed to excellent customer service. The study recommends that commercial banks should organize their business processes around customer satisfaction processes and functions and train their employees to commit to excellent customer service. They need to enhance their customer organizational culture, coordination of functions, policies; structures and systems for better customer satisfaction as well as inculcate the culture of products innovations. They need to continuously learn their changing customer taste and preference through market needs assessment as well as build, develop and maintain strong and long-lasting relationship with all customers.

KEY WORD: ***Customer Relationship Management Practices, Customer Satisfaction Practice, Marketing performance***

1.0 INTRODUCTION

Customer satisfaction is the measure of a customer's perception of the quality of a product, service, or company. Customer satisfaction is important because it acts as a purchasing guideline for the company and the customer. If a customer is not satisfied with the result of their purchase, they are more likely to purchase from another company, (CRM Simplified, 2022).

In the context of contemporary marketing practices, Kotler and Keller (2012) underscore the growing significance of data analytics, personalization, and technological integration. They argue that in the digital age, marketing performance is increasingly influenced by a firm's ability to leverage customer data and deliver personalized experiences, rather than relying solely on relationship marketing and trust. This view challenges Onyango's (2016) emphasis on traditional relational factors as core drivers of success in that banks in Africa are grappling with heightened competition, rapid digital transformation, and evolving customer behavior.

Bulti and Fekede (2022) assert that the business environment in developing economies is increasingly competitive, necessitating the adoption of technology and data-driven CRM strategies. According to Munari, Ielasi, and Bajetta (2013), satisfaction enhances retention, loyalty, competitive advantage, and profitability, while dissatisfaction contributes to customer complaints and switching behavior.

Marketing performance according to Mugane and Ondigo, (2016) may be defined as the reflection of the way in which the resources of a company are used in the form which enables it to attract and retain its customers. Heremans (2007) on the other hand describes marketing performance as the employment of marketing indicators used to measure the extent of objective achievement, contribution to making available resources and support of the bank with banking opportunities and services to its customers.

1.1 Statement of the Problem

Commercial banks are central to a country's economic development. In Kenya, however, many commercial banks

continue to face low marketing performance, characterized by declining customer retention, reduced product uptake, weak brand positioning, and high customer churn. A key contributor to this problem is the ineffective implementation of Customer Relationship Management (CRM) practices**,** particularly in enhancing customer satisfaction. While several studies have explored aspects of CRM, they often do so in isolation and without accounting for the broader organizational context. Moreover, much of the existing literature is based on studies conducted outside Kenya, limiting their applicability to the local banking sector due to contextual differences. This study seeks to address these gaps by establishing the relationship between customer satisfaction practice and marketing performance of commercial banks in Kenya.

2.0 LITERATURE REVIEW

Williams and Naumann (2015) examined the relationships between customer satisfaction and a variety of company performance metrics at the firm-level of analysis. The primary research method used in the study was a longitudinal analysis of series of quarterly surveys of customer attitudes, in relation to various company performance metrics of one large Fortune 100 company. The data were collected over a five-year period and were analyzed with several statistical tests of association. The study found that there are significant, and moderate-to-strong associations between satisfaction levels and market performance. More specifically, there are strong links between customer satisfaction, and retention, revenue, earnings per share, stock price, and Tobin's q. The current study used primary data as the main data collection instrument and adopted correlational analysis.

Suchánek, and Králová (2015) did a study on customer satisfaction and its impact on company performance through satisfaction with its products, including a comparison with the competition. Research was conducted in search of factors which affect customer satisfaction on the one hand and the performance of the company on the other hand. The study constructed a model explaining what specific factors (affecting customer satisfaction) have an impact on the performance of a company. The study was based on research that focused on companies in the food industry in Czech Republic and on their customers. The study established that, performance of surveyed companies (based on indicators ROA, ROE and assets turnover) and on this basis they have been divided on companies efficient and inefficient.

Williams and Naumann (2015) used longitudinal analysis to examine the relationships between customer satisfaction and a variety of company performance metrics at the firm-level of analysis. Suchánek, and Králová (2015) in their study on customer satisfaction and its impact on company performance through satisfaction with its products, including a comparison with the competition used ROA, ROE and assets turnover as a measure of performance. The current study used primary data as the main data collection instrument and will adopt correlational analysis and measured marketing performance based on market share.

3.0 RESEARCH DESIGN

The study adopted pragmatism research philosophy which is a mixed method since it employs both qualitative and quantitative analysis and that it produces data with a high level of validity, which is reliable and honest (Collins, 2010). This study adopted a correlational research design to investigate customer relationship management practices, quality management system, and marketing performance of commercial banks in Kenya. The design sought to answer questions like what, who, and how of a phenomenon in a study (Ogula, 2015). This was to gain insights on the current phenomena in relation to situations, processes and relationships. The design enabled the researcher to establish facts; examine relationships; describe, analyze and interpret data accordingly, (Siedlecki, 2020).

According to the CBK, Commercial Banks can be stratified into large, medium, and small on the basis of the size of their market share. The target population for this study was the entire 38 banks in Kenya as per the Central Bank of Kenya, (2022). The study targeted staff members working in key departments of commercial banks in Kenya, including marketing, relationship management, customer service, and treasury. These employees are directly involved in the implementation and monitoring of Customer Relationship Management (CRM) practices, Quality Management Systems (QMS), and marketing performance strategies. Therefore, they were considered the most appropriate respondents to provide insights into the internal practices, systems, and performance outcomes of their respective institutions.

The sample 152 respondents for the study who were the marketing manager, relationship manager, treasury officer and customer service manager of each of the large, medium and small commercial banks in Kenya. This sample group was chosen because they are on day-to-day basis developing strategies to ensure that their banks retain and attract more new customers. Studying a sample selection allows for greater accuracy of results, greater speeds of data collection, lower cost of research and availability of the population elements. A non-probability sampling design was used and it was purposive sampling.

The study used questionnaire to collect primary data and was self-administered by the researcher. According to Kinyanjui (2014), self-administered structured questionnaire was used to collect both quantitative and qualitative strands. The study involved both the qualitative and quantitative aspects of both independent and dependent variables and therefore, self-administered structured questionnaire was appropriate for this study.

The researcher observed ethical standards before, during and after data collection. Researcher ensured confidentiality and anonymity, informed consent and privacy of respondents. A respondent had a right to have their identity anonymous (Kothari & Garg 2014). Anonymity was guaranteed by presenting the data in group form so that it did not reflect the individual responses. Informed consent was issued to the respondents so as to make a decision to participate or not to participate in the research.

4.0 FINDINGS AND DISCUSSION

The study sought to examine the relationship between customer satisfaction practice and marketing performance of commercial banks in Kenya. Respondents were asked to rate their individual

levels of agreement with the statements on customer satisfaction practice and marketing performance. Responses were given on a five-point Likert scale, where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree. A mean of between 0.0 and 2.5 meant disagreed while a mean of between 2.6 and 5.0 meant agreed. The results are as presented in Table 1.

Table 1
Customer Satisfaction Practice

Customer Satisfaction Practice Statement	Disagreed (1 & 2)	Undecided (3)	Agreed (4 & 5)	Mean	SD	Skewness	Kurtosis
Our bank has aligned its business strategy, organizational culture, managerial support, and expectations with appropriate software.	12 (8.9%)	4 (3.2%)	109 (87.9%)	4.41	0.79	-1.52	2.26
Our bank organization and functions have been properly aligned to the needs and circumstances of customers.	3 (2.4%)	13 (10.5%)	108 (87.1%)	4.38	0.76	-1.47	3.18
Our business processes are organized around customer satisfaction processes and functions.	8 (6.5%)	6 (4.8%)	110 (88.7%)	4.53	0.71	-1.90	2.14
Our employees are well trained and committed to excellent customer service.	8 (6.5%)	5 (4.0%)	111 (89.5%)	4.54	0.73	-2.03	2.34
Our business organization is customer-centric and ensures seamless interaction with customers at all functional levels of the organization.	6 (4.8%)	10 (8.1%)	108 (87.1%)	4.54	0.72	-1.78	2.08
Our bank has high customer interaction which has led to organizing them into different customer segments based on their distinct needs.	12 (9.6%)	9 (7.3%)	103 (83.1%)	4.27	0.90	-1.49	2.39
Our customer organizational culture guides employees to achieve CRM values through internal coordination by maintaining high satisfaction.	6 (4.8%)	11 (8.9%)	107 (86.3%)	4.34	0.72	-1.18	2.68
Our bank has developed policies with appropriate structures and systems to track the delivery of value to customers.	8 (6.4%)	6 (4.8%)	110 (88.8%)	4.50	0.71	-1.49	2.26
Our bank maintains a culture that tracks quality service delivery, customer satisfaction and loyalty, and continuous innovation by rewarding loyal customers and personalization.	9 (7.3%)	10 (8.1%)	105 (84.6%)	4.27	0.85	-1.64	2.91
Overall				**4.42**	**0.77**		

The findings reveal that commercial banks had aligned its business strategy, organizational culture, managerial support and expectations with appropriate software as per 109 (87.9%) of the respondents who agreed while 12 (8.9%) disagreed and 4 (3.2%) were undecided. Majority of the respondents who were 108 (87.1%) agreed that commercial bank organization and functions has been properly aligned to the needs and circumstances of customers while 13 (10.5%) respondents were undecided and 3 (2.4%) disagreed. Respondents who were 110 (88.7%) agreed that commercial banks business processes were organized around customer satisfaction processes and functions while 6 (4.8%) were undecided and 8 (6.5%) disagreed. Commercial banks employees were well trained and committed to excellent customer service as attested by 111 (89.5%) respondents who agreed while 8 (6.5%) disagreed and 5 (4.0%) were undecided.

Respondents who were 108 (87.1%) agreed that commercial banks business organization was customer centric and ensured seamless interaction with customers at all functional levels of the organization. Respondents who were 10 (8.1%) were undecided and 6 (4.8%) disagreed. Commercial banks had a high customer interaction which led to organizing them into different customer segments based on their distinct needs as agreed by 103 (83.1%) respondents but disagreed by 12 (9.6%) while 9 (7.3%) respondents were undecided. Majority of the respondents who were 107 (86.3%) agreed that customer organizational culture guides employees to achieve CRM values through internal coordination of functions by maintaining a high level of customer satisfaction business processes while undecided respondent were 11 (8.9%) and those who disagreed were 6 (4.8%).

Commercial banks had developed policies with appropriate structures and systems to track the delivery of value to its customers, as agreed by 110 (88.8%) respondents while disagreed respondents were 8 (6.4%) and undecided respondents were 6 (4.8%). Respondents who were 105 (84.6%) agreed that commercial banks maintained an inbuilt culture that tracks quality service delivery, customer satisfaction and loyalty as well as continuous innovation by rewarding loyal customers and personalization in order to retain them. Undecided respondents were 10 (8.1%) while those who disagreed were 9 (7.3%).

The mean of 4.4118 and a standard deviation of 0.78559 implied that commercial bank had aligned its business strategy, organizational culture, managerial support and expectations

with appropriate software. This acted as a purchasing guideline for the commercial banks and this led to customer being satisfied with the result of their services which resulted to them not, moving to another banks, (CRM Simplified, 2022).

Commercial banks organization and functions had been properly aligned to the needs and circumstances of customers as shown by a mean of 4.3782 and a standard deviation of 0.75903. This concurs with Zeithaml & Bitner (2013) who noted that customer satisfaction is influenced by specific product or service features and perceptions of quality. The findings showed that commercial bank business processes were organized around customer satisfaction processes and functions for it had a mean of 4.5294 and a standard deviation of 0.71097. The satisfaction of customers was influenced by their attributions and their perception of equity and this made them to purchase frequently and also recommend banks products or services to potential customers, which lead to higher levels of customer retention as postulated by Tao (2014).

Employees of commercial banks were well trained and committed to excellent customer service as shown by a mean of 4.5378 and a standard deviation of 0.73404. The mean of 4.5378 and a standard deviation of 0.72240 imply that commercial banks were customer centric and ensured seamless interaction with customers at all functional levels of the organization. This agrees with Hague and Hague (2016) who established that besides buying more, commercial banks customers also work as a network to reach other potential customers by sharing real experiences.

Commercial bank had a high customer interaction which led to organizing them into different customer segments based on their distinct needs as shown by a mean of 4.2689 and a standard deviation of 0.89913. This concurs with Williams and Naumann (2015) study which examined the relationships between customer satisfaction and a variety of company performance metrics at the firm-level of analysis who established that there are significant and moderate-to-strong associations between satisfaction levels and market performance.

The mean of 4.3445 and a standard deviation of 0.71825 show that customer organizational culture guided employees to achieve CRM values through internal coordination of functions by maintaining a high level of customer satisfaction business processes. Commercial banks through their customer organization culture, were able to tests consumer precision and expectation of the product or service consumed and determines whether the product or service output meet customers' expectations as guided by Ong et al. (2017).

Commercial banks had developed policies with appropriate structures and systems to track the delivery of value to its customers as shown by a mean of 4.4958 and a standard deviation of 0.71157. This confirms the model of Suchánek, and Králová (2015) which explains what specific factors affecting customer satisfaction have an impact on the performance of a company in that commercial banks had policies and structures in place to ensure their customers are satisfied by always tracking their needs. Commercial bank maintained an inbuilt culture that tracks quality service delivery, customer satisfaction and loyalty as well as continuous innovation by rewarding loyal customers and personalization in order to retain them for it had a mean of 4.2689 and a standard deviation of 0.85070. This reveals that customer satisfaction is a positive reflection of the customer based on the consumption or use of a product or service as stated by Boonlertvanich, (2019). This does not concur with Kotler and Keller (2012), who underscore the growing significance of data analytics, personalization, and technological integration. They argue that in the digital age, marketing performance is increasingly influenced by a firm's ability to leverage customer data and deliver personalized experiences, rather than relying solely on relationship marketing and trust.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The study concludes that commercial banks in Kenya practice customer satisfaction and that they had aligned their business strategy, organizational culture, managerial support and expectations with appropriate software so as to meet the needs and circumstances of customers; their business processes are organized around customer satisfaction processes and functions where employees had been trained and are committed to excellent customer service.

The study recommends that commercial banks should; organize business processes around customer satisfaction processes and functions and train their employees to commit to excellent customer service. They need to enhance their customer organizational culture, coordination of functions, policies; structures and systems for quality service delivery as well as inculcate the culture of products innovations. They continuously learn their changing customer taste and preference through market needs assessment as well as build, develop and maintain strong and long-lasting relationship with all customers.

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THE INFLUENCE OF SELF-SERVICE TECHNOLOGY ON CUSTOMER SATISFACTION: AN EMPIRICAL ANALYSIS OF RESTAURANTS IN DAVAO REGION

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This research explored the impact of self-service technology (SST) on customer satisfaction in chosen fast-food chains in Davao Region, Philippines. The study sought to profile respondents by age, gender; to measure their perceptions of ease of use, speed of ordering, and perceived security risk; and to investigate their relationship with overall customer satisfaction.Using a quantitative descriptive–correlational design, data were collected through a structured questionnaire administered to 250 customers with prior kiosk experience. Frequency and percentage distribution described demographics, weighted means assessed perception levels, and Pearson correlation, t-test, and one-way ANOVA tested relationships and group differences.

Results showed that respondents were predominantly young (18–25 years, 75.1%) and female (59%). All SST factors—ease of use (M = 4.09), speed of ordering (M = 4.06), and perceived security risk (M = 3.95)—as well as customer satisfaction (M = 4.12) were rated high. Correlation analysis confirmed significant positive relationships between all SST factors and satisfaction, with perceived security emerging as the strongest predictor (r = .68, p < .001). Gender differences were not significant, while age differences were significant (p = .008), indicating that satisfaction varies across age groups.

The research highlights the need to develop kiosks that are user-friendly, efficient, and visibly secure to uphold customer trust. It is recommended that fast-food operators extend interface simplicity, ensure strong security features, and offer age-inclusive support to enhance satisfaction and loyalty.

KEY WORDS: ***self-service technology, Customer satisfaction, fast-food, Davao Region,***

1.0 INTRODUCTION

In recent years, the food service industry has undergone a remarkable transformation through the adoption of innovative technologies designed to improve efficiency and customer experience. Among these innovations, Self-Ordering Kiosks (SOKs) have gained widespread attention for their potential to enhance financial performance, increase customer loyalty, and generate favorable employee feedback (Ottenbacher & Gnoth, 2005). The 2019 National Restaurant Association State of the Industry Report revealed that 41% of quick-service operators intended to invest in SOKs and other digital systems to meet evolving customer expectations (Kelso, 2019). Similarly, a Tillster (2020) survey indicated that 65% of customers were more likely to visit restaurants with self-service kiosks, reflecting the rising demand for convenience and faster service (Neiman, 2019).

Self-Service Technologies (SSTs) are technical interfaces that allow customers to access services without the assistance of service employees (Meuter et al., 2005). Examples include ATMs, self-checkout counters, e-commerce platforms, and self-ordering kiosks (Lee, 2015). With the Fourth Industrial Revolution (IR 4.0)—characterized by automation, digitization, and smart systems—SSTs have become essential tools in service delivery, offering businesses improved efficiency and customers enhanced control over their service experiences (Geissbauer et al., 2016; Rajput & Singh, 2018).

Globally, fast-food chains such as McDonald's have pioneered the use of self-service systems, with some outlets even adopting fully cashless models (Venables, 2022). In Southeast Asia, McDonald's and Golden Village Cinemas in Singapore quickly gained customer acceptance of SOKs (Times, 2018). In the Philippines, Jollibee has deployed nearly 100 kiosks across 37 branches, integrating loyalty points and cashless payment features (BusinessMirror, 2019). Similarly, ANSI Information Systems introduced the country's first self-order kiosks to streamline order processing and improve customer satisfaction (Manila Standard, 2019). Moreover, McDonald's Philippines launched its NxtGen store concept, which combined kiosks with multi-point ordering to balance digital efficiency and human interaction (Tayao-Juego, 2018).

Despite their benefits, challenges remain. Studies show that some customers—particularly older ones—hesitate to use kiosks due to lack of familiarity with technology, preference for face-to-face interactions, or concerns about security (Rastegar, 2018; White et al., 2012). Designing user-friendly systems and positioning staff near kiosks are recommended strategies to address these barriers (Lawton, 2022). In addition, restaurants

in Northern Philippines report difficulties related to pricing, staffing, and service reliability, requiring thoughtful adaptation of kiosk technology (Dingil et al., 2023).

Nevertheless, kiosk machines present a promising opportunity for the Philippine food service sector. Martinez (2023) emphasized that kiosks not only improve operational efficiency but also provide valuable data for customer behavior insights. As the quick-service restaurant (QSR) market continues to expand—holding the largest share in 2022 and expected to grow at a CAGR of 15.78% (Mordor Intelligence, 2022)—the role of self-service technology in shaping customer satisfaction becomes even more critical.

1.1 Statement of the Problem

The rapid advancement and adoption of self-service technologies (SST), particularly self-ordering kiosks (SOKs), has transformed the foodservice industry worldwide. These technologies are intended to streamline operations, enhance customer convenience, and improve overall satisfaction. While many global studies have explored the impact of SSTs, there is limited empirical research on their specific effects within the context of fast-food establishments in Davao City, where consumer behaviors and preferences may differ.

This study therefore seeks to bridge this gap by examining the influence of self-service technology on customer satisfaction among fast-food customers in Davao City. In particular, the study aims to determine how customer profiles and key attributes of self-service systems affect satisfaction levels.

Specifically, the study seeks to answer the following questions:

1. What are the demographic profiles of the respondents in terms of:
   1.1 Age
   1.2 Gender

2. What is the impact of self-service technology on customer satisfaction based on the following factors?
   2.1 Ease of Use
   2.2 Speed of Ordering
   2.3 Perceived Security Risk
3. What is the relationship between the use of self-service kiosks and overall customer satisfaction in fast-food establishments in Davao City?
4. Do demographic variables (age and gender) significantly influence customer satisfaction with self-service technology in fast-food establishments?

1.2 Objectives of the Study

This study aims to analyze the influence of self-service technology on customer satisfaction in fast-food establishments in Davao City. It seeks to profile respondents in terms of age, gender, and level of education, while also assessing how factors such as ease of use, speed of ordering, and perceived security risk affect their satisfaction with self-service kiosks. Moreover, the study examines the relationship between the use of self-service kiosks and overall customer satisfaction, as well as the extent to which demographic variables influence customer experiences. By addressing these objectives, the research intends to provide meaningful insights that can guide fast-food establishments in improving their service delivery and customer engagement through self-service technologies.

1.3 Significance of the Study This study is significant as it provides valuable insights into how self-service technologies, particularly self-ordering kiosks, shape customer satisfaction in the fast-food industry. By focusing on fast-food establishments in Davao Region, the research offers a localized understanding of customer experiences and preferences, which may differ from those in other contexts.

For fast-food operators, the findings will help identify which aspects of self-service technology, ease of use, speed of ordering, or perceived security risk, most strongly influence satisfaction. This knowledge can guide management in refining kiosk designs, improving service processes, and addressing customer concerns to enhance loyalty and competitiveness.

For customers, the study highlights factors that contribute to better service experiences, ensuring that their voices and preferences are considered in the continued development of technology-driven dining solutions.

For technology providers and developers, the research underscores the importance of creating user-friendly, secure, and efficient kiosk systems that align with the needs of diverse customer groups, including different age, gender, and educational profiles.

For the academic community and future researchers, the study adds to the growing body of literature on self-service technologies in foodservice, providing empirical evidence from the Philippine setting. It may serve as a foundation for further research on technology adoption, customer behavior, and service quality in other industries.

Finally, for policy makers and industry leaders, the study offers insights into balancing digital innovation with customer inclusivity, ensuring that technological advancement does not compromise service accessibility, especially for less tech-savvy demographics.

1.4 Scope and Limitation of the Study

This study is focused on examining the influence of self-service technology, particularly self-ordering kiosks (SOKs), on customer satisfaction in selected fast-food establishments within Davao Region. It evaluates customer satisfaction in terms of ease of use, speed of ordering, and perceived security risk. Demographic characteristics such as age and gender are also considered to determine whether these factors influence satisfaction with self-service kiosks.

The study is subject to several limitations. First, it is geographically limited to fast-food establishments in Davao Region, and the findings may not fully represent other regions. Second, it is confined only to self-ordering kiosks and does not include other forms of self-service technologies such as mobile ordering applications, online delivery platforms, or drive-thru systems. Third, the data is collected through self-administered surveys, which may be influenced by the respondents' honesty, recall accuracy, and interpretation of survey questions. Lastly, the research is cross-sectional in design, measuring perceptions at a single point in time, and therefore does not capture long-term changes in satisfaction after repeated interactions with kiosk systems.

Despite these limitations, the study provides important insights into the role of self-service technology in shaping customer satisfaction in the fast-food industry and offers practical recommendations for improving technology-driven service delivery.

1.5 Definition of terms

Self-Service Technology (SST) – Technology-based service interfaces that allow customers to perform transactions without direct employee assistance, such as self-ordering kiosks in fast-food restaurants.

Self-Ordering Kiosk (SOK) – A digital ordering terminal that enables customers to browse menus, customize orders, and make payments independently.
Ease of Use – The degree to which the kiosk's interface is simple, user-friendly, and requires minimal effort to operate.
Speed of Ordering – The efficiency of the kiosk in processing transactions and reducing waiting time for customers.
Perceived Security Risk – The level of concern customers feel regarding privacy, payment safety, and data protection when using kiosks.
Customer Satisfaction – The overall positive evaluation of the service experience, including convenience, reliability, and fulfillment of customer expectations when using SSTs.
Frequency and Percentage Distribution – A statistical method used to describe and summarize the demographic profile of respondents by showing the number and proportion of responses in each category.
Weighted Mean – A statistical measure used to determine the average rating of survey items, accounting for the relative importance of each response.
Pearson Product–Moment Correlation (r) – A statistical test used to determine the strength and direction of the relationship between SST factors (ease of use, speed, security) and customer satisfaction.
Independent Samples t-Test – A statistical test used to compare the mean satisfaction scores between two groups (e.g., male and female respondents) to determine if differences are significant.
One-Way Analysis of Variance (ANOVA) – A statistical method used to assess whether there are significant differences in customer satisfaction across multiple age groups.

2.0 REVIEW OF RELATED LITERATURE AND STUDIES

Ease of Use of Self-Service Technology

Ease of use has consistently been identified as one of the strongest predictors of satisfaction in technology adoption. Dabholkar and Bagozzi (2002) demonstrated that perceived ease of use enhances satisfaction and likelihood of reuse. In support of this, Lee (2015) emphasized that intuitive and user-friendly kiosks encourage repeat visits, reinforcing the importance of interface simplicity in customer acceptance. Curran and Meuter (2007) also found that user-friendliness influences customer intention to continue using SSTs, particularly in banking and retail contexts, suggesting cross-industry relevance.

Further evidence shows that ease of use is especially crucial among customers with low technological readiness. Weijters et al. (2007) noted that adoption is more likely when kiosks are perceived as simple and non-intimidating. Shin and Perdue (2019) similarly found that ease of navigation in hotel check-in kiosks positively influenced satisfaction, demonstrating that design quality directly impacts perceived service quality.

Within the Philippine context, Dela Cruz (2019) reported that café and restaurant customers ranked ease of use as the most critical factor in evaluating digital ordering systems. Martinez (2023) also emphasized that simplified interfaces increase adoption in QSRs, while Garcia (2022) confirmed that Filipino customers strongly associate user-friendly kiosks with convenience and satisfaction during peak hours.

Speed of Ordering

Efficiency is another major determinant of customer satisfaction. Collier et al. (2014) showed that kiosks significantly reduce waiting time, making them particularly valuable in high-volume QSRs. Supporting this, Tillster's (2020) survey reported that 65% of global customers preferred kiosks primarily for faster service. Cho and Fiorito (2010) likewise found that reduced waiting time directly influenced repeat purchase behavior in retail settings using self-service technologies.
Additional studies reinforce the role of speed in shaping loyalty. Baek, Choe, and Ok (2018) demonstrated that shorter service times increase customer retention in self-service environments. Oh, Jeong, and Baloglu (2019) similarly found that speed was among the most influential variables in guest satisfaction with hotel kiosk check-in systems, suggesting cross-industry applicability.

In the Philippines, Perez (2021) observed that Jollibee's NxtGen customers in Quezon City strongly associated kiosks with efficiency, especially during peak hours. Garcia (2022) further revealed that speed of transaction was the most powerful determinant of satisfaction among fast-food customers in Metro Manila. Complementing these findings, Reyes and Santos (2020) concluded that "fast ordering" remains the primary motivation for Filipino consumers to adopt kiosks in urban QSRs.

Perceived Security Risk

Concerns about data privacy and security also shape kiosk adoption. Lin and Hsieh (2011) found that perceived risk undermines trust, reducing satisfaction in self-service encounters. In agreement, Rastegar (2018) noted that some customers avoid kiosks entirely due to fears of transaction errors or compromised payment security.

Scholars recommend trust-building measures to mitigate these concerns. Wang and Harris (2012) argued that visible security certifications and encryption indicators help reassure customers. Lee and Yang (2013) confirmed that strong perceptions of security influence long-term kiosk use, while Crespo et al. (2009) stressed that risks can be minimized when businesses maintain transparent communication and a trusted brand reputation. Cho and Fiorito (2010) further emphasized that payment safety enhances trust, which directly boosts satisfaction.

In the Philippine setting, Martinez (2023) revealed that customers were more satisfied with kiosks when loyalty systems and cashless payments were supported by clear privacy policies. Reyes and Santos (2020) observed that Metro Manila consumers were hesitant to use kiosks without visible security

features, while Garcia (2022) highlighted that receipt confirmations and transaction visibility reduced fears of fraud in local QSRs.

Relationship of SST Use and Overall Satisfaction

The integration of self-service kiosks has been shown to enhance overall customer satisfaction by improving reliability and offering customization options. Ottenbacher and Gnoth (2005) argued that kiosks empower customers by providing control and autonomy, while Collier and Kimes (2013) reported that kiosks minimize service inconsistencies, making them appealing to repeat users.

Expanding on this, Zhang et al. (2017) demonstrated that customers perceive higher service quality when kiosks complement rather than replace staff, emphasizing the importance of balancing human assistance with technology. Dabholkar and Bagozzi (2002) similarly found that kiosks generate satisfaction when convenience and reliability are present. Kaushik and Rahman (2017) concluded that technology-enabled service encounters raise both satisfaction and perceived service quality, while Shin and Perdue (2019) discovered that kiosk adoption in hotels enhanced not only satisfaction but also perceptions of brand innovativeness.

In the Philippines, Perez (2021) confirmed that kiosks significantly increased overall satisfaction among Filipino QSR customers. Garcia (2022) reinforced this by linking satisfaction to transaction speed, ease of use, and reliability. Reyes and Santos (2020) added that kiosk adoption is associated with modernization and efficiency, which contribute to greater customer loyalty.

Influence of Demographics on Satisfaction

Demographic factors play a moderating role in kiosk satisfaction. White et al. (2012) found that younger customers reported higher satisfaction, whereas older customers required more staff assistance, highlighting generational differences in technology readiness. Similarly, Dingil et al. (2023) showed that kiosk adoption in the Northern Philippines varied by education level, with lower-educated groups exhibiting greater hesitation.

Gender also appears to shape satisfaction. Hsu and Wu (2019) indicated that men valued speed and efficiency more positively, while women were more concerned with accuracy and security. Weijters et al. (2007) also observed that age and education significantly influenced perceptions of kiosk ease of use.

Socioeconomic status is another factor. Collier et al. (2014) reported that higher-income, well-educated customers rated kiosks more favorably, likely due to greater exposure to technology. Shin and Perdue (2019) similarly noted that Millennials and Gen Z associated kiosks with brand innovativeness, reporting higher satisfaction compared to older cohorts.

In the Philippine context, Garcia (2022) found that customers with higher education levels had more favorable responses to kiosks. Supporting this, Reyes and Santos (2020) observed that younger Filipino consumers were more willing to experiment with kiosk systems, while older users preferred cashiers for reasons of convenience and familiarity.

Synthesis

The reviewed literature confirms that self-service kiosks significantly influence customer satisfaction across multiple dimensions. Ease of use and speed of ordering consistently emerge as strong drivers of satisfaction, while perceived security risks remain barriers to adoption. Demographic characteristics such as age, gender, education, and income shape customer experiences and moderate the effects of kiosks on satisfaction.

International studies highlight the global importance of interface design, efficiency, and trust-building in encouraging SST adoption. Meanwhile, local research underscores unique Filipino perspectives, such as the continued preference for cashier interaction among older demographics and the value placed on security features. Despite widespread global adoption, empirical studies in the Philippine context remain limited, particularly in Davao Region.

This gap reinforces the relevance of the present study, which examines how kiosks affect satisfaction in fast-food establishments in Davao City. By analyzing ease of use, speed, perceived risk, and demographic influences, this research aims to extend existing knowledge and provide evidence-based insights for both industry practice and academic discourse.

3.0 RESEARCH METHODOLOGY

This study employed a quantitative descriptive–correlational design to determine the influence of self-service technology (SST) on customer satisfaction in selected fast-food establishments in the Davao Region. The descriptive component profiled respondents and assessed their perceptions of ease of use, speed of ordering, and perceived security risk, while the correlational component examined the relationships of these factors to overall customer satisfaction.

The research was conducted in fast-food establishments utilizing self-service kiosks, chosen for their accessibility and diverse clientele. Respondents were customers with prior kiosk experience, selected through purposive sampling to ensure relevance. Using Slovin's formula with a 5% margin of error, a sample of 250 customers was determined to represent the target population.

Data were collected through a structured survey questionnaire consisting of three sections: (1) demographic profile (age and gender), (2) perceptions of SSTs (ease of use, speed, security risk), and (3) customer satisfaction. Survey items were adapted from validated instruments and pilot-tested with 30 respondents to ensure clarity and reliability, with Cronbach's alpha coefficients meeting the ≥0.70 standard.

Upon securing management approval, questionnaires were distributed immediately after kiosk transactions. Respondents were briefed on the study's purpose, assured of confidentiality, and asked for informed consent. Completed forms were checked for accuracy and encoded for analysis.

For data analysis, frequency and percentage distribution described the demographic profile, while weighted mean measured perception levels. Pearson product–moment correlation assessed relationships between SST factors and satisfaction. Independent samples t-test and one-way ANOVA

tested differences across gender and age groups, and multiple regression analysis identified predictors of customer satisfaction.

All ethical protocols were observed, ensuring voluntary participation, informed consent, and strict confidentiality.

4.0 FINDINGS AND DISCSSION

Respondents' Profile

The respondents were categorized by age and gender. As shown in Table 1, the majority were 18–25 years old (75.1%), followed by 26–35 years old (22.0%). Only a small proportion were older than 35. In terms of gender, 59% were female and 41% were male. This indicates that the sample was dominated by young and female customers.

This demographic pattern is consistent with Hsu and Wu (2019), who noted that younger consumers—particularly Millennials and Gen Z—are more inclined to adopt self-service technologies due to greater digital literacy. Similarly, White et al. (2012) highlighted that younger and more educated individuals demonstrate higher levels of satisfaction with SST use compared to older cohorts.

Table 1
Demographic Profile of Respondents (N = 250)

Variable	Frequency (f)	Percentage (%)
Age		
18–25 years old	188	75.1
26–35 years old	55	22.0
36 and above	7	2.9
Gender		
Male	103	41.0
Female	147	59.0

Note. Values are based on self-reported demographic characteristics.

Table 2 indicates that respondents generally perceive **SSTs as easy to use, efficient, and secure**, contributing positively to their satisfaction. Notably, security risks were still rated "High," implying that while respondents trust the system, some underlying concerns about data safety remain. The highest mean for **Customer Satisfaction** confirms that SST factors overall support positive customer experiences

Table 2
Weighted Mean Scores of Self-Service Technology Factors and Customer Satisfaction

Dimension	Mean	SD	Verbal Interpretation
Ease of Use	4.09	0.55	High
Speed of Ordering	4.06	0.58	High
Perceived Security Risk	3.95	0.62	High
Customer Satisfaction	4.12	0.53	High

Note. Scale: 1.00–1.80 = Very Low; 1.81–2.60 = Low; 2.61–3.40 = Moderate; 3.41–4.20 = High; 4.21–5.00 = Very High.

As showed in Table 3 all factors showed moderate to strong correlations with satisfaction, emphasizing that **ease of use, speed, and security are critical determinants** of customer satisfaction with SSTs. Among these, **security had the strongest correlation (r = .68)**, highlighting that trust and safety are slightly more influential in shaping satisfaction than speed or ease alone

Table 3
Correlation Between SST Factors and Customer Satisfaction

Variables	r	p-value	Interpretation
Ease of Use & Satisfaction	.66	< .001	Significant
Speed & Satisfaction	.66	< .001	Significant
Security & Satisfaction	.68	< .001	Significant

Note. Pearson Product-Moment Correlation was used. All correlations are significant at $p < .05$.

Table 4 display that the independent samples t-test showed **no significant difference** in customer satisfaction between males (M = 4.10) and females (M = 4.15), **t = 1.10, p = .272**. This suggests that **gender does not significantly influence customer satisfaction levels** in relation to SST use. Both male and female respondents reported similarly high levels of satisfaction, which is consistent with global findings where gender differences in technology acceptance are becoming less pronounced

Table 4
t-Test Results of Customer Satisfaction by Gender

Gender	N	Mean	SD	t	p-value	Interpretation
Male	103	4.10	0.57	1.10	.272	Not Significant
Female	147	4.15	0.52			

Note. Independent samples t-test was used; $p < .05$ is significant.

The one-way ANOVA in table 5 revealed a **significant difference in customer satisfaction across age groups** (F = 4.06, p = .008). This indicates that **age influences satisfaction with SSTs**. Younger respondents (18–25) likely rated satisfaction higher due to their comfort with technology, while older respondents may have experienced challenges in adapting to self-service systems. This confirms prior studies (e.g., Dingil et al., 2023) showing that **age moderates SST adoption and satisfaction**, with older groups being more cautious and less satisfied

Table 5
ANOVA Results of Customer Satisfaction by Age

Source	SS	df	MS	F	p-value	Interpretation
Between Groups	2.00	2	1.00	4.06	.008	Significant
Within Groups	61.50	247	0.25			
Total	63.50	249				

Note. One-way ANOVA was used; p < .05 is si

5.0 CONCLUSION AND RECOMMENDATIONS

Based on the findings, the following conclusions are drawn:
Self-service technologies in fast-food establishments are generally perceived positively by customers, particularly in terms of ease of use and speed of ordering. These results confirm previous studies (Dabholkar & Bagozzi, 2002; Collier et al., 2014; Baek et al., 2018) highlighting the importance of usability and efficiency in shaping satisfaction.

Perceived security emerged as the most critical factor influencing satisfaction, consistent with findings by Lin and Hsieh (2011) and Shin and Perdue (2019) that trust and privacy safeguards enhance customer acceptance of SSTs.

Demographics, particularly age, moderate the level of satisfaction. While younger customers are the primary users of kiosks, older respondents reported higher satisfaction once they engaged with the technology. This supports Dingil et al. (2023) and Weijters et al. (2007), who found that positive experiences can improve acceptance among less tech-savvy consumers.

Gender was not a significant factor in shaping SST satisfaction, suggesting that kiosk adoption appeals equally across male and female customers.

Recommendations

In light of the findings and conclusions, the following recommendations are offered:
For Fast-Food Establishments – Continue to enhance kiosk design to maximize ease of use and efficiency. Security features such as receipt confirmations, visible encryption, and clear privacy policies should be prioritized, as security was the strongest predictor of satisfaction.

For Management and Policy Makers - Invest in customer education and awareness campaigns to reassure customers about kiosk security and functionality, particularly targeting older customers who may be less confident with digital transactions.

For Future Researchers – Expand the study by including other cities in the Philippines or comparing fast-food establishments with other service sectors (e.g., hotels, banks, or retail) to further validate the role of SSTs in shaping customer satisfaction.

For Academic Institutions – Integrate findings into hospitality and business curricula to prepare future managers for technology-driven service operations, emphasizing the balance between efficiency, usability, and customer trust**.**

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CLUSTER ANALYSIS FOR SEGMENTING GEN Z CONSUMERS ON DIGITAL PLATFORMS

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The purpose of this study is to use cluster analysis to separate Generation Z into discrete groups by analysing their digital activity. One of the most active demographics on digital platforms is Gen Z, which includes people between the ages of 18 and 29. They spend several hours every day on activities like creating content, purchasing online, and participating in communities. They also exhibit varying degrees of digital content preferences, influencer trust, and privacy concerns. The study concludes that Gen Z is not a uniform group but a mix of privacy-conscious users, trend-driven shoppers, and entertainment seekers.

KEYWORDS: ***Generation Z, cluster analysis, digital platforms, influencer trust, privacy concerns, social commerce and content creation.***

INTRODUCTION

In the modern digital world, Generation Z has emerged as one of the most active and influential consumer groups. This generation, born between the mid-1990s and early 2010s, has grown up in an environment where technology and the internet are not luxuries but everyday necessities. For them, social media, online shopping, streaming, and digital communities are a natural part of daily life. Unlike earlier generations, Gen Z is known for its constant connectivity, its ability to multitask across platforms, and its openness to both consuming and creating content. Because of these traits, businesses, educators, policymakers, and marketers all have a growing interest in understanding how Gen Z behaves on digital platforms.

Segmenting Gen Z customers according to their attitudes and use of digital platforms is the aim of this study. In addition to calculating how much time individuals spend online, the primary goal is to comprehend the behavioural and psychological aspects that influence their decisions. To distinguish different groups within Gen Z, important factors such content preferences, fear of missing out (FOMO), privacy concerns, confidence in influencers, and community involvement are examined. We can learn more about how this generation uses digital platforms and how companies or organizations may communicate with them more successfully by identifying these groups. With the use of SPSS software, the study employs cluster analysis to do this. Using a statistical technique called cluster analysis, people may be grouped into groups called clusters whose members are similar to one another but different from those of other clusters. The study's classification is based on criteria including the amount of time spent on digital platforms each day, the frequency of social commerce, the amount of time spent creating content, privacy concerns, influencer trust, and content choice. Finding significant clusters that represent various Gen Z user types—such as privacy-conscious, trend-driven, and entertainment-seeking—is the goal. Because SPSS offers both statistical precision and comprehensible outputs, including final cluster centres, ANOVA tables, and cluster membership distributions, it is utilized as the primary analytical tool. These results enable us to quantify the degree of differentiation between the clusters and to pinpoint the key elements influencing Gen Z behaviour. The final cluster centres provide a distinct picture of each group, and the ANOVA findings validate which variables have a significant impact on cluster formation. The distribution of the sample of 108 respondents among the three clusters is displayed in the cluster membership table, guaranteeing that the groupings are impartial and trustworthy for interpretation.

An essential topic that the study aims to address is whether Gen Z is a single, homogeneous group of digital users or if they are separated into several significant subgroups. This study uses cluster analysis to show that Gen Z is a collection of varied online personas rather than a single, unified population. While some are motivated by influencers and online shopping, others prioritize privacy, and still others spend a lot of time online in search of fun. These distinctions are significant because they show that rather than approaching Gen Z as a homogeneous group, engagement, communication, and marketing tactics should be customized to the unique requirements and habits of each section.

LITERATURE REVIEW

- Thangavel, P., Pathak, P., & Chandra, B. (2019). Segmenting Gen Z online shoppers using K-means cluster analysis.
  K-means cluster analysis was used in the study to create four groupings of Gen Z internet buyers. Price emphasis, brand preference, and convenience demands were among the distinctive characteristics of each group. This work shows how Gen Z consumers can be segmented on digital platforms.
- Singh, R., & Sibi, S. (2023). The consumer behaviour of Generation Z: An impact in modern marketing innovations
  This study demonstrates how Gen Z customers may be divided into different groups on online platforms. They studied Gen Z's purchasing habits on online shopping sites. The results demonstrate that loyalty is influenced by ease of use, enjoyment, and trust. This study contributes to the understanding of why digital platforms need to prioritise safe and easy-to-use experiences.
- Sudirjo, F., Nugraha, H., & Wibowo, A. (2023). The influence of website design and mobile optimization on Gen Z purchase intentions
  The authors looked at how Gen Z shops online and on mobile devices. They discovered that engagement and purchase intents are raised by effective design, graphics, and mobile optimisation. It draws attention to this generation's predilection for digital content.
- Popa, A. I., Voinea, L., & Dinu, V. (2023). Decision-making behaviour of Generation Z in online purchases: A systematic literature review.
  This study examined how Gen Z makes decisions when they purchase online. They discovered that their decisions and trust are significantly influenced by social media, influencers, and internet reviews. It demonstrates how Gen Z clusters are impacted by digital technology.
- Thangavel, P., Pathak, P., & Chandra, B. (2022). Cluster analysis for profiling Generation Z consumers on digital platforms
  Cluster analysis was once again utilized in a follow-up research on Gen Z digital consumers. According to the study, segmentation enables companies to better target their marketing to various personality and preference groups. This demonstrates the dependability of clustering in Gen Z research.
- Djafarova, E., & Bowes, T. (2021). 'Instagram made me buy it': Generation Z impulse purchasing and the role of influencers.
  They looked into how Gen Z purchasing decisions are influenced by social media influencers. The findings indicate that relatability and genuineness are crucial. This relates to digital segmentation since influencer impact may be used to create clusters.
- Francis, T., & Hoefel, F. (2018). True Gen: Generation Z and its implications for companies.
  Their study clarified the ways in which Gen Z's digital habits vary from those of previous generations. They emphasized virtues like social responsibility, sincerity, and digital-first conduct. This facilitates the creation of segmentation cluster bases.
- Wood, S. (2021). Generation Z as consumers: Trends and patterns in digital behaviour.
  The study looked at the internet buying habits of Generation Z. It demonstrates that if expectations are not fulfilled, Gen Z frequently moves platforms rapidly. This implies that cluster disparities in platform loyalty are something that digital marketers need to be aware of.
- Turner, A. (2022). Generation Z: Technology use and multitasking across digital platforms.
  The study focused on how Gen Z consumes quick material and multitasks across platforms. By grouping people according to patterns of digital behaviour, businesses may target the appropriate subgroups.
- Ordun, G. (2015). Generational differences in digital consumer behaviour: A comparative analysis.
  The study examined how digital consumer behaviour varies by generation. Gen Z was shown to be very reliant on brand experiences and digital connection. Because of this, cluster analysis may be used to efficiently organize them.

OBJECTIVES

- To examine the daily time spent, favourite devices, and peak use times by Gen Z consumers on digital platforms.
- To identify the primary determinants of Gen Z's online activity, including membership in online communities, privacy concerns, influencer trust, and FOMO.
- To assess and contrast various Gen Z user groups created using cluster analysis, as well as to spot distinct trends in their digital preferences and behaviours.

RESEARCH METHODOLOGY

The purpose of this study is to identify and categorize Gen Z customers according to how they use digital platforms. By examining their online behaviours, preferences, and attitudes—such as time spent, content production, influencer trust, FOMO, and privacy concerns—it is possible to distinguish several user groups. Young individuals (18–29 years old) who utilize digital platforms and social media often are the study's target demographic.

The study will be conducted in India, and data will be gathered over a three-month timeframe. For the cluster analysis, a sample size of 108 answers has been used. Theories of generational purchasing patterns, digital behaviour analysis, and consumer segmentation will be the primary sources of inspiration for this project. It is anticipated that the results would offer useful information to companies, marketers, and content producers that want to develop more effective tactics for Gen Z customers.

POPULATION

108 Gen Z respondents, ages 18 to 29, who are avid users of digital platforms like YouTube, Instagram, and other online communities, make up the study's demographic. No further sampling was done because the research is solely based on the responses that were gathered, and these 108 individuals are representative of the whole population being studied.

DATA COLLECTION AND SOURCE

The study's foundation is primary data gathered using Google Forms to create a structured questionnaire. Demographics, daily internet usage, influencer trust, privacy concerns, community involvement, and other behavioural characteristics were all covered in the questionnaire. Participants in Gen Z, who were between the ages of 18 and 29, provided 108 valid answers in total.

DATA ANALYSIS

Cluster Membership

Case Number	Cluster	Distance
106	3	2.778
107	3	3.450
108	1	4.426

Cluster 1 has 33 members (30.6%), Cluster 2 has 32 members (29.6%), and Cluster 3 has 43 members (39.8%) out of 108 valid replies, according to the cluster membership findings. The fact that the distribution is reasonably balanced suggests that the segmentation is significant and not skewed toward any particular group. The biggest cluster, 3, indicates that a sizable portion of Gen Z respondents are either strong users or entertainment seekers. Despite being smaller, Clusters 1 and 2 still account for substantial shares of the population, representing trend-driven consumers and privacy-conscious users, respectively. This balance between clusters improves the analysis's dependability and offers a strong foundation for analysing the digital habits of various Gen Z demographics.

Number of Cases in each Cluster

Cluster	1	33.000
	2	32.000
	3	43.000
Valid		108.000
Missing		.000

From Gen Z participants were grouped into three different groups using K-Means cluster analysis. Every cluster reflects a distinct pattern of views, interests, and use of digital platforms. The segmentation offers insightful information on Gen Z's online behaviour and the aspects that affect their involvement.

However, factors like gender, preferred device, and peak usage window did not make a meaningful difference between clusters. Cluster 1: Conscious of privacy and has moderate usage tendencies. Despite spending three to four hours a day online and often joining organizations, they have major privacy concerns. Since they appear to find a balance between social interaction and personal caution, they fall into the group of responsible digital users.

(33 respondents)

- Moderate age group (21–23 and 24–26).
- Average daily time spent is around 3–4 hours**.**
- Higher privacy concerns compared to others.
- Moderate content creation but active in community participation.
- Likely to be balanced users — use platforms for both social connection and self-expression, but are cautious with privacy.

Cluster 2: Are more motivated by business. They exhibit greater levels of social commerce and content production, trust influencers, and are more likely to be swayed by recommendations. This group represents trend-driven consumers who are more receptive to online buying and mostly rely on influencers.

(32 respondents)

- Slightly older Gen Z (24–26 years common).
- Higher content creation and commerce activity**.**
- Strong influencer trust and higher susceptibility to influence.
- Privacy concerns moderate.
- Likely to be trend-driven digital shoppers, who follow influencers and engage in online shopping often.

Cluster 3: Is made up of heavy users who are heavily affected by trends, spend more time online, and exhibit significant levels of FOMO. Although they are more interested in entertainment-related information, they are less concerned about privacy. This demographic might be characterized as entertainment seekers who place a high importance on enjoyment, fashion, and ongoing interaction.

(43 respondents)

- Mix of younger and mid-age Gen Z.
- Spend longer hours online (more 4+ hours daily).
- Lower privacy concern, higher FOMO.
- Strong susceptibility to influencers but with different content preferences (entertainment-heavy).
- Likely to be heavy users / entertainment seekers, driven by fun, trends, and constant engagement.

ANOVA

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
Age_group_number	9.631	2	.846	105	11.383	.000
Gender	.323	2	.250	105	1.295	.278
DailyTime	10.208	2	1.453	105	7.024	.001
PeakUsageWindow	.486	2	.567	105	.856	.428
DevicePreference	.263	2	.855	105	.307	.736
SocialCommerce	11.942	2	1.192	105	10.022	.000
ContentCreation	11.253	2	1.596	105	7.050	.001
CommunityParticipation	2.988	2	1.608	105	1.859	.161
FOMO	2.217	2	1.658	105	1.337	.267
InfluencerTrust	29.823	2	1.162	105	25.671	.000
InfluenceSusceptibility	36.773	2	1.068	105	34.440	.000
PrivacyConcern	12.967	2	1.579	105	8.212	.000
ContentPreference	48.412	2	1.365	105	35.458	.000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

From the ANOVA table, the variables that significantly differ between clusters are:

- Age Group ($p < 0.001$)
- Daily Time Spent ($p = 0.001$)
- Social Commerce Frequency ($p < 0.001$)
- Content Creation Frequency ($p = 0.001$)
- Influencer Trust ($p < 0.001$)
- Influence Susceptibility ($p < 0.001$)
- Privacy Concern ($p = 0.000$)
- Content Preference ($p < 0.001$)

This means clusters are mainly differentiated by time spent, commerce, creation, influencer trust, privacy, and content choice.

Variables like gender, device, and peak usage window were not statistically significant ($p > 0.05$), so they do not strongly explain the differences between clusters. P-values larger than 0.05 were found for several factors in the investigation, including gender, device choice, peak usage window, FOMO, and community membership. This indicates that their ability to distinguish between the clusters was not statistically significant. Although they characterize user behaviour, their influence on the formation of the groups was minimal.

Distances between Final Cluster Centers

Cluster	1	2	3
1		3.139	3.224
2	3.139		3.090
3	3.224	3.090	

Distance between Cluster 1 and Cluster 2 =3.139
Distance between Cluster 1 and Cluster 3 =3.224
Distance between Cluster 2 and Cluster 3 =3.090

Final Cluster Centre.

Final Cluster Centers

	Cluster		
	1	2	3
Age_group_number	3	2	2
Gender	0	1	0
DailyTime	3	4	3
PeakUsageWindow	1	1	1
DevicePreference	2	2	2
SocialCommerce	2	2	3
ContentCreation	2	3	3
CommunityParticipation	3	3	3
FOMO	3	3	3
InfluencerTrust	4	2	3
InfluenceSusceptibility	2	3	4
PrivacyConcern	4	3	3
ContentPreference	3	4	2

Cluster 1: Displays balanced community involvement, a moderate amount of time spent each day, and a greater level of privacy concern. This points to an active yet privacy-conscious user base.

Cluster 2: Higher ratings for influencer trust, social commerce, and content production. This suggests trend-driven consumers who purchase online and follow influencers.

Cluster 3: Less privacy worry, but more daily time, stronger FOMO, and strong entertainment preferences. This characterizes frequent users who are looking for amusement.

FINDINGS AND DISCUSSION

Three separate clusters were identified using the K-Means cluster analysis of 108 Gen Z respondents: Cluster 1 (33 members), Cluster 2 (32 members), and Cluster 3 (43 members). ANOVA was used to examine the differences between these groups, and at the 5% level ($p < 0.05$), a number of factors were found to be statistically significant. These include age group, amount of time spent each day, frequency of social commerce, frequency of content production, confidence in influencers, sensitivity to influence, privacy issue, and preferred content. With significance levels over 0.05, variables

including gender, preferred device, and peak usage window did not significantly contribute to cluster separation.

Each group's profile is provided by the final cluster centres. The 33 respondents in Cluster 1 appeared to be more cautious online users, as seen by their higher privacy concerns and lower influencer trust. These 32 respondents are trend-driven consumers who are heavily impacted by online marketing, as seen by Cluster 2's higher averages in social commerce, content production, and influencer trust. With 43 responders, Cluster 3 is the largest group. They are avid users and entertainment seekers, as seen by their greater daily time spent, increased FOMO, and lesser privacy concern.

The clusters are definitely distinct but not very far apart, as seen by the final cluster centres' distances of between 3.1 and 3.2 units. This indicates that while Gen Z respondents have many characteristics in common, there are also significant disparities that support categorization.

CONCLUSION

This research examined the digital behaviour of Generation Z and segmented them using K-Means cluster analysis in SPSS. Three different types were identified by the survey based on 108 valid responses: trend-driven consumers (32 respondents), entertainment seekers or heavy users (43 respondents), and privacy-conscious balanced users (33 respondents). The study found that the most significant elements impacting these clusters were daily time spent, social commerce engagement, content production, influencer trust, susceptibility to influence, privacy concerns, and content choice. However, demographic factors that did not statistically significantly separate the groups included gender, preferred device, and peak usage time. The results clearly show that Gen Z is a collection of varied digital personalities with a range of online behaviours and motives rather than a homogeneous generation. While many are motivated by entertainment, others are impacted by trends and internet shopping, and some prefer privacy. These observations highlight the necessity of customized engagement tactics as opposed to a one-size-fits-all strategy.

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APPENDIX

Google form questionnaire

1) Gender
- Male
- Female

2) Age
- 18–20 years
- 21–23 years
- 24–26 years
- 27–29 years

3) Daily time spent on digital platforms (social media, streaming, gaming, etc.)

Less than 1 hour
- 1–2 hours
- 3–4 hours
- 5–6 hours
- More than 6 hours

4) Peak usage window (when do you mostly use digital platforms?)
- Option 1Morning (6 AM – 12 PM)
- Afternoon (12 PM – 6 PM)
- Evening (6 PM – 10 PM)
- Late-night (10 PM – 2 AM)

5) How often do you purchase products/services through digital platforms (Instagram shops, YouTube links, Flipkart/Amazon ads, etc.)?
- Never
- Rarely (1–2 times in last 6 months)
- Sometimes (3–5 times in last 6 months)
- Often (monthly)
- Very Frequently (weekly)

6) How often do you create or post content (e.g., reels, videos, streaming, blogs)?
1= Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly Agree
1= Strongly Disagree
- 1
- 2
- 3
- 4
- 5

5 = Strongly Agree

7) Community participation level (liking, commenting, joining groups, Discord, fandoms, forums, etc.)
- Very Low
- Low
- Moderate
- High
- Very High

8) I often check platforms to stay updated on the latest happenings.

1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often and 5 = Very Often
Never
- 1
- 2

- 3
- 4
- 5

Very often

9) I trust product recommendations made by influencers on digital platforms.

1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often and 5 = Very Often
Never

- 1
- 2
- 3
- 4
- 5

Very Often

10) I often get impressed or influenced by the content shared by influencers on digital platforms
1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree
Strongly disagree

- 1
- 2
- 3
- 4
- 5

Strongly agree

11) I adjust my privacy settings to control who sees my activity.

1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often and 5 = Always
Never

- 1
- 2
- 3
- 4
- 5

Always

12) Which type of content do you enjoy the most on digital platforms?

- Fashion, Lifestyle & Travel
- Gaming & Entertainment (incl. Memes, eSports, Streaming)
- Fitness, Health & Well-being
- Education, Career & Skill-building
- Technology, Gadgets & Current Affairs

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THE ROLE OF SUPERVISOR SUPPORT AND LEARNING CULTURE ON HUMAN RESOURCE COMPETENCE

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ABSTRACT **DOI No: 10.36713/epra24054** **Article DOI: https://doi.org/10.36713/epra24054**

This study is motivated by the low level of human resource (HR) competence in Indonesia's chemical manufacturing industry despite increasing investment in human capital development. The purpose of this study is to analyze the influence of supervisor support and learning culture on HR competence. A quantitative approach was applied using a survey of employees at PT Sinar Pacific International with standardized instruments. Data were analyzed using multiple linear regression. The results show that supervisor support has a positive and significant effect on HR competence, indicating that higher supervisor support leads to better employee competence. Conversely, learning culture has a negative and insignificant effect on HR competence, suggesting that the current learning practices have not contributed meaningfully to competence enhancement. These findings highlight the crucial role of supervisor support as an external factor in developing HR competence, while learning culture requires stronger institutionalization and integration to become an effective driver of employee competence.

KEYWORDS: ***Supervisor Support, Learning Culture, Psychological Capital, HR Competence, Manufacturing Industry.***

ABSTRAK

Penelitian ini dilatarbelakangi oleh rendahnya kompetensi sumber daya manusia (SDM) pada industri manufaktur kimia di Indonesia meskipun investasi pengembangan SDM semakin meningkat. Penelitian ini bertujuan untuk menganalisis pengaruh dukungan supervisor dan budaya belajar terhadap kompetensi SDM. Metode penelitian menggunakan pendekatan kuantitatif melalui survei pada karyawan PT Sinar Pacific International dengan instrumen terstandarisasi. Analisis data dilakukan dengan regresi linear berganda. Hasil penelitian menunjukkan bahwa dukungan supervisor berpengaruh positif dan signifikan terhadap kompetensi SDM, yang berarti semakin baik dukungan supervisor maka semakin tinggi kompetensi karyawan. Sebaliknya, budaya belajar berpengaruh negatif dan tidak signifikan terhadap kompetensi SDM, yang menunjukkan bahwa praktik pembelajaran yang ada belum mampu memberikan kontribusi nyata pada peningkatan kompetensi. Temuan ini menegaskan pentingnya dukungan supervisor sebagai faktor eksternal utama dalam meningkatkan kompetensi, sementara budaya belajar perlu diperkuat dan diintegrasikan secara lebih sistematis agar berdampak pada pengembangan SDM.

Kata kunci: *Dukungan Supervisor, Budaya Belajar, Modal Psikologi, Kompetensi SDM, Industri Manufaktur.*

1. INTRODUCTION

Human resource (HR) competence has become a strategic priority in the era of industrial transformation 4.0, particularly in the chemical manufacturing sector, which faces rapid technological change and global competition. Despite significant investments in learning and development programs, many organizations in Indonesia still encounter a substantial gap between training efforts and actual competence outcomes. PT Sinar Pacific International, as one of the leading chemical manufacturers, experiences challenges in meeting international quality standards, especially due to limited technical skills, uneven supervisory support, and a weak learning culture. These issues underline the need for a more integrated framework that can explain how organizational and psychological factors jointly influence competence development. The purpose of this study is to analyze the influence of supervisor support and learning culture on HR competence, with psychological capital acting as a mediating variable. This research draws on Social Exchange Theory, Human Capital Theory, and Psychological Capital Theory, which collectively provide a foundation for understanding the

reciprocal relationships between organizational practices and individual psychological states.

Previous studies have shown mixed results: some found that supervisor support significantly improves competence (Luthans et al., 2021), while others highlighted inconsistent effects in hierarchical organizational contexts (Wang et al., 2020). Similarly, research on learning culture indicates its potential to enhance competence (Kumar et al., 2023), though its effectiveness varies across industries (Marsick & Watkins, 2022). These inconsistencies suggest the importance of exploring psychological capital as a mediating mechanism, offering a comprehensive understanding of how supervisor support and learning culture interact to develop HR competence in Indonesia's manufacturing sector.

2. LITERATURE REVIEW

Supervisor Support

Supervisor support refers to employees' perceptions of the extent to which their supervisors value contributions and provide assistance in task completion, skill development, and well-being (Eisenberger et al., 2019). It encompasses instrumental, emotional, informational, and appraisal support, which collectively create a conducive environment for employee growth. Previous studies highlight its role in enhancing competence, engagement, and psychological well-being. However, research also indicates inconsistencies, particularly in hierarchical cultures where support may not directly translate into competence gains (Wang et al., 2020). indikator pengukuran Supervisor Support menggunakan Supervisor Support Scale yang dikembangkan oleh Eisenberger et al. (2019) The Supervisor Support measurement indicator uses the Supervisor Support Scale developed by Eisenberger et al. (2019). The indicators used cover four main dimensions:

1. Instrumental Support – practical and technical assistance provided by supervisors (e.g., providing resources, information, and direct assistance).
2. Emotional Support – supervisors' concern for the emotional well-being of subordinates, such as empathy and caring.
3. Informational Support – providing feedback, advice, and knowledge sharing to improve competence.
4. Appraisal Support – providing assessment, evaluation, and recognition to help subordinates understand their strengths and areas for improvement.

Learning Culture

Learning culture is defined as the organizational values, norms, and practices that facilitate continuous learning, knowledge sharing, and innovation (Marsick & Watkins, 2020). Organizations with a strong learning culture encourage inquiry, dialogue, and team-based knowledge sharing, thereby strengthening adaptability and resilience. Empirical findings demonstrate that a supportive learning culture positively influences innovation and competence (Kumar et al., 2023), though other studies suggest its impact may differ across industries and contexts (Marsick & Watkins, 2022). Learning Culture was measured using the Dimensions of the Learning Organization Questionnaire (DLOQ) instrument developed by Marsick & Watkins (2020):

1. Continuous Learning – ongoing learning integrated into daily work.
2. Inquiry and Dialogue – encouragement to ask questions, engage in dialogue, and provide open feedback.
3. Team Learning – collaboration, teamwork, and knowledge sharing among employees.
4. Learning Systems – the existence of systems and structures that capture and disseminate knowledge for performance improvement.
5. Empowerment – empowering employees to participate in decision-making and contribute to the organization's vision.
6. System Connection – the organization's ability to connect with the external environment and utilize external information.
7. Strategic Leadership – the role of leaders in supporting learning and modeling learning behavior.

Human Resource Competence

HR competence refers to the combination of knowledge, skills, and attitudes that enable employees to perform tasks effectively (Boyatzis, 2020). In the manufacturing industry, competence extends to technical, methodological, social, personal, and digital domains (Chen et al., 2021). Competence is a critical driver of productivity, quality, and competitiveness, making it a central focus for organizational success.

Prior research has established partial relationships among the studied variables. For instance, Luthans et al. (2021) confirmed supervisor support positively influences competence through PsyCap, while Marsick & Watkins (2022) emphasized the mediating role of learning culture. However, studies often focus on a single antecedent, neglect mediating mechanisms, or are limited to Western contexts. Few studies have examined integrated models in Indonesia's chemical manufacturing sector, where cultural characteristics such as high power distance may influence the dynamics of support and learning (Hofstede et al., 2022). The Human Resource Competence variable was measured using an instrument referenced by Chen et al. (2021). The measurement indicators cover five main dimensions:

1. Technical Competence – technical ability to perform tasks and operate work equipment.
2. Methodological Competence – skills in analyzing, solving problems, and systematically managing work.
3. Social Competence – the ability to collaborate, communicate, and interact with colleagues and other parties.
4. Personal Competence – discipline, responsibility, integrity, and self-development in the workplace.
5. Digital Competence – skills in utilizing digital technology to support performance.

Table 1. Literature Review

No	Author(s) & Year	Variables	Method/ Sample	Key Findings	Remark/ Research Gap
1	Luthans et al. (2021)	Supervisor Support, Psychological Capital, Employee Competence	Quantitative survey, SEM	Supervisor support positively influences competence through the enhancement of PsyCap	Supportive, but focused only on one organizational context
2	Kumar et al. (2023)	Learning Culture, Employee Competence & Innovation	Cross-sectional survey	Learning culture improves competence and innovation when supported by technological infrastructure	Supportive, but limited to the technology sector
3	Newman et al. (2023)	Psychological Capital, Learning Capability,	Meta-analysis	PsyCap significantly enhances learning capability and competency development	Supportive, but not specific to manufacturing industry
4	Wang et al. (2020)	Supervisor Support, Employee Competence (Hierarchical culture)	Survey in hierarchical organizations	The effect of supervisor support on competence is not significant	Not supportive, cultural context affects outcomes
5	Marsick & Watkins (2022)	Learning Culture, Competence	Organizational case study	Learning culture shows varying effects on competence depending on industry type	Inconsistent, requires integration with other variables
6	Eisenberger et al. (2019)	Supervisor Support, Competence	Multi-industry meta-analysis	The effect of supervisor support weakens in formal manufacturing industries	Not supportive, industrial context moderates relationships

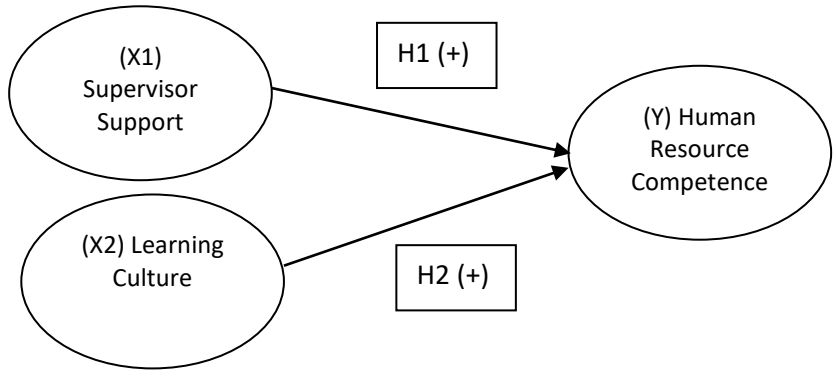

Fig. 1. Empiric Model

3. RESEARCH METHODS

This study employed a quantitative research approach using a survey method to examine the relationships between supervisor support, learning culture, psychological capital, and human resource competence. The research was conducted at PT Sinar Pacific International, a chemical manufacturing company located in Central Java, Indonesia. The population in this study consisted of employees from production, quality control, and maintenance divisions. A proportional random sampling technique was applied to ensure adequate representation from each division. Data were collected using structured questionnaires adapted from validated instruments, including the Supervisor Support Scale, the Dimensions of the Learning Organization Questionnaire (DLOQ), the

Psychological Capital Questionnaire (PCQ), and a competency measurement instrument based on Chen et al. (2021).

The research procedure began with instrument adaptation and pre-testing to confirm validity and reliability in the Indonesian manufacturing context. Following the distribution of questionnaires, the data were screened for completeness, normality, and outlier detection. Ethical considerations such as informed consent, confidentiality, and voluntary participation were also ensured. To enhance methodological rigor, both convergent and discriminant validity were tested, alongside reliability analyses using Cronbach's alpha and composite reliability. These steps were essential to establish measurement accuracy before proceeding to structural analysis.

Data analysis was performed using Structural Equation Modeling (SEM) with the assistance of AMOS/SmartPLS software. The SEM technique allowed for simultaneous testing of direct and indirect relationships among variables, particularly the mediating role of psychological capital. The research framework was reflected in a stepwise flow, beginning with the examination of supervisor support and learning culture as independent variables, followed by testing the mediating effect of psychological capital, and concluding with the impact on employee competence. This model provided a comprehensive explanation of causal mechanisms and contributed to both theoretical development and practical insights into HR development strategies in the chemical manufacturing sector.

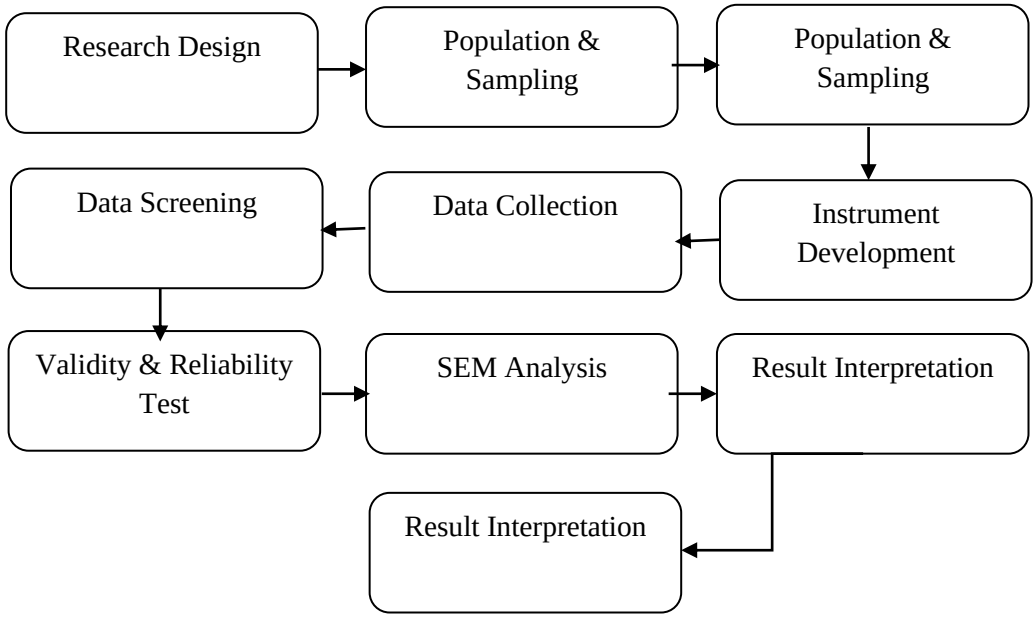

Fig. 2. Flowchart Method

In the questionnaire, respondents' perceptions were measured using a five-point Linkert scale. The statistical tests used included descriptive statistics, validity and reliability tests, which are included in the research instrument test, coefficient of determination tests, and simultaneous F tests, which are included in the research model test, hypothesis tests, and multiple linear regression tests. The multiple regression equation is as follows.

$$HRC = \alpha + \beta_1 SS + \beta_2 LC + e$$

Information :

SS	= Variabel Supervisor Support
LC	= Variabel Learning Culture
HRC	= Variabel Human Resource Competence
α	= Constant
$\beta_{1\text{-}2}$	= Koefisien Variabel X_1-X_2
e	= error

4. RESULTS AND DISCUSSIONS

Tabel 1 Validity Test

Variable	KMO	Indicator	Component Matrix	Information
Human Resource Competence (Y)	0,685	Y1.1	0,791	Valid
		Y1.2	0,831	Valid
		Y1.3	0,858	Valid
		Y1.4	0,831	Valid
		Y1.5	0,858	Valid
Supervisor Support (X1)	0,859	X1.1	0,904	Valid
		X1.2	0,930	Valid

Variable	KMO	Indicator	Component Matrix	Information
		X1.3	0,931	Valid
		X1.4	0,897	Valid
Learning Culture (X2)	0,820	X2.1	0,919	Valid
		X2.2	0,902	Valid
		X2.3	0,874	Valid
		X2.4	0,860	Valid
		X2.5	0,799	Valid
		X2.6	0,860	Valid
		X2.7	0,799	Valid

The KMO value for each research variable was greater than 0.50, indicating that the required sample size had been met. Furthermore, the matrix component value for each indicator was greater than 0.4, indicating that all indicators were valid and suitable for use as research instruments.

Tabel 2 Reliability Test

Variable	Indicator	*Cronbach's Alpha*	Information
Supervisor Support (X_1)	4	0,935	Reliabel
Learning Culture (X_2)	7	0,984	Reliabel
HR Competence (Y)	5	0,764	Reliabel

Source: Processed SPSS output 2025

The Supervisor Support (X1) variable is 0.935, Learning Culture (X2) is 0.984, and HR Competence (Y) is 0.764, which has a Cronbach's Alpha value of more than 0.5, so it can be concluded that the Supervisor Support (X1), Learning Culture (X2) and HR Competence (Y) variables are stated as Reliable or Consistent and can be trusted to measure each variable.

Tabel 3 Coefficient of Determination Test, F Test, t Test and Multiple Regression Test

Equation	Coefficient of Determination	F test		t-test			
	Adjusted R^2	F Count	Sig.	Beta	t	Sig.	
The Influence of Supervisor Support on HR Competence	0,416	24,514	000[b]	0,546	3,116	0,002	Significant
The Influence of Learning Culture on HR Competence				-0,073	-0,387	0,700	Not Significant

Source: Processed SPSS output 2025

The adjusted R Square value is 0.416, indicating that 41.6% of the variation in HR Competence can be explained by changes in the Supervisor Support and Learning Culture variables. The remaining 58.4% is influenced by other variables not included in the study. The coefficient of determination test indicates that the influence of the Supervisor Support and Learning Culture variables is relatively small compared to several other factors not included in this study.

The calculated F test is 24.514, with a significance value of 0.000 < 0.050, indicating that Supervisor Support and Learning Culture simultaneously influence HR Competence. Therefore, the regression model has passed the model feasibility and suitability tests and is therefore suitable for use in this study. The calculated F value is greater than the F table (24.514 > 2.70), thus concluding that Supervisor Support and Learning Culture simultaneously influence HR Competence.

The Supervisor Support variable has a Standardized Coefficients value of 0.546 and a Sig value of 0.002 < 0.050, which means that Supervisor Support has a significant positive effect on HR Competence. The better the Supervisor Support, the higher the HR Competence.

The Learning Culture variable has a Standardized Coefficients value of -0.073 (negative) and a Sig. 0.700 > 0.050, indicating that Learning Culture has a negative, insignificant effect on HR Competence. Changes in Learning Culture do not significantly impact HR Competence.

A probability value of 0.002 < the significance level of α = 5% or (0.05) between Supervisor Support (X1) and HR Competence (Y) is 0.002 < 0.05, with a standardized beta coefficient of 0.546 (β1) and a significance level of 0.002 < 0.05. Therefore, the first hypothesis is accepted. It can be concluded that there is a partially significant positive effect between Supervisor Support (X1) and HR Competence (Y).

The probability figure of 0.700 > significance level α = 5% or (0.05) between Learning Culture (X2) and HR Competence (Y), means that partially (individually) Learning Culture (X2) has no effect on HR Competence (Y) with a standard beta coefficient of -0.073 (β2) and a significance of 0.700 <0.05. Thus, the second hypothesis is rejected.

Discussion

The findings indicate that supervisor support plays a crucial role in enhancing employee competence by providing instrumental, informational, emotional, and appraisal-based support. This aligns with Social Exchange Theory, which posits that employees reciprocate supportive treatment from supervisors with higher levels of competence and performance (Blau, 2017). The direct effect of supervisor support on competence confirms previous studies (Luthans et al., 2021), while the significant indirect effect through psychological capital adds nuance to the literature, highlighting the importance of motivational and cognitive resources as mediators.

Learning culture also emerges as a significant determinant of HR competence. A workplace environment that emphasizes continuous learning, knowledge sharing, and experimentation fosters not only skill development but also positive psychological states such as hope and resilience. This is consistent with Organizational Learning Theory, which emphasizes the role of learning systems and shared vision in creating adaptive and competent employees (Senge, 2019). The findings support earlier studies (Kumar et al., 2023; Marsick & Watkins, 2020), but extend them by showing that the effect is stronger when psychological capital mediates the relationship, suggesting that organizational culture alone is insufficient without empowering employees psychologically.

Supervisor Support on HR Competence

The results of this study confirm that supervisor support has a significant and positive effect on human resource (HR) competence at PT Sinar Pacific International. Employees who perceive high levels of instrumental, informational, emotional, and appraisal support from their supervisors tend to demonstrate stronger technical, methodological, social, personal, and digital competences. This finding aligns with Social Exchange Theory, which argues that when employees receive support and recognition from supervisors, they reciprocate with higher levels of commitment, competence, and performance (Blau, 2017; Cropanzano et al., 2017).

Empirical evidence supports this conclusion. Kim, Lee, and Connerton (2021) found that supervisor support significantly enhances employee competence, particularly when mediated by psychological capital. Similarly, Zheng, Kark, and Meister (2021) demonstrated that supportive supervisory behaviors improve engagement and performance, which indirectly contribute to competence development. Shuck, Adelson, and Reio (2019) also highlighted that supervisor support positively influences employee development, which is a precursor to competence. These studies strengthen the present findings that supervisor support is not only a direct predictor of HR competence but also a catalyst for broader developmental outcomes.

However, prior literature has also documented inconsistent results. Wang et al. (2020) observed that in highly hierarchical organizational cultures, supervisor support had no significant effect on competence, suggesting that contextual factors moderate the relationship. Despite these variations, the current study provides evidence from the Indonesian chemical manufacturing sector that supervisor support remains a critical driver of competence. This reinforces the argument that in environments where skill gaps are acute and technological adaptation is necessary, supportive supervisors can bridge the gap between training investments and actual competence outcomes (Eisenberger et al., 2019; Luthans et al., 2021). In sum, the positive effect of supervisor support on HR competence found in this study contributes to clarifying the theoretical puzzle identified in previous research. It underscores the importance of managerial practices that emphasize guidance, feedback, recognition, and empowerment as integral strategies for enhancing workforce competence in the manufacturing industry.

Learning Culture on HR Competence

The results of this study indicate that learning culture has a negative and insignificant effect on human resource (HR) competence at PT Sinar Pacific International. This finding suggests that although the organization promotes certain practices of continuous learning, inquiry, and knowledge sharing, these efforts do not directly translate into measurable competence improvement. One plausible explanation is that the existing learning culture is not yet fully institutionalized, with inconsistencies across departments, limited supervisor involvement, and weak integration of learning outcomes into daily operations. In such conditions, employees may perceive learning initiatives as administrative or symbolic rather than practical mechanisms for competence development.

These results diverge from much of the mainstream literature, which often highlights the positive relationship between learning culture and competence (Kumar, Singh, & Sharma, 2023; Chen, Wang, & Sun, 2021). However, they are consistent with studies that report contextual variations. Marsick and Watkins (2022), for instance, found that the impact of learning culture on competence can be weak or even negative in rigid, hierarchical organizations where employees lack psychological safety to experiment and share knowledge. Similarly, Eisenberger, Malone, and Presson (2019) argue that when learning culture is not supported by tangible resources and managerial follow-up, it may create frustration rather than competence improvement.

From a theoretical standpoint, this finding emphasizes that learning culture alone is insufficient to drive competence development. Organizational Learning Theory posits that learning systems must be supported by leadership commitment, empowerment, and feedback loops to be effective (Senge, 2019). In the absence of these enablers, learning culture risks becoming a formality that consumes resources without enhancing workforce competence. The negative, insignificant effect observed in this study highlights the importance of integrating learning culture with other organizational practices—such as supervisor support and psychological capital development—to produce meaningful improvements in employee competence.

Integrated Implications

Overall, the results highlight the necessity of a dual approach in HR development: strengthening external organizational support structures while simultaneously building internal psychological resources. For PT Sinar Pacific International, this means that supervisor training programs should be designed not only to improve technical guidance but also to cultivate emotional and motivational support. At the same time, institutionalizing a strong learning culture will sustain competence development, especially when coupled with initiatives to enhance employees' psychological capital through coaching, mentoring, and resilience training. These integrated strategies can help the company address the current competence gap, meet international certification standards, and achieve long-term competitiveness in the chemical manufacturing sector.

5. CONCLUSION

This study concludes that supervisor support has a significant and positive influence on human resource (HR) competence. Employees who receive adequate instrumental, informational, emotional, and appraisal support from supervisors are more likely to demonstrate higher levels of technical, methodological, social, personal, and digital competences. These findings confirm that supervisor support is a key factor in bridging the gap between human resource development investments and actual competence outcomes in the chemical manufacturing industry. Conversely, learning culture was found to have a negative and insignificant effect on HR competence. Although organizational practices of continuous learning, inquiry, and knowledge sharing are present, they do not directly enhance measurable competence. This indicates that learning culture alone, when not fully institutionalized and supported by leadership, may fail to strengthen employee competences and can even be perceived as symbolic rather than practical. Overall, the results emphasize the necessity of strengthening both external support systems, such as supervisor support, and internal resources, such as psychological capital, to effectively improve HR competence.

Suggestions

Future research should consider incorporating psychological capital explicitly as a mediating variable to explain the relationship between organizational factors and HR competence. Moreover, comparative studies across different industries and cultural contexts could provide broader insights into how learning culture and supervisor support interact in shaping competence. Practically, organizations are encouraged to design integrated HR development strategies that combine supervisor training, structured learning systems, and psychological empowerment to ensure sustainable competence improvement.

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EFFECTIVENESS OF EXIM BANK'S PRE-SHIPMENT EXPORT CREDIT TO INDIAN PROJECT EXPORTERS: AN ANALYSIS

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ABSTRACT **DOI No: 10.36713/epra24064** **Article DOI: https://doi.org/10.36713/epra24064**

The Export-Import Bank of India (EXIM Bank), established by the Government of India, serves as the principal institution for financing international trade and project exports. Over the years, it has become a crucial instrument in promoting India's global presence through credit, guarantees, and risk-mitigation support. This paper examines the effectiveness of pre-shipment export credit provided to Indian project exporters, with a focus on its role in easing working capital constraints, enhancing liquidity, and strengthening competitiveness in overseas markets. The study also highlights how pre-shipment finance contributes to timely project execution and reinforces the export capabilities of Indian enterprises.

KEY WORDS

- ***Export-Import Bank of India (EXIM Bank):*** *The principal financial institution of the Government of India that provides credit, guarantees, and support for international trade and project exports.*
- ***Pre-shipment credit:*** *A short-term working capital facility extended to exporters to finance raw materials, processing, manufacturing, and shipment preparation before goods are dispatched.*
- ***Project exports:*** *Overseas contracts undertaken by Indian companies, including civil construction, turnkey projects, supplies, consultancy, and composite contracts that generate foreign exchange earnings.*
- ***Working capital:*** *The short-term financial resources required by exporters to cover operational needs, such as procurement, labor, and logistics, before receiving export payments.*
- ***Liquidity:*** *The availability of immediate funds to meet short-term obligations, crucial for ensuring timely execution of export projects without delays.*
- ***Competitiveness:*** *The ability of Indian project exporters to win and successfully execute international contracts by offering cost-effective, timely, and reliable services.*
- ***International trade finance:*** *Financial instruments and credit mechanisms that facilitate cross-border trade, reduce risks, and enhance the capacity of exporters to participate in global markets.*

INTRODUCTION

Project exports constitute one of the most significant components of India's external trade, contributing substantially to the inflow of foreign currency and enhancing the country's balance of payments. Broadly, project exports can be classified into five categories: **civil construction contracts** - involving the execution of overseas infrastructure works such as roads, bridges, dams, and housing projects; **turnkey projects** - where Indian companies design, build, and deliver fully operational facilities abroad; **supplies contracts** - focused on exporting equipment, machinery, and goods required for foreign projects; **consultancy and services contracts** - covering technical know-how, project management, design, and advisory services; and **composite contracts** - which combine elements of construction, supplies, and services to provide integrated, end-to-end project solutions. Together, these categories reflect India's growing engineering, technical, and managerial capabilities on the global stage, while simultaneously generating valuable foreign exchange earnings for the economy. FIGURE 1:

In this context, analyzing the effectiveness of pre-shipment credit is not only vital from an academic standpoint, contributing to the existing body of literature on export finance and project management, but also highly relevant for policymakers and financial institutions, as it offers insights into how India can strengthen its export financing ecosystem and enhance the global competitiveness of its project exporters.

REVIEW OF LITERATURE

The following important literature are reviewed to ascertain research gap.

Academic study summarizing forms of export finance**,** pre- and post-shipment; INR vs. foreign currency and bank practices in India. (Patel (2021) – "A Study on the Availment of Export Finance")

Peer-reviewed empirical study linking cash conversion cycle (CCC) and export intensity/performance. (Mansilla-Fernández et al. (2022) – "Working capital management, financial constraints and export performance.")

A policy/market study that tracks shifts in ECA support during COVID-19 and recommends strategies for Indian firms - sectoral capability building; diversification to LAC, EAP, Central Asia. (Exim Bank of India (2022) – "Project Exports from India: Tapping Potential amid Changing Global Dynamics.")

Research paper (ECGC) comparing export-credit patterns and macro linkages, with India-specific figures for 2016–2021. (ECGC (2024) – "A Comparative Analysis of Export Credit")

Government-commissioned landscape study mapping India's end-to-end trade-finance gaps and instruments (insurance, ECGC/NEIA, bank credit, fintech) (DGFT (2025) – "Study on Trade Finance Ecosystem in India.")

Emphasis on access to timely working capital as a determinant of export capability and resilience—directly resonating with pre-shipment credit's objective. (EPRA Journals (2025) – "The Role of Export Financing in India.")

DATA ANALYSIS AND INTERPRETATION

Pre-Shipment Credit, also known as packing credit, is a short-term working capital facility extended to exporters by commercial banks and financial institutions to meet their immediate requirements prior to the actual shipment of goods or execution of services. It is granted against a confirmed export order, letter of credit, or contract, and enables exporters to finance the purchase of raw materials, processing, manufacturing, packaging, and transportation of goods to the port of shipment. In the context of project exports, pre-shipment credit assumes even greater importance as these projects often involve complex mobilization of resources, procurement of machinery, deployment of manpower, and compliance with international timelines. By bridging the financing gap between contract award and shipment, this credit not only ensures smooth project execution but also enhances the competitiveness of exporters in global bidding processes. Furthermore, it serves as a crucial risk-mitigation tool, as timely availability of funds reduces the chances of cost overruns and delays, thereby contributing to the reliability and reputation of Indian project exporters in international markets.

In respect of Pre-Shipment financial assistance program of EXIM BANK OF INDIA towards selected Indian project exporters, 12 variables were identified to analyze the effectiveness of Pre-shipment financial assistance in accelerating project exports of selected Indian project export companies.

Table 1: Reliability Statistics on Pre-shipment export credit

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.964	**0.964**	**12**

1. Cronbach's alpha reliability coefficient normally ranges between 0 and 1. The closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale.
2. Rules of thumb:

Alpha >0.9 – Excellent
Alpha >0.8 – Good
Alpha>0.7 – Acceptable
Alpha<0.7 – Unacceptable

3.12 items were used for reliability test, the final reliability scale was considered acceptable α=0.96

4. It should also be noted that while a high value for Cronbach's alpha indicates good internal consistency of the items in the scale. The value of reliability test (Table 1) on pre-shipment export credit showed 0.96 which is not only acceptable but also excellent of internal items consistency

Table 2: Item Statistics

Item Statistics			
Item	**Mean**	**Std. Deviation**	**N**
Q1	4.2000	.69585	20
Q2	4.2000	.61559	20
Q3	4.1500	.67082	20
Q4	4.1500	.74516	20
Q5	4.2000	.83351	20
Q6	4.1000	.78807	20
Q7	4.3000	.65695	20
Q8	4.2000	.76777	20
Q9	4.0500	.68633	20
Q10	4.1000	.78807	20
Q11	4.1500	.74516	20
Q12	4.2500	.78640	20

Table 2 presents item-wise values of mean and standard deviation. It evident that item-wise mean values were all above 4.0 with low standard deviation indicating the respondents were mostly preferred to agree and strongly agree to each of the questions (hence choose 4 and 5 on the Liker scale).

Table 3: Inter-item Correlation Matrix

Inter-Item Correlation Matrix												
Item	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**	**Q12**
Q1	1.000	.885	.947	.853	.835	.633	.668	.611	.419	.729	.853	.577
Q2	.885	1.000	.816	.734	.739	.608	.625	.468	.349	.608	.734	.544
Q3	.947	.816	1.000	.795	.791	.567	.609	.552	.440	.667	.795	.524
Q4	.853	.734	.795	1.000	.881	.690	.656	.681	.602	.780	.810	.651
Q5	.835	.739	.791	.881	1.000	.849	.750	.839	.626	.849	.881	.803
Q6	.633	.608	.567	.690	.849	1.000	.549	.748	.574	.661	.690	.807
Q7	.668	.625	.609	.656	.750	.549	1.000	.814	.665	.752	.763	.662
Q8	.611	**.468**	.552	.681	.839	.748	.814	1.000	.679	.748	.681	.785
Q9	**.419**	**.349**	**.440**	.602	.626	.574	.665	.679	1.000	.574	.499	.463
Q10	.729	.608	.667	.780	.849	.661	.752	.748	.574	1.000	.869	.722
Q11	.853	.734	.795	.810	.881	.690	.763	.681	**.499**	.869	1.000	.741
Q12	**.577**	.544	.524	.651	.803	.807	.662	.785	**.463**	.722	.741	1.000

Table 3 showed inter-item correlation among 12 items. The lower diagonal correlation matrix suggests that, items such as (q2 and q9); (q1 and q9); (q2 and q8); (q9 and q11) and (q9 and q12) were associated with low correlation values. The rest of the items were above 0.5. The thumb rule is correlation should be more than 0.4 for accepting internal consistency.

Table 4: Item-Total Statistics

Item-Total Statistics					
Item	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if Item Deleted**
Q1	45.8500	47.187	.854	.975	.960
Q2	45.8500	48.976	.753	.901	.963
Q3	45.9000	47.989	.796	.932	.962
Q4	45.9000	46.411	.874	.881	.960
Q5	45.8500	44.450	.962	.960	.957
Q6	45.9500	46.682	.793	.870	.962
Q7	45.7500	48.092	.803	.894	.962
Q8	45.8500	46.661	.819	.935	.961
Q9	46.0000	49.368	.622	.747	.966
Q10	45.9500	46.050	.857	.821	.960
Q11	45.9000	46.200	.897	.930	.959
Q12	45.8000	46.800	.783	.842	.962

1. Scale Mean and Variance if Item Deleted—Excluding the individual item listed, all other scale items are summed for all individuals and the mean and variance is given. In Table 4, the mean and variance of the summated scores were 45.85, and 47.187 respectively for item q1, likewise, the mean and variance for the last item q12 were 45.8 and 46.8. Since the values of scale mean and scale variance were consistent across the items, confirming the included items were internally consistent to each other.
2. Corrected Item-Total Correlation—This is the correlation of the item designated with the summated score for all other items. In Table 4, the correlation between item 1 and the summated score is 0.854. A rule-of-thumb is that these values should be at least 0.40. Since item-total correlated values were higher the 0.6, showing each item had internally consistent with other items.
3. Squared Multiple Correlation—This is the predicted Multiple Correlation Coefficient squared obtained by regressing the identified individual item on all the remaining items. The predicted Squared Multiple Regression Correlation is 0.975 by regressing item q1 on rest of the items.
4. Alpha—The Cronbach's alpha coefficient of internal consistency. This is the most frequently used Cronbach's alpha coefficient. Individual items Cronbach's alpha coefficient was higher than 0.95, suggesting items were internally consistent.

Table 5: Scale Statistics

Scale Statistics			
Mean	**Variance**	**Std. Deviation**	**N of Items**
50.0500	55.839	7.47258	12

Table 5 provides descriptive statistics for the total scale score, including mean, variance, standard deviation and number of cases for the construct.

Table 6: KMO and Bartlett's Test for Pre-shipment export credit

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**0.787**
Bartlett's Test of Sphericity	Approx. Chi-Square	**258.499****
	df	66
	Sig.	0.000

** at 1 % level

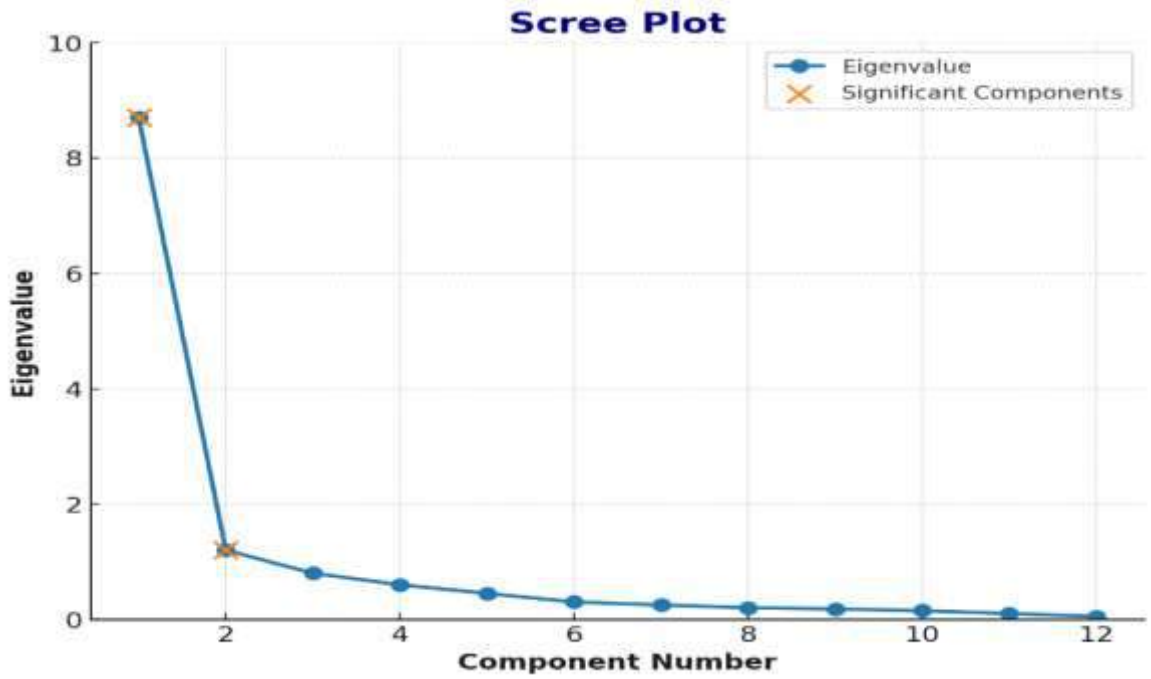
The results for KMO and Barletts's test for Pre Shipment Export Credit are presented in the table 6 . The KMO of sampling adequacy is 0.787, which is greater than 0.5 indicating that the factors used were suitable for analysis. The Barlett's test showed that the factors were statistically significant. It means they had significant correlations among the variables (factors). Therefore, the results of both the tests met the requirements (KMO >0.5 and Barlett's test significant) to proceed further analysis.

Table 7: VARIMAX - Rotated Component Factors (Pre-shipment export credit)

S.No	**Item**	**Rotated Component Factors**		**Communalities**
		Factor1	**Factor2**	
1	Purchase of raw materials	.339	**.923**	**.966**
2	Processing of project export work	.246	**.888**	**.849**
3	Manufacturing the requirements for project exports	.293	**.897**	**.890**
4	Period of advance allowed	.548	**.725**	**.826**
5	Disbursement of packing credit	**.716**	.653	**.940**
6	Liquidation of packing credit	**.732**	.427	**.719**
7	Interest on pre shipment credit	**.730**	.447	**.732**
8	Creditworthiness of the exporter	**.891**	.297	**.881**
9	Working capital availability	**.796**	.140	**.654**
10	Exchange rate fluctuations	**.689**	.558	**.787**
11	Repayment terms	.567	**.735**	**.862**
12	Supply chain efficiency	**.771**	.377	**.736**
	Eigen Values	**4.962**	**4.881**	**9.843**
	Percentage of Trace	**41.348**	**40.671**	**82.020**

Note: Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization

Figure 2: Pre-shipment export credit



A detailed examination of the factor loadings reveals that the fifth factor (0.714), sixth factor (0.732), seventh factor (0.730), eighth factor (0.894), ninth factor (0.794), tenth factor (0.849) and twelfth factor (0.771) are loaded on the first component, identifying them as primary contributing factors. The first principal component explains 41.349 percent of the total variance. The second principal component accounts for an additional 40.671 percent, together representing a substantial proportion of overall variance of 82.020 percent. From this analysis, it can be inferred that disbursement of packing credit, liquidation of packing credit, interest on pre-shipment credit, credit-worthiness of exporter, working capital availability, exchange rate fluctuations, and supply chain efficiency were perceived as the most significant factors influencing the pre-shipment credit facility offered by EXIM Bank of India, as viewed by the sample respondents.

CONCLUSION

The empirical findings provide clear evidence of a strong and positive association between **pre-shipment credit extended by EXIM Bank** and the performance of project exporters. The measurement quality across constructs is robust, with reliability indicators at a very high level (Cronbach's alpha in the range of 0.95–0.97), sampling adequacy consistently acceptable to strong (KMO values ≥0.60, often around 0.78), and Bartlett's tests uniformly significant at the 1% threshold, confirming that the scales are internally coherent and the latent factors statistically valid. Within this rigorous framework, firm-level growth analyses reveal that project-export performance responds significantly to the timely availability of pre-shipment credit, with several companies recording statistically significant and economically meaningful compound growth rates.

The factor-analytic results clarify which features of assistance drives outcomes. For pre-shipment credit, the most influential loadings cluster around the speed and adequacy of packing-credit disbursement and liquidation, the cost of credit (interest), exporter creditworthiness, and exposure to exchange-rate and supply-chain frictions. This pattern underscores that export readiness is highly sensitive to how quickly and predictably working capital moves through the system and to the extent to which FX and logistics risks are cushioned at source.

In conclusion, the analysis demonstrates that project exporters attach the highest importance to the **speed and adequacy of pre-shipment credit disbursement**, the **efficiency of liquidation procedures**, the **cost of credit**, and the **management of exchange-rate and supply-chain risks**. These priorities underscore the need for EXIM Bank to adopt more responsive mechanisms, such as **formal service-level agreements to ensure timely disbursement**, the **integration of pre-approved hedging instruments with pre-shipment loans**, and the **incorporation of supply-chain finance solutions into its product suite**. By aligning its offerings more closely with the operational realities of exporters, EXIM Bank can not only strengthen the effectiveness of pre-shipment credit but also reinforce India's overall project-export competitiveness in global markets.

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THE IMPACT OF DIGITAL TECHNOLOGY ON ACCOUNTING ACTIVITIES: TRANSFORMATION, CHALLENGES, AND STRATEGIC IMPERATIVES

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The accounting profession, historically characterized by manual ledgers and repetitive tasks, is undergoing a profound transformation driven by rapid advancements in digital technology. This paper examines the multifaceted impact of technologies such as cloud computing, artificial intelligence (AI), robotic process automation (RPA), block chain, and data analytics on modern accounting activities. Moving beyond automation of basic tasks, these technologies are reshaping the very nature of accounting, shifting the accountant's role from historical record-keeping to strategic advisory and data-driven decision support. This research employs a systematic review of current literature and industry case studies to analyze the implications for efficiency, accuracy, security, and the skillset required of accounting professionals. The findings indicate that while digital technology presents significant challenges, including cyber security risks, data integrity concerns, and a looming skills gap, its strategic adoption is imperative for firms seeking competitive advantage. The paper concludes with recommendations for accounting practitioners, firms, educators, and professional bodies to successfully navigate this digital transformation, ensuring the profession evolves to meet the demands of the future.

KEYWORDS: ***Digital Transformation, Accounting Technology, Artificial Intelligence, Robotic Process Automation, Block chain, Cloud Accounting, Data Analytics, Future of Accounting.***

1. INTRODUCTION

Accounting has long been the language of business, providing a structured framework for recording, classifying, summarizing, and interpreting financial information. For centuries, its processes were manual, time-consuming, and prone to human error. The advent of computers in the late 20th century began to change this, digitizing ledgers and calculations through software like spreadsheets and early enterprise resource planning (ERP) systems. However, the current wave of digital technology represents not merely an incremental improvement but a paradigm shift.

The Fourth Industrial Revolution, characterized by a fusion of technologies blurring the lines between the physical, digital, and biological spheres, is fundamentally altering industries worldwide (Schwab, 2016). The accounting profession is no exception. Technologies such as AI, RPA, and block chain are moving beyond simple automation to enable entirely new capabilities, including predictive analytics, continuous auditing, and immutable transaction verification.

This research paper aims to provide a comprehensive analysis of the impact of these digital technologies on core accounting activities. The central thesis is that technology is liberating accountants from mundane tasks, thereby elevating their role to that of strategic partners within organizations. However, this transition is not without its obstacles. This paper will explore both the immense benefits and the significant challenges, culminating in strategic recommendations for a successful digital future.

2. LITERATURE REVIEW

The existing body of literature extensively documents the ongoing digital evolution within accounting. Moll and Yigithasioglu (2019) discuss the emergence of the "hybrid accountant," a professional who possesses both deep accounting expertise and strong technological acumen. Their research highlights the demand for skills in data management and analytics as core components of the modern accounting curriculum.

Regarding specific technologies, Zhang et al. (2020) provide a robust framework for understanding how RPA is deployed to automate high-volume, rule-based tasks in finance and accounting, such as accounts payable/receivable processing and reconciliations, leading to dramatic increases in efficiency and a reduction in processing errors.

In the realm of AI and machine learning, Kokina and Davenport (2017) were among the first to systematically explore the

emergence of AI in accounting, predicting its role in complex judgment tasks such as revenue recognition and lease accounting under new standards, thereby enhancing the quality of professional judgment.

Block chain technology has garnered significant academic interest for its potential to revolutionize auditing and assurance. Dai and Vasarhelyi (2017) propose the concept of "continuous auditing" through block chain, where transactions are verified and recorded in real-time on a distributed ledger, potentially reducing the need for traditional substantive testing and shifting the audit focus to system controls and exceptions.

Finally, the migration to cloud-based accounting systems (e.g., QuickBooks Online, Xero, NetSuite) has been widely studied. Sledgianowski et al. (2017) note that cloud computing offers enhanced collaboration, real-time data access, and scalability, though it also introduces new concerns regarding data security and privacy.

This paper builds upon this foundation by synthesizing these discrete technological impacts into a holistic view of the accounting function's transformation and providing actionable recommendations for navigating the associated challenges.

3. KEY DIGITAL TECHNOLOGIES AND THEIR IMPACT ON ACCOUNTING ACTIVITIES

This section delves into the specific technologies driving change, detailing their applications and impacts on various accounting domains.

3.1. Cloud Computing

Cloud computing is the foundational layer upon which many other modern accounting technologies are built. It involves delivering computing services—including servers, storage, databases, networking, and software—over the internet ("the cloud").

- **Impact:** Cloud-based accounting software has democratized advanced financial tools for small and medium-sized enterprises (SMEs). It enables:
  - **Real-Time Collaboration:** Multiple users, including accountants, bookkeepers, and clients, can access and work on the same data simultaneously from any location.
  - **Automated Updates and Integration:** Software is automatically updated, and cloud platforms easily integrate with other business applications (e.g., CRM, banking APIs), facilitating seamless data flow and reducing manual data entry.
  - **Disaster Recovery and Data Security:** Reputable cloud providers offer enterprise-grade security and automated backups, which are often superior to on-premise solutions for smaller firms.

3.2. Artificial Intelligence (AI) and Machine Learning (ML)

AI refers to the simulation of human intelligence in machines, while ML is a subset of AI that allows systems to learn and improve from experience without explicit programming.

- **Impact:** AI is transforming accounting from reactive to proactive.
  - **Automated Data Entry and Categorization:** AI-powered systems can read invoices and receipts using optical character recognition (OCR), extract relevant data, and suggest or make appropriate ledger entries, learning from user corrections over time.
  - **Advanced Forecasting:** ML algorithms can analyze vast datasets to identify patterns and predict future cash flows, customer payment behaviors, and financial risks with greater accuracy than traditional methods.
  - **Fraud Detection:** AI systems can continuously monitor transactions in real-time, flagging anomalies and patterns indicative of fraudulent activity that would be impossible for a human to detect in large datasets.

3.3. Robotic Process Automation (RPA)

RPA uses software "bots" to mimic and automate repetitive, rule-based human tasks across digital systems.

- **Impact:** RPA is exceptionally effective for streamlining high-volume, repetitive accounting processes.
  - **Process Efficiency:** Bots can work 24/7 to execute tasks like processing payroll, performing bank reconciliations, and generating bulk invoices, drastically reducing process time and cost.
  - **Error Reduction:** By removing the human element from monotonous tasks, RPA significantly decreases the rate of transposition and calculation errors.
  - **Audit Trail:** Every action performed by a bot is logged, creating a clear and detailed audit trail for compliance and control purposes.

3.4. Block chain and Distributed Ledger Technology (DLT)

Block chain is a decentralized, distributed digital ledger that records transactions in a secure, transparent, and tamper-proof manner.

- **Impact:** While still emerging, block chain's potential is revolutionary.
  - **Triple-Entry Bookkeeping:** The concept involves a third, cryptographically-secured entry for every transaction shared between parties and their auditor, creating an immutable and transparent record (Ijiri, 1986). This could fundamentally change how transactions are recorded and verified.
  - **Smart Contracts:** These are self-executing contracts with terms directly written into code. They could automate transactions like payments upon receipt of goods, recorded immutably on the block chain.
  - **Transformation of Auditing:** Auditors could shift from sampling transactions to testing the integrity of the block chain protocol and smart contracts, enabling real-time, continuous assurance.

3.5. Data Analytics and Visualization

Big data analytics involves examining large and varied datasets to uncover hidden patterns, correlations, and insights. Data visualization tools present these findings in an accessible graphical format.

- **Impact:** This technology empowers accountants to become business analysts.

- **Strategic Insight:** Accountants can move beyond standardized financial reports to perform deep-dive analyses on customer profitability, operational inefficiencies, and market trends.
- **Interactive Reporting:** Tools like Tableau and Power BI allow for the creation of dynamic dashboards that enable management to interact with financial and non-financial data, facilitating quicker and more informed decision-making.
- **Enhanced Auditing:** Analytical procedures can be applied to entire populations of data rather than just samples, increasing audit coverage and the likelihood of identifying risk areas.

4. RESULTS AND DISCUSSION: SYNTHESIZING THE IMPACT

The integration of these technologies yields significant, interconnected results across several dimensions:

4.1. Enhanced Efficiency and Productivity: The most immediate result is the dramatic increase in efficiency. Automated data entry, reconciliations, and report generation free up countless hours previously spent on manual tasks. This allows accounting departments to handle larger volumes of work without proportional increases in staff, reducing operational costs and closing books faster.

4.2. Improved Accuracy and Reliability: Automation reduces the incidence of human error inherent in manual processes. AI and RPA perform repetitive calculations and data transfers with consistent accuracy, leading to more reliable financial data and reducing the time and cost associated with error correction and investigation.

4.3. Evolution of the Accountant's Role: This is perhaps the most profound result. The accountant's role is shifting from a "bean counter" or historical reporter to a "value creator" or strategic advisor. With technology handling compliance and data processing, accountants are expected to interpret complex data, provide forward-looking insights, advise on business strategy, manage financial risks, and guide technological implementation itself.

4.4. Real-Time Decision Support: Cloud platforms and integrated systems provide access to real-time financial data. Coupled with advanced analytics, this empowers management to make data-driven decisions promptly, based on the current financial state of the organization rather than on reports that are weeks or months old.

4.5. Strengthened Compliance and Internal Controls: Technologies like RPA ensure processes are executed consistently according to predefined rules, strengthening internal controls. Block chain offers the potential for unprecedented transparency and auditability. AI-driven monitoring tools enhance fraud detection and ensure ongoing compliance with complex regulatory requirements.

5. CHALLENGES AND RISKS

Despite the overwhelming benefits, the digital transformation of accounting is fraught with challenges.

5.1. Cyber security Threats: The move to digital and cloud-based systems expands the attack surface for cybercriminals. Accounting systems, which contain highly sensitive financial and personal data, are prime targets for ransom ware, phishing, and data breaches. Ensuring robust cyber security measures is non-negotiable.

5.2. Data Privacy and Integrity: With regulations like GDPR and CCPA, managing and protecting client data is a major legal and ethical responsibility. Furthermore, the principle of "garbage in, garbage out" still applies; automated systems will propagate errors at scale if source data or underlying algorithms are flawed.

5.3. High Implementation Costs and Technical Expertise: Acquiring and implementing advanced technologies like AI or custom RPA solutions requires significant upfront investment and specialized IT expertise, which may be a barrier for smaller accounting firms and businesses.

5.4. The Skills Gap and Resistance to Change: There is a growing gap between the traditional skills of many accounting professionals and the new technological skills demanded by the market. Resistance to change, fear of job displacement, and a lack of training can hinder successful adoption and maximize the return on technology investments.

5.5. Ethical and Regulatory Implications: The use of AI introduces ethical questions around bias in algorithms and accountability for automated decisions. The regulatory and auditing standards for technologies like block chain are still underdeveloped, creating uncertainty.

6. RECOMMENDATIONS

To successfully navigate this transformation, stakeholders must take proactive and strategic steps.

For Accounting Practitioners:

- **Commit to Continuous Learning:** Proactively up skill in data analytics, data visualization, and basic programming (e.g., SQL, Python). Understand the functionalities and limitations of key technologies like RPA and AI.
- **Embrace an Advisory Mindset:** Focus on developing soft skills such as critical thinking, communication, and strategic analysis to complement technical accounting knowledge.
- **Specialize:** Consider specializing in areas like IT auditing, cyber security assurance, or forensic accounting, where technology expertise is highly valued.

For Accounting Firms and Corporate Departments:

- **Develop a Strategic Technology Roadmap:** Invest in technology that aligns with specific business goals, starting with process automation (RPA) before moving to more advanced analytics and AI.
- **Invest in Training and Change Management:** Allocate resources for continuous training programs to reskill existing staff. Foster a culture of innovation that embraces, rather than fears, technological change.
- **Prioritize Cyber security:** Implement robust security protocols, including multi-factor authentication, encryption, and regular security audits. Ensure vendor due diligence for any cloud-based services.
- **Redefine Roles and Hire Strategically:** Create new roles like "data analyst" or "automation specialist" within the finance team. Hire new talent with hybrid skills in accounting and technology.

For Educators and Professional Bodies (e.g., AICPA, ACCA)

- **Revamp Accounting Curricula:** Integrate technology education deeply into accounting programs, including courses on data analytics, information systems, and emerging technologies.
- **Update Professional Certifications:** Ensure that CPA and chartered accountant qualifications reflect the need for technology proficiency, perhaps through new modules or specialized certificates.
- **Provide Guidance and Standards:** Lead the development of auditing and ethical standards for evaluating and using AI, blockchain, and other emerging technologies in accounting practice.

7. CONCLUSION

The impact of digital technology on accounting activities is unequivocal and irreversible. It is dismantling traditional processes and redefining the profession's value proposition. Technologies like AI, RPA, and block chain are not threats to be feared but powerful tools to be harnessed. They are eliminating the tedium of compliance work, enhancing the accuracy and reliability of financial information, and—most importantly—freeing accountants to fulfill a more strategic, insight-driven role as essential business partners.

The journey ahead requires a concerted effort. Individual professionals must commit to lifelong learning, firms must invest strategically and foster a culture of innovation, and educators must radically modernize their approach. By embracing this digital transformation proactively and ethically, the accounting profession can secure its relevance and continue to serve as the cornerstone of trust and integrity in the global economy for decades to come.

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8. **Note: This list includes foundational and contemporary sources. A full research paper would expand this list to 20-30 quality academic and industry sources.**
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INFRASTRUCTURE AND INCLUSIVE GROWTH: EXAMINING ROAD DEVELOPMENT AND RURAL TRANSFORMATION IN EMERGING ECONOMIES

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This paper reviews how road infrastructure development affects inclusive rural transformation in the emerging economies, with particular emphasis on the disparate effects in the agricultural and non-agricultural sectors. The research design was an evaluative research design using the systematic sampling methods to access primary data on the form of structured questionnaires and semi-structured interviews with rural households and community leaders and secondary data were sourced from the Ghana Statistical Service, district assemblies and national development databases. The results showed that there were profound developmental differences between communities with good versus poor access to roads, with communities along the engineered roads showing a better connection to the market, greater access to facilities of learning and health system, greater agricultural output, higher household earnings, more diversified economies and lower transport expenses. On the other hand, settlements that had no engineered roads had significant barriers to market entry, reduced access to important services and limited economic prospects. Nevertheless, the two types of communities were not sufficiently equipped in terms of social infrastructure, such as Community-based Health Planning and Services and good schools, which means that, as much as road infrastructure may be necessary in terms of economic integration, similar investments in social services and community participation systems are necessary to support inclusive rural transformation. The study identifies gaps in national rural development policy frameworks and recommends integrated infrastructure development approaches that combine road investments with comprehensive social service delivery to maximize inclusive growth outcomes in emerging economies.

KEYWORDS: *Infrastructure Development, Inclusive Growth, Rural Transformation, Emerging Economies, Road Networks, Economic Diversification*

INTRODUCTION

Rural growth plays a crucial role in overall national development (Buragohain and Landge, 2014; Mohapatra and Chandrasekhar, 2007; Kyeyamwa et al., 2008; Kishor and Basanta, 2021; Jemal and Genet, 2019; Adeniyi et al., 2018). Rural development involves increasing agricultural productivity, enhancing livelihood opportunities (Ale, 2013; Adeniyi et al., 2018; Asafo-Adjei, 2020), expanding access to basic services (Ali et al., 2015; Adeniyi et al., 2018; Asafo-Adjei et al., 2020), and ensuring food security (Okakunori, 2006; Ugwuanyi and Chukwuemeka, 2013). It also supports poverty reduction (Cook et al., 2017; Adeniyi et al., 2018; Asafo-Adjei et al., 2020).

In many rural areas, road transportation is regarded as the most important contributor to socio-economic development. Therefore, improving transportation networks significantly influences the competitiveness and attractiveness of rural areas (Cook et al., 2017; Adeniyi et al., 2018; Asafo-Adjei et al., 2020) and results in the accomplishment of most of the Sustainable Development Goals formulated by the United Nations (Cook et al., 2017). Rural roads connect settlements and provide links to other modes of transportation options, including rail, air and sea (Asafo-Adjei et al., 2020; Blankespoor et al., 2017; Ali et al., 2015; Ugwuanyi and Chukwuemeka, 2013; Olorunfemi and Basorun, 2013; Okakunori, 2006). A feeder road network facilitates the exchange of products and services, people movement and information (Adeniyi et al., 2018), reduces travel time to

educational institutions (Okoko, 2011; Asafo-Adjei et al., 2020; Asafo-Adjei, 2020), and facilitates access to healthcare towards the reduction of maternal mortality (Tayler-Smith et al., 2013; Schoon, 2013; Peters et al., 2018). Most significantly, non-farm economic activities such as cottage industry, crafts and tourism all hinge on improved rural transportation infrastructure (Asafo-Adjei et al., 2020; Asafo-Adjei, 2020; Ali et al., 2015; Okoko, 2011).

Constructing new road networks and improving existing ones through the construction of culverts and bridges, sidewalks, hard-surfacing, street widening and landscaping (see Litman, 2010) facilitates the conveyance of raw materials, semi-finished and finished goods (Howe, 2010). This promotes spatial interactions and enhances access to social services and enhances the productivity of the workforce (Asafo-Adjei et al., 2020; Amo and Meirmanov, 2014; Holmgren, 2014). Notwithstanding this recognition, large swaths of rural areas remain inaccessible by roads, hence creating difficulties in terms of mobility of freight and passengers to market centers (Amo and Meirmanov, 2014; Litman, 2010) and limiting the overall socio-economic development (Adeniyi et al., 2018).

Poor road infrastructure in rural areas poses significant constraints to the development of non-agricultural sectors and activities, undermining economic diversification and overall rural development (Ali et al., 2015; Berg et al., 2017). This infrastructure deficit represents a significant barrier to rural transformation, as adequate transportation networks are essential for market access, service delivery and economic integration. Notwithstanding widespread recognition of these challenges, rural road connectivity remains inadequate across many developing regions. The extent of this infrastructure gap varies considerably by region, with South Asia and South America experiencing moderate deficits where approximately 45-55% of rural communities lack access to adequate transportation infrastructure. The situation is markedly more severe in Sub-Saharan Africa, where an estimated 65% of rural communities remain without improved road access, which represents one of the most significant infrastructure challenges facing the continent (Kishor and Basanta, 2021; Jemal and Genet, 2019; Jayne and Headey, 2014). This disparity in rural road infrastructure perpetuates spatial inequalities and limits the potential for sustainable rural economic development and poverty reduction across these regions.

These poor road conditions have several negative implications. First, low road density and the lack of all-weather roads not only limit access to farmlands but also contribute to increasing transportation costs to markets and to agricultural service centers, thereby limiting productivity and profitability (Jemal and Genet, 2019), (Okoko, 2011; Asafo-Adjei et al., 2020; Asafo-Adjei, 2020) and (Olorunfemi and Adenigbo, 2017). Poor rural roads have contributed to more than 40% post-harvest losses to fruits and vegetables (Yeboah, 2015).

Secondly, large tracts of potential farmland remain largely inaccessible and uncultivated (Jayne and Headey, 2014). Communities are unable to harness their tourism potential (Ali et al., 2015) and exploit their natural resources such as gold ore and stone quarry (Berg et al., 2017; Kishor and Basanta, 2021; Sileshi and Tebarek, 2017). Thirdly, even though education and health are critical for human development, many rural residents are unable to access these social services due to poor transportation infrastructure (Ibrahim, 2011; Sileshi and Tebarek, 2017). These conditions contribute to higher concentrations of poverty (Gollin and Rogerson, 2014; Minten et al., 2013; Ugwuanyi and Chukwuemeka, 2013; Emran and Shilpi, 2012; Okakunori, 2006) and food insecurity (Emran and Shilpi, 2012; Minten et al., 2013).

In the case of Ghana, rural roads are generally underdeveloped relative to inter-urban and intra-urban roads (Asafo-Adjei et al., 2020). Most of the rural roads are impassable during rainy seasons and hence isolate communities from the rest of the other settlements (Yeboah, 2015). As a result, rural residents have limited access to education facilities and health delivery and market centers due to the high cost of transportation (Okoko, 2011; Asafo-Adjei, 2020).

Preliminary investigation in the study area shows that, though certain roads are engineered, others are un-engineered and impassable during the wet season. This situation limits access to farmlands, market centers and social infrastructure, which has negatively impacted rural development. The overall effect is that the area is characterized by productivity and livelihood mechanisms. According to Asafo-Agyei (2020), about 60% of the residents travel long distances to get access to social infrastructural facilities, particularly education and health (Asafo-Adjei, 2020).

This research proposition is that improved road networks contribute significantly to farm production, non-farm economic activities and improve access to social services, thereby contributing to the achievement of many of the Sustainable Development Goals. In line with this proposition, this research compares rural development in villages located along engineered cocoa roads with those located on un-engineered roads using several indicators. In light of this central research proposition, the following research questions are posed:

Research Questions

1. What are the characteristics of road networks connecting roads in the study area?
2. How do the road conditions impact crop production and non-farm activities along the selected transportation corridors?
3. How do the road conditions influence access to social services, especially health and education, in the study area?

The research questions outlined above are designed to understand the problem for policy intervention to promote the competitiveness and attractiveness of rural areas for investment through road development. In this light, this broad goal, the following specific objectives are outlined.

Research Objectives

1. To explore the nature of road infrastructural development and its contributions to rural development.

2. To examine the effect of improved roads on agriculture and non-agricultural sectors for socio-economic development.
3. To explore the nature of access to healthcare services and education on engineered and engineered roads.

Methods and Procedures

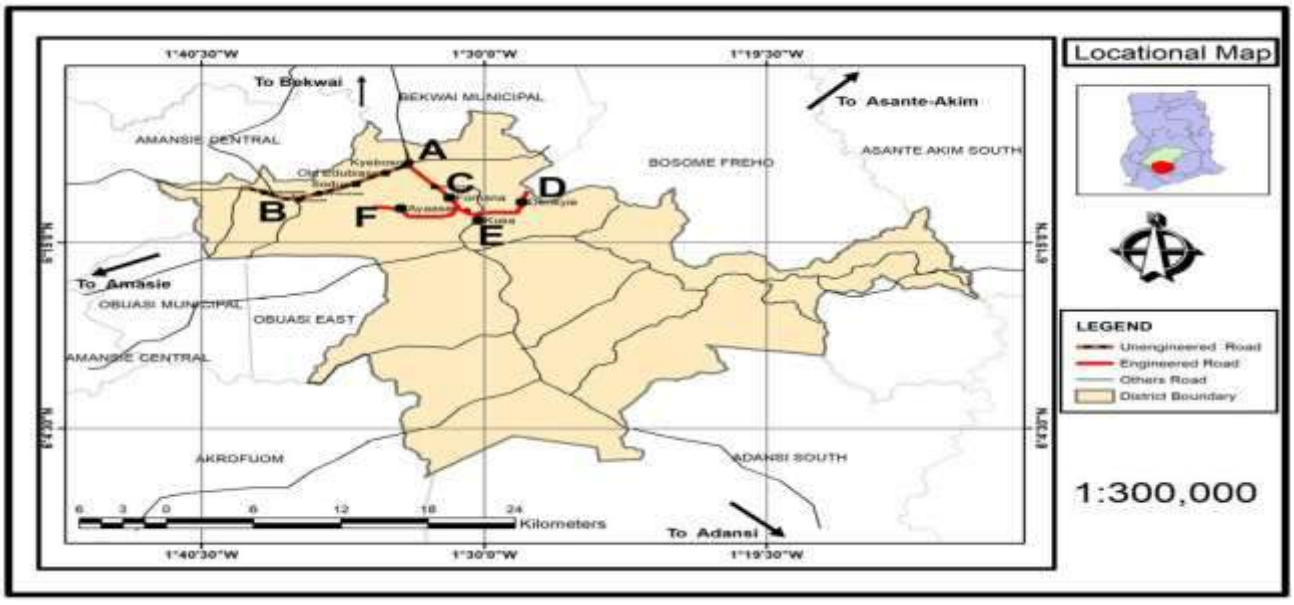
The research design used in this study was a summative evaluative research design that aimed to determine the effects of the cocoa roads project on the rural development of the Adansi North District, Ghana, which is mainly rural with about 70 percent of the road systems in need of enhancement (DCPU, 2014). In this study, the outcomes of socio-economic developments were compared between the communities using the engineered roads (Fomena to Denkyie route and Fomena to Ayaase route) that can be used throughout the year and those using un-engineered roads (Kyeaboso to Akrokerri route), which can only be used in dry seasons. Physical accessibility and cocoa production level were used to select six communities purposely: three along engineered roads (Denkyie, Kusa and Ayaase) and three along un-engineered roads (Kyeaboso, Old Edubiase and Sodua). Primary data collection entailed a structured questionnaire survey of 43 systematically sampled household heads per community (the study used every 3rd house with a 95 percent confidence level and 5 percent margin of error) and the key informant interview of officials with the Feeder Roads Department, Ghana Cocoa Board, District Planning Office, traditional leaders and assembly members. The preliminary investigations yielded secondary data in the form of district profiles, road maps, medium-term development plans and Ghana Statistical Service records. The questionnaire targeted four key areas, namely, respondent demographics, contribution made by road infrastructure and rural development, impact of road quality on agriculture and socio-economic development and access to healthcare and educational services. Analysis of data used SPSS software version 27.1 in quantitative analysis of data using descriptive statistics and association analysis and qualitative data in the form of interviews was subjected to content analysis to determine patterns and themes underlying the quantitative results.

RESULTS OF THE STUDY

Conditions of the road networks in the study communities

To carry out a comparative analysis to assess the influences of road networks on rural development, three communities were selected for the study along the engineered road corridor and another three were selected on an engineered corridor. For the road network connecting Kyeaboso to Akrokerri (A-B) (un-engineered road network), the selected communities were Kyeaboso, Old Edubiase and Sodua (refer to Figure 1.1). In terms of the Fomena to Denkyie to Ayaase road (C-D, E and F) (engineered roads), the selected communities were Denkyie, Kusa and Ayaase (refer to Figure 1.1). Finally, the impacts of road networks (both engineered and un-engineered) on agricultural activities, non-agricultural activities, services and on the market were assessed. The engineered road network was asphalted under the Cocoa Roads Project and is in good condition, hence providing access to markets and farmlands throughout the rest of the year for day-to-day activities (Okoko, 2011; Tayler-Smith et al., 2013; Schoon, 2013; Peters et al., 2018; Asafo-Adjei et al., 2020; Asafo-Adjei, 2020).

Figure 1.1: Adansi-North Road Map



Source: District Planning and Coordinating Unit (2022)

On the other hand, the unimproved road corridor was characterized by potholes, dusty and muddy conditions, which impeded access to educational and health facilities and market centres. While the initial 8 kilometres of the road were in good condition, a significant proportion of the road network was in poor condition, which not only impeded agricultural activities but also access to social services. Table 3.1 shows that the majority (65%) of the respondents from communities located along the engineered road stated that the nature of the road network enhanced their physical accessibility to facilities such as education, health and market centres since there were no developed potholes as well and the road was not dusty or muddy during the dry and rainy seasons, respectively. Consequently, they have regular access to transport services within the

communities. The other majority (85%) of the respondents stated that the nature of un-engineered roads inhibited their physical accessibility to essential infrastructural facilities such as education, among others (Refer to Table 3.1). Generally, the physical accessibility of residents in the community is impeded due to the poor nature of the road network; the road networks have developed potholes, very muddy during rainfall, making maneuverability difficult for motorists.

Table 3.1: Nature of Physical Access on the Road Networks

Variable	Nature of Physical accessibility to facilities		
Types of road networks	Yes	No	Total
Engineered Road	65%	35%	100%
Un-engineered Road	15%	85%	100%

Sources: Field Survey, 2022

The in-depth interview of the Akwamuhene of Old Edubiase community expressed his dissatisfaction with the road conditions in the following words:

> *"The road becomes flooded with water anytime it rains. Also, the road becomes very muddy, such that it becomes very inaccessible to vehicles".*

He also iterated that due to the poor nature of the road and potholes in the area, inhabitants were exposed to accidents, people with emergency cases even died on their way to health facilities and that some pregnant women delivered prematurely due to the delay on the road and difficulties in getting a vehicle to convey them to Fomena Health Centre and Bekwai Government Hospital. The Ashanti Regional Feeder Roads Department have not tried to rehabilitate the road to enhance its condition. Funds from the government for roads are not forthcoming, leaving bad roads in their poor state. A plausible explanation is that the communities along the un-engineered road network are not producing any goods or services that are of high economic value to merit investment in their road networks. Consequently, the road network is left in a poor state with its associated negative effects on members of the communities and adjoining areas. The outcome of the study is consistent with the findings of Berg and Ihlstrom (2019), who established that most rural roads are in poor condition in the northern part of Ethiopia. Similarly, Starkey and Hine (2022) argued that more than 40% of rural roads in Nepal are in poor condition, with the negative consequence on access to education and healthcare services.

The field investigation revealed that the un-engineered road network from Kyeaboso to Akrokerri, marked in Figure 1.1, was impassable during the rainy season, due to floods and gullies, thereby making it impossible for vehicles to ply the road. Though the 25-kilometre stretch of road network is accessible during the dry season, it becomes dusty, thereby predisposing the road users to respiratory diseases. This finding is consistent with the study by Afukaar et al. (2019), who established that the road network connecting Gyasikrom to Goaso, which is about 19 kilometers long and an unpaved feeder road, becomes impassable during the rainy season, most especially with its associated negative effects, such as inaccessibility to essential social infrastructure.

Impacts of road infrastructure on agricultural activities

Agricultural activities were the mainstay of the economy of the inhabitants of the study area since they were involved in the cultivation of crops such as cash crops (citrus, cocoa, etc.) and food crops such as plantain, cocoyam, maize, cassava and yam. Therefore, they require access in the form of good road networks to market their food produce and get farm inputs such as fertilizers. For instance, about 95% of the respondents along the engineered road stated that the engineered road network impacted their farming activities positively (refer to Table 3.2). However, this was not the case according to the household survey conducted. For instance, about 85% of the respondents stated that the unimproved road networks impeded their ability to transport their food products to the markets for sale and easy access to farm inputs from market centres and towns (refer to Table 3.2). The situation was worsened by the inability of traders to purchase farm produce directly from the farmers, as well as their inability to easily carry their harvested produce to market centres such as Bekwai, Akrokerri, Fomena and the like.

Similarly, bush paths leading to various farms are greatly underdeveloped in communities such as Kyeaboso, Old Edubiase and Sodua, thereby making it very difficult for farmers to commute to their farms in the hinterlands, especially during rainy seasons. This phenomenon has to some extent contributed to postharvest loss for farmers in the study area. The challenges inhibiting farming activities included irregular transport services and the wastage of farm produce on transit due to the non-motorable road network and conditions. An interview with an official of the Agricultural Department of the Adansi North District showed that:

> *"Farming communities located along un-engineered road networks are unable to sell their goods on time due to the poor nature of the road networks. Therefore, most of the farm produce gets spoiled, particularly perishable farm produce such as vegetables, resulting in post-harvest loss"* (Agricultural Department of the Adansi North District).

This finding resonates with the findings of Jemal and Genet (2019), Okoko (2011), Asafo-Adjei et al. (2020), and Asafo-Adjei (2020), who established that the lack of all-weather roads not only limits access to farmland but also increases transportation costs to markets and agricultural service centres, thereby limiting productivity and profitability.

Table 3.2: Impacts of road infrastructure on agricultural activities

Variable	Impact on road networks from farming activities		
Categories of Respondents	Yes	No	Total
Respondents along the engineered Road	95%	5%	100%
Respondents along an un-engineered Road	15%	85%	100%

Sources: Field Survey, 2022

Impacts of road infrastructure on annual Farm produce

According to Berg et al. (2018), the nature of rural road infrastructure affects their agricultural activities. The field survey conducted revealed that (60%) of the farmers produced between 10-20 bags of cocoa yearly before the improvement of the roads, with a minority (15%) of the farmers producing between 20-30 bags annually (refer to Table 3.3). Notwithstanding, this trend is not different from cocoa-producing communities along an un-engineered road network. For instance, on average, about 20 bags of cocoa were produced annually.

The factors accountable for this phenomenon, as established by the outcome of the field survey, were that farmers were unable to cultivate more land since they were inaccessible. Worst of all, vehicles get stuck in cocoa farms during the rainy season in the course of transporting the farm produce, thereby resulting in the food produce getting rotten on the farm. This finding resonates with the finding of Angmor (2012), who established that adequate road transportation led to the development of agricultural activities in the form of enhancing farmers' access to farm inputs within a reasonable time, among others, at Esa-Odo in Osun State, Nigeria.

On the other hand, following the improvement of the roads connecting the communities, the total quantity of cocoa produced annually increased by more than 10-fold, thus increasing incomes. For instance, the majority (50%) of the farmers produced between 40-50 bags annually, whereas the minority (5%) produced between 10-30 bags of cocoa within the Adansi North District (refer to Table 3.3). On average, about 400 bags of cocoa are produced annually by farmers in the study communities. The improved road networks enhanced access to large acres of uncultivated lands, which were eventually cultivated. For instance, the respondents stated that the improved roads allowed some traders to directly come to the farm to buy farm produce, purchase vehicles, produce along the roads and some also come to the farm to carry the farm produce home, as well as purchase farm inputs, which are directly delivered to the farm due to the improved nature of the roads. For instance, a respondent (Cocoa Farmer) stated the following;

"We have easy access to farm inputs, especially pesticides and herbicides to apply on our farms. Aboboya easily comes to our farm to deliver the purchased farm inputs. Most importantly, Aboboya comes to our farm to convey the fermented cocoa beans to the house and dry them." (Assemblymember from Ayaase).

This finding is consistent with that of Bonsu (2014), who established that improved road transport infrastructure enhances the easy transportation of farm produce, which is intended to increase agricultural production and incomes.

Table 3.3: Level of Cocoa production in the Communities

Quantity Produced	Percentage	Quantity Produced	Percentage
Before road improvement		**After road improvement**	
1-10bags	25%	10-40bags	5%
10-20bags	60%	40-50bags	20%
20-30bags	15%	50-60bags	50%
31+ bags	-	61+ bags	25%
Total	100%	Total	100%

Sources: Field Survey, 2022

Impacts of road infrastructure on annual Income earned from Farming activities

Poor road networks hinder the transportation and marketing of farm produce, with the consequence being less income for farmers (Kyeyamwa et al., 2008). Therefore, improved access to markets improves access to markets for agricultural produce and facilitates access to modern techniques, farm inputs and extension services, which potentially boost commercial agriculture Minten et al., 2013; and Damania et al., 2017), and contributes to increased incomes (Angmor, 2012; Damania et al., 2017). The study revealed that the farmers from the study communities along the un-engineered road network earned less money from their farming activities, particularly cocoa farming. For instance, a majority (45%) of the farmers earned between GH₵2,100-GH₵4,000, followed by GH₵4,100-GH₵6,000 (30%), Less than GH₵2,000 (23%), with a minority of 2% of farmers earning GH₵12,100 and more annually (refer to Table 3.4). The cocoa farmers stated that due to the unimproved road networks, large tracts of potential farmland remain largely inaccessible and uncultivated. Also, the farmers lacked easy access to farm inputs needed for farming purposes. For instance, a cocoa farmer, who doubles as the Odikro of Sodua, stated the following during an in-depth interview;

"*We, as cocoa farmers, find it difficult to buy pesticides and herbicides to apply on cocoa farms due to the nature of the roads, especially during the rainy season. As you know, cocoa is a delicate farm produce; therefore, if you do not apply pesticides and herbicides in time, it affects the yield.*

(Assembly Member (Cocoa Farmer) from Sodua)

Conversely, farmers from communities connected by engineered roads earn more money annually from their farming activities (refer to Table 3.4). This is because cars and tricycles easily access the farmlands and transport their farm produce to market centres fast and reliably. Also, the market centres became easily accessible all the time, irrespective of the weather conditions and hence easy access to the market centres without any delays or hindrances concerning the transportation of farm produce. Thus, the engineering works carried out on the roads were purposely to improve them, making them all-weather roads without developed potholes, reducing transport costs and enhancing access to the market centres. Yeboah (2015) established that farming activities along a good road network boomed, which translated into high income for the farmers in Jaman South District of Ghana.

Table 3.4: Annual Income earned by Cocoa Farmers'

Income Earned	Percentage	Income earned	Percentage
Un-engineered Road		**Engineered Road**	
Less than GH₵2000	23%	Less than GH₵2000	-
GH₵ 2100-GH₵4000	45%	GH₵ 2100-GH₵4000	-
GH₵4100-GH₵6000	30%	GH₵4100-GH₵6000	5%
GH₵6100-GH₵ 8000	-	GH₵6100-GH₵8000	20%
GH₵8100-GH₵12000	2%	GH₵8100-GH₵12000	40%
GH12,100 +	-	GH12,100 +	35%
Total	100%	-	100%

Sources: Field Survey, 2022

Impacts of road infrastructure on access to Markets

From the survey conducted, about 80% of the residents located along the engineering road stated that the rehabilitation of the road networks enhanced the marketing of their farm produce (refer to Table 4.9). Additionally, the rehabilitation of the networks resulted in the marketing of items along roadsides. For instance, activities such as petty trading in the sale of farm produce (palm oil, plantain, cocoyam, etc.) sprang up along the stretch of roads connecting Kusa and Denkyie due to their good and dust-free nature. For instance, during the field survey, about 30 and 25 individuals were engaged in the sale of food produce as well as the marketing of other items along the roadsides at Kusa and Denkyie, respectively.

The outcome of the household survey further revealed that 20% and 80% of the respondents stated that the conditions of their respective road networks affect access to market facilities positively and negatively, particularly for communities without market facilities and hence have to cover a long distance to access market facilities in neighbouring communities (refer to Table 4.5). Additionally, due to the poor nature of the road networks, they were unable to market their farm produce, as well as other items along the roadside, to earn a living. Kyeaboso, Old Edubiase and Sodua were connected by an un-engineered road (see figure 1.1). Sodua was difficult to access, thereby making traders challenged with cart goods to market facilities and urban centres.

Comparatively, residents in communities connected with engineered roads had easy access to market facilities, whereas communities connected with un-engineered roads had difficulties accessing market facilities. For instance, respondents from communities connected by engineered roads stated that cars and tricycle carry their goods to the market fast and reliably, the market centres are accessible all the time irrespective of the weather conditions and farmers have easy access to farmlands directly to purchase farm produce in bulk and there is easy access to the market centres without any delays or hindrances concerning the transportation of farm produce and cocoa. This is because the improvement of the road networks enhanced easy access to the market centres with its associated positive effects, such as fewer transport costs and less time associated with the transportation of goods, as well as access to reliable transport services.

On the other hand, the inhabitants of communities such as Kyeaboso and Old Edubiase, without market centres, are challenged with both physical and economic access to neighbouring market centres as well as a ready market for produce due to the inaccessibility of the roads during the rainy season, high transport costs associated with the transportation of farm produce and unreliable transport services. For instance, the respondents stated that potholes are a major problem in accessing the market, in addition to the transport cost being expensive due to the poor conditions of the road networks connecting the market centres. These findings are consistent with the findings of Berg et al. (2018), who established that most developing countries in Africa lack access to market centres primarily due to poor transport infrastructure. Similarly, the outcome of studies is consistent with Atuoye et al. (2015) and Danso-Wiredu (2011), who established that most rural areas in Ghana lack access to vital infrastructural facilities such as market centres due to poor rural transport services. Consequently, Hine (2014) stated that the poor road infrastructure confronting rural areas in Ghana comes with a plethora of transport challenges, such as the non-availability, unpredictability, and high transport fares of rural transport services (Hine, 2014).

Impacts of road infrastructure on access to Farm inputs

According to Inoni and Omotor (2009) and Jemal and Genet (2019), access to farm inputs is essential for farmers to support their farming activities, particularly, rural areas. In the view of Adedeji et al. (2014), farming communities located along a good road network have easy access to farm inputs compared to farming communities located along un-engineered road networks. The outcome of the field survey revealed that communities located along the engineered road had easy and fast access to farm inputs to support their farming activities (refer to Table 3.6). This is because they had easy access to farm inputs from suppliers in the community, as well as markets located in the communities, due to the good nature of their road networks. Thus, farmers from farming communities such as Denkyie, Kusa and Ayaase had easy access to farm inputs during the farming season. For instance, a participant stated the following;

"Farmers from Denkyie, Kusa and Ayaase have easy access to farm inputs during the farming season. Our road networks are good, so farmers easily travel to neighbouring communities to purchase farm inputs when the need arises" (Assemblyman of Kusa).

On the other hand, farmers from farming communities located along the un-engineered road networks lack easy access to farm inputs (refer to Table 3.6). The situation is worsened for farmers in communities without market facilities. For instance, farmers

from communities such as Kyeaboso and Old Edubiase without market centres are challenged with both physical and economic access to neighbouring market centres to purchase farm input due to the inaccessibility of the roads during the rainy season, especially. For instance, a participant stated the following;

"Farmers in this community lack easy access to farm inputs during the farming season. Most of us farmers often travel as far as to Fomena, Bekwai or even to Kumasi to purchase farm inputs" (Chief of Edubiase).

Table 3.6: Impacts of road infrastructure on access to Farm produce

Variable	Impact on access to Farm inputs		
Categories of Respondents	Positively	Negatively	Total
Respondents along the engineered Road	75%	25%	100%
Respondents along an un-engineered Road	15%	85%	100%

Sources: Field Survey, 2022

Impacts of road infrastructure on access to social services (Health and Education)

In the development of rural areas, transportation plays a crucial role (Okoko, 2011). It is crucial in putting land into production, marketing agricultural goods and developing industries, as well as in expanding trade, implementing health and education programs and exchanging ideas (Olawole et al., 2010; Inoni and Omotor, 2009). According to Adedeji et al. (2014), the main de facto market force and the development of rural areas is transportation. Additionally, the existence of growth poles or a vibrant economic activity within a particular area within a region can also stimulate the provision of road infrastructure as well as vital infrastructural facilities (Adedeji et al. 2014). They further reiterated that the provisions of road infrastructure stimulate the provision of infrastructural facilities such as schools, electricity and water.

Therefore, it is expected that communities connected by engineered roads are expected to be provided with all the needed social infrastructural facilities. On the reverse, communities without access to improved road networks are expected to lack access to all the essential social infrastructural facilities. However, that is not the case as the outcome of the household survey conducted revealed that communities such as Kusa and Ayaase along engineered road networks are provided with educational facilities that range from pre-school to basic level education. Denkyie, which also has an engineered road, has no school, but has access basic school in Kusa, which is a neighboring community. Because of the good nature of the road, students walk to school without difficulty, whereby no dust or inconvenience is encountered. Thus, the provisions of the engineered roads contributed to and stimulated the provisions of these educational facilities in the communities or made it easy to access schools in neighbouring towns.

On the other hand, communities such as Kyeaboso, Old Edubiase and Sodua that are located along un-engineered road networks do not have public educational facilities that range from pre-school to a basic level (Junior High School). This finding resonates with the findings of Ibrahim (2011) and Sileshi and Tebarek (2017), who stated that rural residents with access to all-weather road networks have been able to access essential social services such as education and health care services due to efficient transportation infrastructure. In the view of Okoko (2011), rural residents with poor road infrastructure have limited access to education facilities and health delivery primarily due to the high cost of transport. Similarly, Asafo-Adjei (2020) argued that only a handful of rural roads are passable during rainy seasons, thereby isolating these communities from the rest of the other settlements (Yeboah, 2015).

In terms of health facilities, residents within the communities, such as Denkyie, Sodua, Kyeaboso and Old Edubiase communities, do not have a CHPS compound but access health care services at Fomena and Bekwai when the need arises. This means that communities along both engineered and un-engineered roads are not provided with all the necessary social infrastructural facilities, like health and educational facilities. It is therefore inferred that the provisions of all-weather road networks do not necessarily stimulate the provisions of social infrastructural facilities but may enhance access to these facilities in neighboring areas.

To test if there is any significant association between engineered roads and the provisions of social infrastructural facilities, a simple linear regression test was conducted. The result of the regression model below shows a positive correlation between engineered road networks and the provision of social infrastructural facilities. The relationship is statistically insignificant ($p>0.05$) (Refer to Table 3.7). This implies that a good road infrastructure necessarily stimulates the provision of social infrastructure in the long run. However, the provision of essential infrastructural facilities is determined by several factors such as the threshold population of the said community, the location, the role of the community and the nature of economic activity ongoing in the community (Moeketsi, 2017; Agbigbe, 2016; Pradhan and Bagchi, 2013).

Table 3.7: Model Summary

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. E	Beta		
(Constants)	1.800	0.424		4.243	.004
Provisions of Social Infrastructural Facilities	0.600	0.278	0.478	1.440	0.9

Dependent Variable: Provisions of Social Infrastructural Facilities

CONCLUSION AND RECOMMENDATIONS

This paper examined how road infrastructure and inclusive rural transformation are connected in the background of developing economies, using the Adansi North District in Ghana as the case study. The research aimed to understand the character of road infrastructural development and its impacts on inclusive rural development, to assess the impacts of the enhanced road networks on agricultural and non-agricultural development on socio-economic development and to evaluate the disparities in access to healthcare services and education along engineered and non-engineered road corridors. The results showed that communities with better road networks enjoyed increased accessibility to important infrastructural facilities such as markets, schools and health care services and had a positive spillover to their core economic development, specifically agricultural production. The endemic underdevelopment of the communities situated on the un-engineered roads corresponds with the theoretical assumptions of the urban bias thesis, which states that resources are systematically transported out of the underdeveloped periphery to the more developed centers, which in turn triggers the continuance of spatial inequalities and provides fewer chances of inclusive growth (Lipton, 1965; Lehmann, 1980a; Ahiakpor, 1985). On the other hand, societies that lacked enhanced road networks faced a big rift in access to basic social amenities, especially markets, educational institutions and medical services. Although traditional wisdom dictates that communities that are better equipped with road infrastructure should be prioritised to receive social infrastructure (Banerjee et al., 2020; Blankespoor et al., 2017; Beyzatlar and Kustepeli, 2011), the research findings are in opposition to this perception, as unimproved and improved road network-linked communities did not equally receive infrastructural facilities such as CHPS compounds. This gap implies that road infrastructure itself does not precondition the inclusive access to social services but rather exists as a complex system of predeterminants such as the population threshold requirements, geographic location, the role of the community in the overall economic system and the character of local economic activity (Berg et al., 2018; Moeketsi, 2017; Agbigbe, 2016; Pradhan and Bagchi, 2013). The simple linear regression analysis established that there was a positive correlation between the engineered road networks and the provision of the social infrastructure, but the correlation did not prove to be statistically significant ($p>0.05$). This indicates that, despite the need to develop road infrastructure, this alone is not sufficient to bring about the actual inclusive rural transformation unless other complementary factors are addressed at the same time, as they must together establish equitable access to basic services and economic opportunities.

Policy Recommendations

The findings of the study imply some important policy implications for infrastructure-based inclusive growth in emerging economies. The Ghana Cocoa Board, in conjunction with the Department of Feeder Roads, ought to focus on the restoration of the degraded road networks in the cocoa-producing regions as part of improving the farm output and access to the market. The Ministry of Local Government and Rural Development should devise an elaborate rural development model that may perceive transportation infrastructure as a driving force of rural change. The Ministry of Roads and Highways also need to develop an integrated national transport policy that focuses on systematic upgrading of the feeder roads by making use of evidence-based planning and equal resource distribution. Strategic investment in rural road infrastructure is a key channel through which spatial inequalities can be minimized and balanced national development ensured.

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CONSEQUENCES OF NON-TAX COMPLIANCE: A COMPREHENSIVE ANALYSIS OF POTENTIAL REVENUE LEAKAGE AND ITS IMPACT ON FEDERAL INFRASTRUCTURE INVESTMENT

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This paper examines the multifaceted nature of tax compliance gaps in the United States and their extensive, often overlooked, consequences on federal infrastructure investment and ultimately, overall economic development performance. The gross federal tax gap, representing the difference between taxes legally owed and those collected on time, was projected at approximately $601 billion in 2020 and has since risen to an estimated $688 billion in 2021 and nearly $700 billion in 2022, highlighting its continued growth in recent years. While the direct revenue loss is a critical fiscal concern, the analysis in this paper extends beyond these headline figures to explore the less visible but equally significant systemic costs challenges of the United States tax system, including administrative complexity, regulatory uncertainty, excessive time burdens, and compliance expenditures that disproportionately affect small businesses, lower-income households, and taxpayers with limited access to professional advisory services. Such inefficiencies divert capital and labor from productive economic activity, discourage voluntary compliance, and erode public confidence in the administration of the tax laws. Drawing from peer-reviewed literature, empirical data from the Internal Revenue Service and Congressional Research Service, and policy analyses from reputable institutions, the study assesses the composition, causes, and distributional effects of the compliance gap, specifically the trend in enforcement, the loss of IRS capacity through budgetary cuts, and the unfair concentration of audit resources on low-income taxpayers alongside the insufficient auditing of high-income individuals and large corporations. These dynamics not only exacerbate inequality but also compromise enforcement deterrence, allowing underreporting to persist. By quantifying the opportunity costs of noncompliance, particularly the foregone capacity to fund long-term, high-impact infrastructure projects, the research establishes a stronger conceptual link that exists between fiscal inefficiency and underinvestment in public goods. The annual net tax gap exceeds typical yearly budgets allotted by the Bipartisan Infrastructure Law, underscoring the potential for improved compliance to serve as a sustainable revenue source the need to raise statutory tax rates. In doing so, the study positions the tax gap not merely as a technical issue of collection but as a structural limit on economic growth, competitiveness, and equity, and it ends with policy-relevant recommendations intended to improve compliance, modernize enforcement, and rebalance federal fiscal capacity with long-term development objectives.

KEYWORDS: ***Tax compliance gap, Revenue leakage, IRS enforcement, Hidden compliance costs, Infrastructure investment, Fiscal capacity***

INTRODUCTION

Tax compliance gaps are a systemic and accumulating long-term issue of the U.S. fiscal policy. Such gaps indicate the disparity between the taxes payable and tax penalties and accrued interest at prevailing interbank rates, the fines imposed as a result of non-filing/compliance, underreporting, and underpayment, limiting public revenue available for long-term investment (Sarin & Summers, 2019). According to the Internal Revenue Service, the gross federal tax gap in 2011-2013 tax years was approximately 441 billion dollars annually and the latest estimates show that it increased to over 600 billion dollars (Internal Revenue Service, 2019; McDermott, 2023). Although the direct revenue losses are large, the wider economic and policy consequences have been sparsely researched. This compliance gap will undermine the Government's fiscal planning, limit the discretionary capacity of the federal government, and limit investment funding in core areas such as infrastructure, climate adaptation, and digital equity.

Beyond the revenue shortfall, the U.S. tax system creates large hidden compliance costs on individuals, businesses, and government institutions. These involve administrative

complexity, regulatory uncertainty, legal and lobbying costs, as well as time and resource costs incurred in tax preparation. According to Fichtner and Feldman (2013), these invisible costs are between 215 and 987 billion dollars per year. These burdens not only diminish economic efficiency but also impact small and medium-sized enterprises, households with a lower income, and taxpayers with low access to advisory services disproportionately (George, 2019). In the meantime, the IRS enforcement has been undermined by budget reductions and technological disadvantage, which have led to insufficient oversight of the high-income population and large businesses and increased vertical inequities in compliance (Black et al., 2022).

It is worth noting that the implications for infrastructure investment are particularly pressing. The annual net tax gap is larger than the legally authorized federal infrastructure expenditures, which is approximately 150 billion dollars per year, or less than half of the potential revenue forgone as a result of noncompliance (Washington, 2019). These opportunity costs highlight the economic consequences of inefficiencies in tax policy. This paper provides an in-depth analysis of the visible and unseen expenses of the tax compliance gaps, as well as their effects on the investment in infrastructure. It is a synthesis of U.S. recent empirical literature, government reports, and policy analyses to comprehend the fiscal, behavioral, and institutional dynamics of the tax gap and the strategic reforms required to modernize the IRS and realign public finance with long-term developmental goals.

Methodology

The literature review employed a narrative synthesis approach grounded in peer-reviewed journal articles, government reports, and policy research produced by reputable institutions. The analysis prioritized sources that are verifiable via Google Scholar and published by entities such as the Internal Revenue Service (IRS), the Congressional Research Service (CRS), the Treasury Inspector General for Tax Administration (TIGTA), the Center on Budget and Policy Priorities (CBPP), as well as the National Taxpayer Advocate.

While the conceptual framework draws from foundational literature, only studies with empirical or policy-based analysis published after 2015 were used in the review to make them relevant to and consistent with the latest fiscal and institutional realities. Specific focus was put on materials that discuss enforcement trends, administrative burden, audit coverage, and revenue implications for public investment planning.

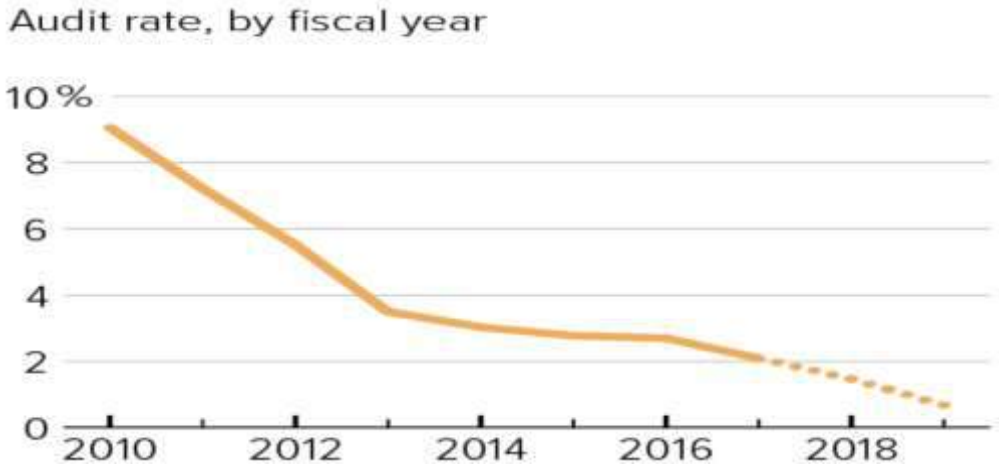
LITERATURE REVIEW ON TOPICAL AREAS

Tax Gap Composition and Trends

The Internal Revenue Service defines gross tax gap as the total amount of tax liability that is not paid voluntarily at the due time. The gross gap averaged 441 billion dollars per year in the tax years 2011 through 2013. About 352 billion were not reported, 39 billion were not filed, and 50 billion were underpaid (McDermott, 2023). The net tax gap was estimated post-enforcement and late payment at 381 billion dollars. Recent evaluations of the Internal Revenue Service estimate that the gross tax gap has increased to more than 600 billion dollars per year (see *Figure 2*) and reached 601 billion in 2020 and 668 billion in 2021, whereas the net tax gap has been estimated to have reached 539 billion in 2020 and 625 billion in 2021 (Internal Revenue Service, 2023). In the meantime, the amount of coverage and enforcement resources has been slashed, the audit rate of million-dollar earners dropped by more than sixty percent in the period between 2010 and 2019, and enforcement outlays decreased by twenty-six percent during the period between the fiscal year 2010 and the fiscal year 2022 (Internal Revenue Service, 2023; Peterson Foundation, 2023).

Policy analysts and Economic commentators have traced this to the recurrent underfunding of the IRS revenue collection operations, the weakened third-party information reporting, and the outdated electronic computer systems as reported by Marr et al. (2022). Furthermore, in this first analysis, it is worth noting the uneven distribution of the tax gap across the various types of income (*Figure 3*). There is a high compliance rate on wages that are subject to third-party reporting while withholding and business income and capital gains are often underreported because of their more opaque and complex form (Slemrod, 2019). Black et al. (2022) stresses that structural inequities in the distribution of audits contribute to the growing disparities, as high-income filers increasingly escape scrutiny while lower income earners face higher audit rates due to automated enforcement targeting refundable credits (*see Figure 1*).

Figure 1
IRS Audits on Millionaires Have Plummeted



Note. Source: Marr et al. 2022

Hidden Costs of Compliance

Beyond measurable revenue shortfalls, the U.S. tax system imposes substantial compliance burdens that presents some hidden costs to individuals and firms. These hidden expenses come in the form of labor hours spent preparing the taxes returns, tax consultants' fees, and resources to comply with complicated and changing tax laws. According to Holtzblatt and McGuire (2016), recent tax policy changes have made reporting more complex, particularly to small and medium-sized businesses and sole proprietors, which has magnified the marginal cost of non-compliance and decreased the incentives to accurately and promptly self-report. The economic implications of these burdens are that they divert labor and capital from productive activities.

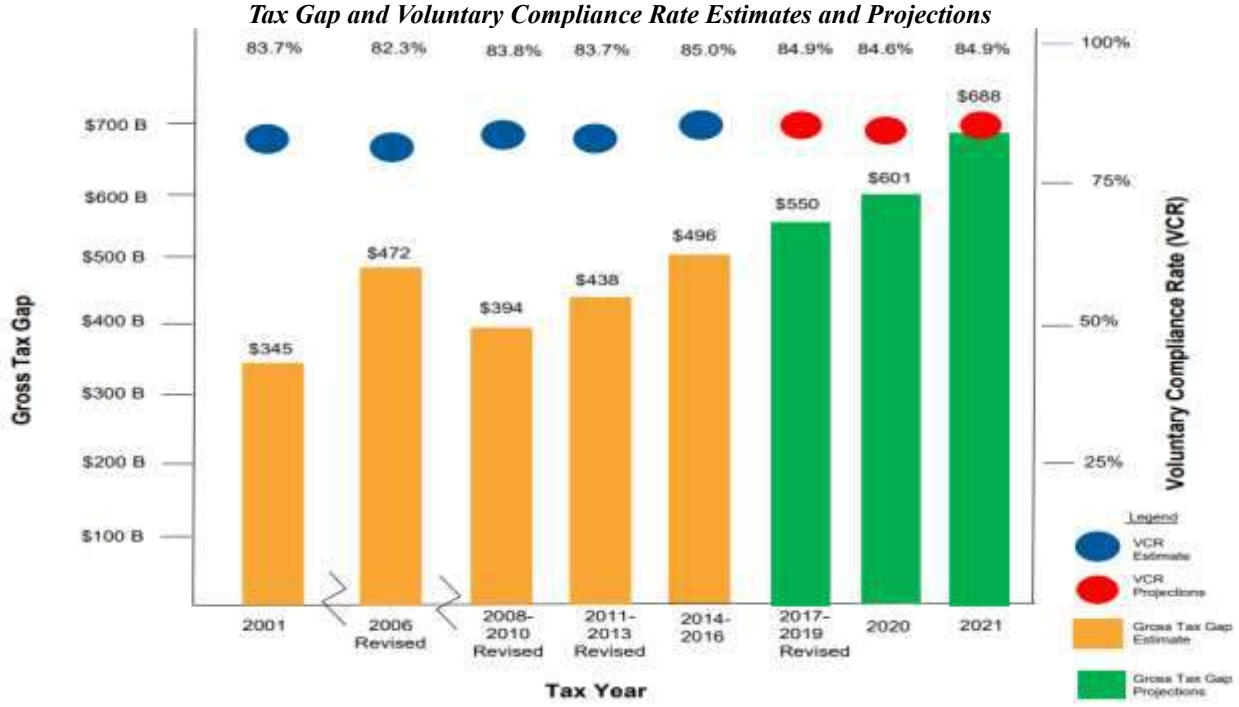
The compliance burden is unevenly distributed across taxpayers, putting those without access to professional tax advice or automated reporting systems at a disadvantage. At the same time, high-income individuals and large corporations can leverage legal expertise in tax planning to minimize tax liabilities while incurring relatively lower compliance costs per dollar of income. These disparities not only reduce administrative efficiency but also undermine perceptions of fairness, thus diminishing voluntary compliance and trust in the system (Holtzblatt & McGuire, 2016; Black et al., 2022). The fall in the rate of audits and enforcement capacity by the IRS, as documented by Marr et al. (2022) and McDermott (2023), also hinders the ability of the IRS to seal these structural gaps. This, in turn, leads to the leakage of revenue, contributing to the chronic underfunding of the public infrastructure (see *Figure 1* above).

Enforcement and Administrative Capacity

The workforce of the Internal Revenue Service (IRS) decreased by more than 20 percent between 2010 and 2018, whereas the number of revenue agents decreased by nearly 30 percent during the same period, even though the number of tax returns filed was on the rise (U.S. Department of the Treasury, 2021). This reduction in IRS resources is believed to have caused a sharp decrease in the number of audits, especially among high-income earners and large corporations, where audit coverage of the millionaires reduced by over 75 percent (Sarin & Summers, 2019). Analysts believe that have repeatedly cited this attrition to years of budgetary shortages and archaic technology that have hampered the IRS in its efforts to identify underreporting, audit complex returns and enhance compliance. The population of the most affluent filers, those who engage in the most extreme tax avoidance behaviors, has become the target of a severely limited enforcement effort (Guyton et al., 2021).

Recent empirical research demonstrates the fiscal returns from bolstering enforcement capacity. Guyton et al. (2021) estimate that the audit of the highest 0.1% of earners generates more than six dollars in revenue per dollar employed, and the effect of randomized audit trials demonstrates long-run compliance effects. Advancements in enforcement analytics, such as machine learning models for risk scoring, are improving targeting efficiency and reducing false positives (Boning et al., 2025). Although analysts believe that new hires and IT upgrades under the Inflation Reduction Act of 2022 will increase audit coverage of high-income earners by a factor of two, they warn that political uncertainty and funding rollbacks will undermine these advances. Although analysts believe that new hires and IT upgrades under the Inflation Reduction Act of 2022 will increase audit coverage of high-income earners by a factor of two, they warn that political uncertainty and funding rollbacks will undermine these advances (Congressional Research Service, 2023). The scholarly consensus emphasizes that a trend of chronic underinvestment in tax collection increases the tax gap and decreases the fiscal space to pursue long-term development goals.

Figure 2.
Tax Gap and Voluntary Compliance Rate Estimates and Projections



Note. Source: Internal Revenue Service, 2023

Impact on Infrastructure Investment

The existing tax compliance gap is worth hundreds of billions of dollars yearly, directly hindering the amount of funding available to support public infrastructure and social investment (U.S. Department of the Treasury, 2021). These unpaid dues amount to substantial foregone revenue to fund the repairs and maintenance work to deal with the aging infrastructure across the country, especially in public transportation, internet, telecommunication, broadband, water, and energy infrastructure. Recent empirical analysis indicates that an increased focus on IRS enforcement and compliance activities can yield significant additional revenue, with reports suggest that closing the gap would create fiscal space large enough to fund significant shares of the federal infrastructure backlog, reducing the need to finance the backlog using deficit financing or cuts to other priorities (Boning et al., 2024; Sarin & Summers, 2019). Furthermore, lack of revenues due to tax noncompliance puts federal governments in a difficult position where they must make tough trade-offs that prioritize short-term mandatory expenditures over long-term capital investments, which highlights the symbiosis between effective tax administration and the sustainability of federal investment plans (Congressional Budget Office, 2020).

In addition to limitations in direct funding, the infrastructure gaps result in longer-term economic implications. Bom and Ligthart (2014) suggest that public capital increases output and productivity; thus, recurring deficits in the supply reduce growth and limit convergence in the living standards of the regions (Bom and Ligthart, 2014). The reliability and soundness of fiscal and regulatory regulations can also influence the involvement of the private sector in the public-private partnership infrastructure market, where better governance systems increase the positive impact of risk distribution on the investment of the private sector (Wang et al., 2019). Some recent policy frameworks, such as those outlined in the U.S. Department of the Treasury (2021), have been based on the estimated IRS enforcement gains, which will be used as revenue offsets. These results emphasize the fact that the tax gap is not merely a revenue problem but a problem of inclusive and future-oriented development.

Key Findings

1. The U.S. tax gap remains a substantial and persistent threat to fiscal health

The amount of gross federal tax gap (difference between taxes owed and taxes collected on time) was roughly 441 billion dollars per year in 2011-2013, and the net gap (after enforcement activities) of 381 billion dollars (McDermott, 2023). Recent IRS estimates and other projections indicate that the gap could now be more than 600 billion dollars a year (as shown in *Figure 2*). Such a constant loss in revenues greatly compromises the capability of the federal government to balance its budgets, fulfill its mandates of providing services to its people, and invest in infrastructure and other capital-intensive projects. The relative stability of the tax gap, even in the face of marginal enforcement, evidences a structural problem in U.S. tax administration.

2. Hidden compliance costs versus economic performance

Besides uncollected tax, the complexity of the U.S. tax code also has significant compliance costs to households, businesses, and even the IRS. According to Fichtner and Feldman (2013), the total of these hidden costs, such as the time spent filing, money paid to tax preparers, and the cost of lobbying to receive favorable treatment, is estimated between 215 billion and 987 billion dollars per year. Such expenditures do not have a direct budgetary impact on federal revenues but are an actual waste of resources and productivity in the economy. The compliance burden can be disproportionately greater on small businesses

and middle-income households, and can be a source of concern with respect to both efficiency and fairness.

Table 1

Average Net Misreporting for Individual Income Tax Filers by Income Level

	Average underreporting percentage
Under $200,000	2.6%
$200,000 under $500,000	4.5%
$500,000 under $1,000,000	6.7%
$1,000,000 under $5,000,000	9.1%
$5,000,000 under $10,000,000	11.1%
$10,000,000 or more	13.9%

Note. Source: Sarin & Summers 2019

3. Erosion of IRS enforcement capacity exacerbates noncompliance and widens inequality

Over the last decade, the IRS has faced declining budgets, staff reductions, and outdated technology systems. According to George (2019), enforcement staff have decreased by 38 percent since 2010, and the level of audits and tax assessments has fallen significantly. Especially, audit coverage of large corporations and high-income earners who engage in most of the underreporting has decreased. This enforcement gap not only allows noncompliance to continue but also lowers the morale of the taxpayers due to the sense of inequality in the tax laws as applied to them. The weakened deterrence effect also causes the gap to remain.

4. Tax compliance shortfalls directly limit federal infrastructure investment capacity

While few studies explicitly quantify the relationship between the tax gap and infrastructure investment in the U.S, the literature implies a direct fiscal trade-off. Washington (2022) notes that the annual net tax gap could fully fund the entire capital outlay of federal infrastructure programs such as the Highway Trust Fund, Amtrak expansion, and broadband access initiatives. Comparatively, the Bipartisan Infrastructure Law (2021) appropriated approximately one-half of the annual tax gap, or about 1.2 trillion dollars over eight years, or 150 billion dollars per year. Hence, better compliance would completely transform the capacity to undertake infrastructure policy without any rise in tax rates.

5. Audit Disparities and Equity in Tax Compliance

New studies, including work by Black et al. (2022), have revealed that low-income earners, particularly those who receive the Earned Income Tax Credit (EITC), are over-audited compared to their wealthier counterparts, as shown in *Table 1*. Part of this is because of automated risk models, which tag easily verifiable income Support claims and overlook sophisticated underreporting by richer individuals and businesses. Such an inverted audit structure is not only a cause of concern regarding vertical equity but can also lead to low compliance of low-income taxpayers based on a sense of unfairness. Moreover, companies that have the resources to navigate tax regulations and take advantage of loopholes are more likely to have an advantage and, therefore, are less likely to be burdened by enforcement, furthering structural inequality as shown in *Figure 3*.

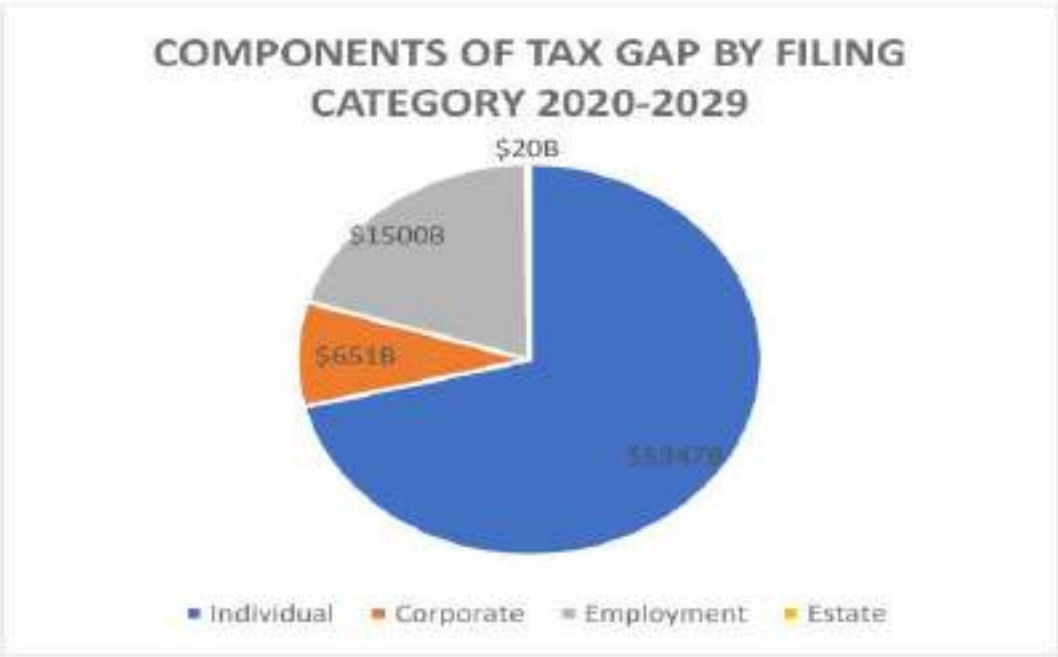
6. There is an urgent need for IRS Systems modernization and policy reform

Despite acknowledgment of the tax gap, the literature stresses that it will take more than incremental funding to reduce the gap sustainably. Investments in artificial intelligence, data analytics, pre-filled returns, and enhanced taxpayer services could modernize the IRS and improve voluntary compliance at a lower administrative cost. Research demands new reforms that would make the tax code less complex, high-risk loopholes closed, and enforcement proportionate and fair. In addition, the quantification of the return on investment of such reforms is a critical research and policy agenda going forward.

7. The effects of inaction are costly in the long term and accumulate annually

Turning a blind eye to the compliance gap will not only lead to a continued loss of revenue and to long-term compounding effects on the formation of public capital, the productivity of the economy, and equity. The annual shortfall in investment in infrastructure would cause depreciation of assets, leading to higher costs of maintenance in the years to come and less economic efficiency. The effects of poor tax compliance are long-term because it goes beyond fiscal parameters to include reduced competitiveness, weak climate resilience, and minimized quality of life for American communities.

Figure 3
2020-2029 Projected Tax Gap by Filing Category



Note. Source: Sarin & Summers 2019

Future Directions and Research Gaps

1. Establishing empirical models that directly link tax compliance improvements to infrastructure investment outcomes

Although multiple sources highlight that the annual tax compliance gap exceeds typical federal infrastructure spending, few empirical models quantitatively map this relationship. There is a pressing need for dynamic fiscal models that simulate how incremental improvements in tax collection, driven by enforcement or administrative reforms, result in expanded capacity for federal infrastructure programs. Such modeling would enable policymakers to estimate opportunity costs and assess fiscal multipliers in infrastructure-specific industries like transportation, energy, water systems, and digital access.

Subsequent studies can draw from the approach to fiscal sustainability modeling adopted by the Congressional Budget Office and the Urban-Brookings Tax Policy Center and apply it to the cases of compliance enforcement and capital investment correlations.

2. Evaluating the cost-effectiveness and return on investment of IRS modernization efforts

Few studies conduct a strong cost-benefit analysis of the investments in the IRS modernization programs, like artificial intelligence, enhanced data analytics, e-filing systems, and enhanced taxpayer service infrastructure. Further development of this research stream would make it possible to quantify the return on each dollar invested in IRS capacity in terms of fiscal returns in terms of resulting voluntary compliance or deterrence. Current reviews are either descriptive or too general and do not have real-time measurement frameworks, which take into consideration behavioral responses by the taxpayers and businesses.

The future research could be based on the simulating frameworks created by the National Taxpayer Advocate or the policy organizations, such as the Tax Foundation, and used with the disaggregated data and sectoral differentiation.

3. Disaggregated analysis of compliance costs by sector and taxpayer type

The existing literature largely presents compliance costs in aggregate form, often based on survey data or modeling assumptions. There is a gap in understanding how compliance burdens differ across industry sectors, income groups, and business sizes. For example, large infrastructure contractors may face disproportionate compliance burdens due to the intersection of federal and state tax codes, while sole proprietors or gig economy workers may struggle with a lack of clarity or access to affordable tax advisory services.

Disaggregated research would also allow the IRS and policymakers to tailor compliance frameworks more closely, streamline rules in high-compliance-cost areas, and better understand how people respond to tax rules behaviorally. and behavioral responses to tax rules.

4. Longitudinal research on taxpayer behavior and deterrence

Although a number of IRS and Treasury reports have made static estimates of noncompliance, there is limited longitudinal research to trace the evolution of taxpayer behavior in response to enforcement, simplification, or information campaigns. Behavioral insights are especially relevant in determining why high-income earners or some business entities continue to be noncompliant and how the perception of the likelihood of audit or fairness in the system would influence compliance choices over time.

A behavioral public finance framework, as advanced by Slemrod (2019), may have greater applicability with IRS administrative data to examine the compliance lifecycle of various taxpayer categories.

5. Investigating equity implications of compliance and audit structures

More recent studies have started to demonstrate how audit algorithms and patterns of enforcement can unwittingly replicate social and racial inequalities. Black et al. (2022) reveal that low-income taxpayers are audited at a higher rate than higher-income taxpayers with a complex return, especially those who claim the Earned Income Tax Credit. Additional studies are needed to learn more about the implications of these enforcement asymmetries on trust and the willingness of taxpayers to comply with the tax system and the perceptions of fairness.

The study should be put in the larger context of distributive justice, with interdisciplinary perspectives of law, sociology, and public administration.

6. Studying taxpayer trust and compliance in the context of public investment outcomes

One relatively unexplored research direction is the role of visible and effective spending of public money on voluntary compliance, with infrastructure as a notable example. International research findings indicate that the existence of perceptions of efficiency and service delivery of the government has effects on tax morale. There is little empirical work in the U.S. context that explores the question of whether taxpayers are willing to pay more taxes when they believe that the taxes they pay are used to make tangible, well-managed investments in transportation, health, and education.

Future research efforts should combine public finance with research on public perception tools, including taxpayer satisfaction surveys, experimental research, and cross-municipal data.

CONCLUSION

The ever-evolving persistence of tax compliance gaps in the United States is indicative of more than just lost tax revenues; it is a structural problem with far-reaching fiscal and economic implications. These deficits undermine the fairness and effectiveness of the tax system, as well as limiting the federal ability to invest in infrastructure that is essential to long-term growth. The problem is compounded by hidden compliance costs, the shrinking enforcement resources of the IRS, and unfairness in the allocation of audits that undermine confidence and place an unfair burden on small businesses and low-income families. The tax gap is not only an issue of collection efficiency, but also one about fiscal capacity, equity, and inclusive growth. Finally, it is worth noting that the revamp and upgrade of IRS systems, increased enforcement against high-income noncompliance, and simplification of tax administration would free up resources that would be used to address substantial infrastructure needs, diminish the use of deficit financing, and strengthen the federal fiscal policy credibility.

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COOPERATIVES BUILD A BETTER WORLD - RURAL TRANSFORMATION THROUGH DIGITALIZATION OF COOPERATIVES IN TAMIL NADU-A STUDY

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ABSTRACT **DOI No: 10.36713/epra23750** **Article DOI: https://doi.org/10.36713/epra23750**

The year 2025, is the International Year of Cooperatives declared by UN. India has placed a strong emphasis on agricultural production, ranking second in the world such as crops rice, fruits, and vegetables after China. Marketing is getting crucial in the field of agricultural products to consumers, selling output, obtaining a fair price, building relationships, and delighting customers. Cooperative society is an organization of group of people with collective responsibilities and thoughts for the development of needy, especially the under-privileged. It is based on the values of the development of agriculture, forestry, banking, credit, agro-processing, storage, marketing, dairying, fishing and housing and its network covers 85 per cent of rural households.The society started the production of value added products like Turmeric powder, Coriander powder, Chilly powder, Sambar powder, Rasam mix powder, Curry masala, Garam masala, Mutton masala, Chicken masala, Ragi powder, Bajji and Bonda mix, Kumkum powder. The Products are sold in the brand name of "Mangalam" at a reasonable price to the consumer throughout the state without any added flavours and colouring. Started sale of products through mobile app.TAPCMS is producing value added products like Ground nut oil, Gingelly Oil, Coconut oil, Turmeric powder, etc., in the brand name of "Arthanareeswara"

Develop their own Website and Mobile App for Digital Market, Tie-up with other popular digital marketing companies, offer online sale to private companies, Governments Supports, Maintain You tube Channel. Cooperatives are facing lot of challenges in the digitalized world. Private and other traders are selling their products at cheaper rate with compromising quality but cooperatives are meant for its quality and have some uniqueness. Some of the challenges are as follows. Less capital base, lack of professional management and lack of interest among the producers.

KEY WORDS: ***Cooperative Society, Marketing, Digital, Mangalam, Arthanareeswara***

INTRODUCTION

The year 2025, is the International Year of Cooperatives declared by UN second time because cooperatives build better world. India is an agricultural country that is directly or indirectly dependent upon the agricultural sector. India has placed a strong emphasis on agricultural production, ranking second in the world such as crops rice, fruits, and vegetables after China. Marketing is getting crucial in the field of agricultural products to consumers, selling output, obtaining a fair price, building relationships, and delighting customers.

Cooperative society is an organization of group of people with collective responsibilities and thoughts for the development of needy, especially the under-privileged. It is based on the values of the development of agriculture, forestry, banking, credit, agro-processing, storage, marketing, dairying, fishing and housing and its network covers 85 per cent of rural households. It occupies a key position in agricultural development with support in resource and input use, harvesting of water resources, marketing channels, storage facilities, distribution channels, value addition, market information and a regular monitoring network system. (*Virendrakumar et.al., 2015*).

Cooperative movement in India since its introduction has been considered more as a product of Government Policy rather than a people's movement. Nevertheless 99% villages and 75% of the rural population in India are serviced by the cooperatives today. It is estimated that there are 5.45 lakh cooperatives functioning with 2.36 crore members and a working capital of Rs. 34,000 crores, that have made significant contribution to the development of institutional infrastructure, formation of private capital, distribution of agricultural inputs, and processing and marketing of the produce, which are the key components of value chain development (*NCUI, 2016*). The Cooperative Marketing Societies also help the farmers in processing, storing and Marketing of Agricultural Produce of the farmer members at remunerative price,

Selling of Agricultural inputs at reasonable price, Issuing Produce Pledge Loan for Agricultural Produce, Processing of Agricultural Produce, Marketing of Value-Added Agricultural Produce. The Structure of Cooperative Marketing Societies in Tamil Nadu is a Two-Tier structure (Govt.of TN Policy Note Cooperation, Food and Consumer Protection Department (2021). With these objectives the Cooperative Marketing Societies are functioning at taluk levels https://vamnicom.gov.in/uploads/files/5520.pdf.

Digital Agricultural Information for Farmers

The Government of India is taking series of activities to boom the agricultural sector towards food security and doubling the farmer's income. One among is PM Kissan Scheme in which they provide Rs.6000 per year in three instalments for all eligible farmers in the country. This is very big scheme implemented across the county. To increase the agricultural output and to clarify the doubts regarding farming practices, marketing information the Government have introduces Agrimarket mobile app. Another one is related to Crop insurance related information can get through Crop insurance mobile app in which all the agricultural related information is available. In Tamil Nadu. The Government introduced Uzhavan mobile app for the purpose of agricultural related information.

This study focuses on two different cooperatives took initiatives for digital marketing their products namely

Erode and Trichengode Cooperative Marketing Societies in Tamil Nadu in addition to that The Government of Tamil Nadu introduced Coop Bazaar mobile app combining together collection of all other cooperative products under one app.

Digital Marketing under Agricultural Cooperative: Value-Added Products

Cooperative marketing societies are functioning in Tamil Nadu producing value -added products in their brand name and distributed across the State. The very popular Cooperative Marketing Societies are Erode and Trichengode Cooperative Marketing Societies are introducing various value-added products and started marketing digitally it is welcoming initiatives under cooperatives.

The Erode Agricultural Producers Cooperative Marketing Society

Turmeric private commission on mandis where there and the farmers were not given importance to sell their products at reasonable price. Commission agents ruled over the entire turmeric market and prices offered was not affordable. So the farmers belongs to erode taluk area started a new cooperative society to sell their produce. Thiru.S.K.Paramasivam Ex. M.P., a veteran Cooperator organized the Erode Agricultural Producers Cooperative Marketing Society Ltd on 31st January 1960 and commenced its business from 29th June 1960 onwards

The prime Objective of this Mangalammasala is to providingValuable quality products to the consumer in reasonable prices and also providing reasonable price to the farmer members of the cooperative societies to their produce.**www.mangalammasala.com** is the first compressive online shopping website for value added product of cooperative societies in Tamil Nadu. The Flavors of South India wrapped with joint hands of care and quality. This Society bring heritage to your home. Experience on rich taste of cooperation from the soils of erode through The Erode Agricultural Producers Cooperative Marketing Society. The Raw materials of spices, masala, grocery, millets and oils are directly procured from the farmer's members of the concern co-operative societies. The society started the production of value-added products like Turmeric powder, Coriander powder, Chilly powder, Sambar powder, Rasam mix powder, Curry masala, Garam masala, Mutton masala, Chicken masala, Ragi powder, Bajji and Bonda mix, Kumkum powder. The Products are sold in the brand name of **"Mangalam"** at a reasonable price to the consumer throughout the state without any added flavours and colouring. Started sale of products through mobile app.

The Society has entered an agreement with IFFCO Kishan Sanchar Ltd for masala sales throughout the Country. As per the agreement Erode APCMS will be marketed by IKSL throughout India in the name "SWARNAHAR".

The Tiruchengode Agricultural Producers Cooperative Marketing Society Ltd

In order to eliminate the monopoly roles and to control the middlemen and cut-throating competitors between the line of production and sales, The Tiruchengode Agricultural Producers Cooperative Marketing Society Ltd., (TAPCMS Ltd.,) Tiruchengode is started on 30.4.1930 at the foot hill of Lord Arthanareeswara having registered on 16.04.1930 to give up liftment to the farmers and other agricultural members. Since inception, the TCMS has been working very successfully and profitably in its business operation by rendering more and more (required and essential) services to its member farmers. In addition, it is acting as an exemplary society in the field of agricultural marketing in India. Thus, it is regards as TCMS Model. The TCMS model-need to be adopted by other APMCSs through establishing coordination and amalgamation with TCMS (Suresh 2019). TAPCMS is producing value added products like Ground nut oil, Gingelly Oil, Coconut oil, Turmeric powder, etc., in the brand name of "Arthanareeswara" (Rajamanickam. N, 2021)

Turmeric Grinding unit was established at head office on 19.10.2018, with financial assistance of Rs. 15.50 lakh Under National Agricultural Development Programme 2016-17(NADP). **"Arthanareeswara"** brand turmeric powder produced from quality turmeric which is procured from auction.

The Society manufactures quality products such as Cocount Oil, Gingelly Oil and Groundnut oil, under a reputed Brand Name **"Arthanareeswara"** and sells them to cooperatives, agricultural members and Public at a reasonable price.

Urid and Thoor dhal are procured from Cooperative Marketing Societies and Market Committee. Processed pulses are selling through various sales section of society and other cooperative institutions with brand name of **"Arthanareeswara"**.

Quality paddy varieties like ponni, are being purchased from regulated market comittee, Gingee and grinds them and sells the **"Arthanareeswara"** brand of rice through various sales section of society and other cooperative institutions.

The Society is crushing the neem seeds through its unit and produces the Neem Seed Powder and sells the same through its head office, branches and other Cooperative Institutions. **"Arthanareeswara"** Neem Seed Powder produced from quality neem seeds, which is a natural fertilizer and insect repellent.
Pure Coconut oil handmade soap produced and sold in the name of **Arthanareeswara"** Brand

Coop Bazaar
The Department of Cooperation has introduced a mobile app called 'Coop bazaar' through which consumers can purchase grocery items including hill products such as pepper, honey and spices produced by cooperative societies across the state. As many as 64 products which include cooking oil, honey, coconut oil, pepper, gingelly oil, groundnut, coffee powder, turmeric powder, and others will be made available through the app during the first phase. "Black pepper from Kolli Hills and natural honey extracted from Sathyamangalam forest are now accessible to residents of Chennai. Until now, these products were primarily purchased by city dwellers only during tours.

Additionally, about 20 types of high-value fertilizers have been introduced for sale. Urban consumers can purchase them for their home gardens or rooftop gardens," an official from the cooperative department said. The Cooperative department has tied up with a few partners for delivery of these products. Payment can be done via UPI and credit/debit cards. The products are from cooperative societies in Erode, Thiruchengodu, Salem, Pollachi and Kolli Hills. The Tamil Nadu Cooperative Marketing Federation (TANFED), a state-level apex body, acted as coordinator for developing the app.

Under the Digital India initiative, the government has prioritized transparency and ensured that beneficiaries receive their entitled benefits. Speaking at the 17th Indian Cooperative Congress held in New Delhi's Pragati Maidan on the International Day of Cooperatives, Prime Minister Narendra Modi emphasized the need for the cooperative sector to serve as a model of transparent and corruption-free governance. "For this, digital systems should be promoted in the cooperative sector," he said.

The event, centered around the theme 'Amrit Kaal: Prosperity through Cooperation for a Vibrant India,' witnessed the Prime Minister launching e-commerce portals for cooperative marketing, as well as a portal for cooperative extension and advisory services.

As India is known in the world for its digital transactions, Modi urged the cooperative societies and banks to stay ahead when it comes to digital transactions. It will increase transparency and efficiency in the market while also enabling better competition. During the Amrit Kaal, the role of the cooperative sector in the growth of villages and farmers is going to be big. "Sarkar and Sahkaar (Government and cooperative) will together provide double strength to the dream of the Viksit Bharat".

Based on the above said background this study is aimed at the Opportunities available for cooperatives under digital marketing and assess the challenges before cooperatives.

Opportunities for Digital Marketing
There are lot of scope for marketing value-added products through online. Cooperative brands are very popular among the consumers for their quality products. Those who prefer quality definitely will go for cooperative brand. Some of the opportunities are as follows.

Develop their own Website and Mobile App for Digital Market
The interested marketing societies can take risk for digital marketing of their products. Develop their own websites list all available products with MRP also develop mobile app which very simple and cost-effective chances are more to reach maximum consumers. Which will increase the volume sales and reach ultimate consumers.

Tie-up with other popular digital marketing companies
The Cooperative marketing societies can tie-up with other popular digital marketing companies for marketing their products it is another cost-effective method of marketing product. **Offer online sale to private companies**

The marketing cooperatives can offer online sale not only to customers but also to the traders having good and reputed companies having interested in cooperative products. This another opportunity before cooperatives.

Governments Supports
Governments both the Central and State are very much helpful to cooperatives at present. After establishing a separate ministry for Cooperation by Central Govt. the cooperatives got very good momentum by establishing computerization process – e-commerce portal for Cooperative marketing and so on. The other side Tamil Nadu State Govt. have supported by establishing Coop Bazzar Mobile app in which all kind of cooperative value-added products available.

Maintain You tube Channel
The cooperative value-added products societies can develop and maintain YouTube channel to make reach and attract in online consumers. Further Make popularize cooperative brand through Facebook, email marketing can be done for existing consumers. Now a day's smart phone users are more so, give advertisement through smartphone it will reach more customers.

Challenges before Cooperatives under digital marketing
Cooperatives are facing lot of challenges in the digitalized world. Private and other traders are selling their products at cheaper rate with compromising quality but cooperatives are meant for its quality and have some uniqueness. Some of the challenges are as follows. Less capital base, lack of professional management and lack of interest among the producers.

CONCLUSION
Cooperatives all over the world have become an effective and potential instrument of economic development. Further the

Cooperative marketing societies are very much useful to farmers for getting good and reasonable price. So, they have lot of scope for marketing their products through digitally with Governments supports and guidance.

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THE EFFECT OF DIGITAL LEADERSHIP AND ORGANIZATIONAL CULTURE ON EMPLOYEE INNOVATION WITH TECHNOLOGY READINESS AS AN INTERVENING VARIABLE

(A Case Study at Sarwodadi Makmur Abadi Outsourcing Company in Semarang)

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ABSTRACT

Digital transformation requires organizations to have digital leadership, an adaptive organizational culture, and technological readiness to encourage employee innovation. This study aims to analyze the influence of digital leadership and organizational culture on employee innovation with technological readiness as a mediating variable. The research method uses a quantitative approach with Structural Equation Modeling-Partial Least Squares (SEM-PLS) analysis technique. The results show that digital leadership has a significant positive effect on technological readiness and employee innovation. Organizational culture has a significant effect on technological readiness, but its direct effect on employee innovation is only marginally significant. Furthermore, technological readiness is proven to have a significant effect on employee innovation, while also mediating the relationship between digital leadership and organizational culture with employee innovation. These findings confirm that technological readiness is an important factor that bridges the role of digital leadership and organizational culture in driving employee innovation in the digital era. digital leadership, organizational culture, employee innovation, technological readiness.

KEYWORDS: ***Digital Leadership, Organizational Culture, Employee Innovation, Technological Readiness.***

INTRODUCTION

The development of digital technology in the era of the Fourth Industrial Revolution and towards Society 5.0 has brought about major changes in almost all sectors of life, including the world of business and organizations. Companies are faced with the demand to adapt to the acceleration of digitalization, which not only affects the way goods and services are produced and distributed, but also changes work patterns, organizational structures, and even the characteristics of human resources. Ultimately, digital transformation is inevitable and must be managed with the right leadership strategies and a supportive organizational culture.

In this context, digital leadership has become a strategic necessity. Digital leaders are required to be able to integrate technology into daily management practices, guide employees to be more open to change, and become role models in the use of technology. Previous research shows that digital leadership contributes positively to organizational performance, particularly through the mediation of intellectual capital and innovation (Juvika, 2023). Additionally, Laelawati (2024) emphasizes the importance of the role of digital leaders in building a culture of innovation that ultimately impacts human resource management. Thus, it can be said that digital leadership styles have direct and indirect implications for employee innovation.

In addition to leadership factors, organizational culture also has a significant influence in creating an innovative work climate. Organizational culture is a set of values, beliefs, and norms shared by members of the organization, which shape patterns of behavior at work. An adaptive, consistent, mission-oriented organizational culture with employee engagement can be a powerful driver of innovation (Denison et al., 2020). Research by Cameron & Quinn (2011)also confirms that an organizational culture that emphasizes learning and creativity can help companies cope with dynamic external environmental changes. Without a supportive organizational culture, employee innovation is difficult to achieve even if leadership is adaptive to the digital era.

However, recent research shows that the influence of digital leadership and organizational culture on innovation is not always direct. There are mediating factors that strengthen this

relationship, one of which is technological readiness. Technology readiness is defined as the level of readiness of individuals or organizations to accept and use new technologies to improve efficiency, effectiveness, and competitiveness (Parasuraman & Colby, 2015). This concept covers four dimensions, namely optimism, innovation, discomfort, and insecurity. Research by Nguyen & Hsieh (2022)shows that a high level of technology readiness is closely related to an organization's ability to innovate, while Alsabawy & Cater-Steel (2021) found that low technology readiness is actually a major obstacle to the implementation of digital transformation in organizations.

In practice, many companies face challenges in the form of a gap between digital leadership policies and the technological readiness of employees. Leaders may have encouraged digitization, but if employees feel unprepared—whether due to limited knowledge, skills, or attitudes toward technology—innovation will be difficult to achieve. Conversely, when companies succeed in building an organizational culture that supports learning and improves technological readiness, employees will be more confident in creating new ideas, developing creative solutions, and applying them in their work. This is in line with the findings of Shanker & Bhanugopan, (2020)that organizational support and employee psychological readiness have a significant effect on innovative work behavior.

This context is particularly relevant for Sarwodadi Makmur Abadi Semarang Outsourcing Company, which operates in the service sector with a primary focus on labor. As an outsourcing company, the quality of services provided to clients is highly dependent on the competence, responsiveness, and innovation of its employees. Amidst increasing demands for digitalization, outsourcing companies are required to be able to adapt to market needs, such as the use of information systems, digital applications, and technology-based services. Without visionary leadership, a flexible organizational culture, and employee technological readiness, companies risk falling behind in competition.

Based on this description, this study focuses on the influence of digital leadership and organizational culture on employee innovation with technological readiness as an intervening variable. Theoretically, this study aims to strengthen the literature on the relationship between leadership style, organizational culture, technological readiness, and employee innovation. Meanwhile, in practical terms, this study is expected to contribute to companies in designing more adaptive leadership and organizational culture strategies, while also increasing employee technological readiness so that innovation can be realized optimally. Thus, this study seeks to address both academic and practical needs, as well as fill the research gap regarding the role of technological readiness in strengthening the relationship between digital leadership, organizational culture, and employee innovation in the era of digital transformation.

LITERATURE REVIEW

2.1 Digital Leadership

Digital leadership reflects a leader's ability to respond to technological changes by building innovative strategies, strengthening teamwork, and ensuring that the organization remains adaptive to digital developments and market changes (Sagung & Sri, 2020). Leaders in the digital era are required not only to encourage technology adoption but also to inspire employees to embrace transformation and maximize the use of digital tools to improve performance (Kiefer et al., 2021). Brett (2020) emphasizes the importance of long-term vision, human resource empowerment, flexible mindsets, continuous evaluation, and dynamic leadership structures. Additionally, according to Sheninger (2014), digital leadership requires the creation of a collaborative and strategic learning culture through the use of technology. In various sectors, digital leaders need to have digital intelligence, high adaptability, and data-driven decision-making so that organizations can continue to grow (Erhan et al., 2022; Zhong, 2017; Sağbaş & Erdoğan, 2022; Budiman et al., 2022) (Budiman, 2021).

Digital leadership can be measured through several dimensions and indicators. Wesly in Saputra & Saputra (2020:99) states that there are two dimensions of digital leadership, namely:

1) 1) Digital Attitude

Digital attitude is a leader's and employees' view of the digital technology used by a company to assist in company activities.

a. Adapting to new technology learning.
b. Implementation of new technology.
c. Experience with new technology.
d. Teamwork.
e. Sharing technological knowledge.

2) Leadership Skills

Leadership skills are the ability of a leader to provide direction to employees within a company in order to pursue a shared vision and mission in the digital era.

a. Formulating the company's vision and mission.
b. Data-driven decision making.
c. Comfort in the uncertainty of the digital era.
d. Being a role model for employees.
e. Retaining and managing employees.

The dimensions and indicators of digital leadership are derived from the theory of Van Wart et al., (2019), which states that there are six dimensions of digital leadership, namely:

1) *Digital* Communication Skills
   a. Clarity of communication
   b. Lack of miscommunication
   c. Communication Flow Management
2) *Digital Social* Skills
   a. Good leadership support
3) *Digital* Team Building Skills
   a. Team motivation
   b. Team responsibility
   c. Recognition of team members and the team.
4) *Digital Change Management* Skills
   a. Change management
5) *Digital Technological* Skills
   a. Cost adjustment based on IT.
   b. Combining traditional and digital methods
   c. Digital technology expertise
   d. Digital technology security
6) *Digital Trust*worth*iness*
   a. Trust in the social environment
   b. Work-life balance
   c. Diversity Management.

The indicators in this study are as follows:

1. Digital Communication Skills
2. Digital Social Skills
3. Digital Team Building Skills

4. Change Management Skills
5. Digital Technology Skills
6. Digital Trust

2.2 Organizational Culture

Organizational culture is a fundamental aspect of every institution, defining the shared values, beliefs, and behaviors that shape how members interact and work together. Organizational culture influences organizational effectiveness, employee satisfaction, and overall success. Various experts have provided definitions of organizational culture, each emphasizing different aspects of this complex phenomenon.

Organizational culture is a set of values, beliefs, norms, and practices that develop within an organization and guide the behavior of its members. This culture is shaped by the organization's history, leadership, and patterns of interaction between individuals, and plays an important role in shaping employee performance and loyalty (Schein, 2010; Hartnell et al., 2021). A strong organizational culture that is aligned with the company's vision and mission can create a conducive work environment, encourage productivity, and strengthen cohesion among team members (Cameron & Quinn, 2021). According to Denison et al., (2020), the four main dimensions of organizational culture that influence organizational performance are as follows:

1. involvement, which refers to the extent to which employees are involved and empowered in the organization.
2. Consistency highlights the importance of shared values, agreements, and strong coordination and integration systems.
3. Adaptability refers to an organization's ability to respond to external changes, innovate, and take risks.
4. Mission represents the direction and goals of the organization. The mission ensures alignment between the long-term vision and day-to-day operations.

A culture oriented towards learning and innovation, for example, has been shown to encourage an increase in an organization's ability to adapt to changes in the external environment. In the context of organizations undergoing digital transformation, a flexible and innovation-supportive organizational culture is essential for organizations to remain competitive and survive in a dynamic market (Alvesson & Sveningsson, 2020) . The indicators of organizational culture in this study are:

1. Engagement
2. Consistency
3. Adaptability
4. Mission

2.3 Employee Innovation

Employee innovation is the ability of individuals within a company to generate new ideas, improve work processes, or implement creative solutions that have a positive impact on organizational performance. These innovative ideas can come from various levels, ranging from daily activities to the development of new products or services. Amidst disruption and digital transformation, employee innovation has become an important factor in increasing the competitiveness and survival of companies (Anderson et al., 2023)

Based on recent research, factors such as transformational leadership, a corporate culture that supports creativity, and employee empowerment are highly influential in driving innovation (Yuan & Woodman, 2020). When employees feel psychologically secure, supported by their superiors, and given room to experiment, they are more likely to generate innovative ideas and solutions that can improve work efficiency and quality (Shanker & Bhanugopan, 2020). In addition, the use of digital technology also enables faster collaboration and access to information, thereby strengthening employees' ability to innovate (Susanti & Prasetyo, 2021). A work environment that is flexible to change and appreciates new ideas increases employee engagement and intrinsic motivation to innovate. Therefore, companies that want to survive in the midst of fierce business competition need to create a work climate that supports innovation as part of a sustainable human resource management strategy (Chen, 2006). According to Jong & Hartog, (2010), the indicators of innovative work behavior are as follows:

a. Idea Exploration
   Employees are able to identify opportunities or problems within the company and then create new ideas to solve these problems.
b. Developing ideas (Idea Generation)
   Employees are able to develop ideas that have been created and introduce these ideas for new processes to their colleagues.
c. Seeking support for ideas (Idea Championing)
   Employees are encouraged to seek support for the ideas they have developed in order to bring these new innovations to fruition.
d. Implementing ideas (Idea Implementation)
   Employees have the courage to implement these new ideas into the company's usual work processes.

2.4 Technology Readiness

Technology readiness is the level of readiness of individuals or organizations to accept and use new technologies to improve efficiency, effectiveness, and competitiveness. This concept was introduced by Parasuraman through the Technology Readiness Index (TRI) model, which measures four main dimensions: optimism, innovation, discomfort, and insecurity. Technology readiness is important in the context of digital transformation because it determines how quickly and effectively technology can be adopted by human resources within an organization (Nguyen & Hsieh, 2022).

In an organizational context, technological readiness is closely related to digital culture, technology training, managerial support, and adequate digital infrastructure. A high level of technological readiness encourages innovation, the adoption of new systems, and data- -based decision-making (Nguyen & Hsieh, 2022). Research shows that organizations with high technological readiness are better able to cope with technological change and adapt more quickly to digital disruption, particularly in the public service, education, and manufacturing sectors (Alsabawy & Cater-Steel, 2021).

The existence of technological readiness as an intervening variable is reinforced by various studies showing that the

implementation of technological systems and digitalization in organizations cannot only be done through one-way policies, but through a combination of strong digital leadership and an adaptive organizational culture. For example, Nugroho Y., (2020) found that the implementation of banking digitalization directly increases employee effectiveness and productivity, which certainly requires technological readiness as a basic skill. Thus, this readiness becomes a link between leadership policies and organizational culture towards tangible outputs in the form of employee work innovation. Innovation here includes creative ideas to improve business processes, services, and the development of new products and services.

According to TRI Parasuraman & Colby, (2015), the indicators of technological readiness are as follows:

1. Optimism
2. Innovativeness
3. Discomfort
4. Insecurity

2.5 Relationship Between Variables

2.5.1 The Influence of Digital Leadership on Employee Innovation

Digital leadership plays an important role in creating an innovative work environment. Leaders with digital competencies are able to encourage employees to adapt to technological changes, provide the necessary resources, and set an example in the application of new technologies. According to transformational leadership theory (Bass & Avolio, 1994), visionary leaders can motivate their followers to transcend personal interests and contribute to organizational goals, including through innovative behavior.

Juvika, (2023) research shows that digital transformational leadership has a positive effect on organizational innovation through the mediating role of intellectual capital. Similar results were shown by (Fadhlan et al., 2022), who found that digital leadership can improve innovation management and company competitiveness. Thus, digital leadership theoretically and empirically has a significant effect on employee innovation.

2.5.2 The Influence of Organizational Culture on Employee Innovation

Organizational culture is one of the internal factors that greatly determines the level of employee creativity and innovation. According to Denison's (1990) organizational culture theory, the dimensions of involvement, consistency, adaptability, and mission have a direct influence on innovative behavior. An inclusive work environment that is open to new ideas and provides space for employees to experiment will strengthen their confidence in innovating.

Research by Yuan & Woodman, (2020) confirms that an organizational culture that supports employee creativity can improve the quality and quantity of innovation. Cameron & Quinn (2021) also found that a culture based on learning and flexibility improves organizational adaptation to external changes. Thus, a healthy organizational culture is the foundation for employee innovation.

2.5.3 The Influence of Digital Leadership on Technological Readiness

Digital leadership not only encourages innovation but also influences employees' readiness to use technology. Leaders who provide training, guidance, and digital infrastructure support will increase employees' confidence in using new technologies. This is in line with the Technology Acceptance Model (Davis, 1989) theory, which emphasizes that perceptions of technology's ease and usefulness influence attitudes toward technology acceptance. Research by Van Wart et al., (2019) reveals that digital leaders who have communication, change management, and technological skills are able to increase employee digital readiness. Nguyen et al. (2022) add that organizations with strong digital leadership tend to have higher levels of technological readiness, which ultimately accelerates digital transformation.

2.5.4 The Influence of Organizational Culture on Technological Readiness

An organizational culture that supports learning, adaptability, and collaboration will make it easier for employees to accept and use new technologies. The Learning Organization theory proposed by Senge, (1990) states that organizations that emphasize continuous learning are better prepared to face change, including in terms of technology implementation.

Denison et al. (2020) emphasize that a culture of adaptability is key to keeping organizations competitive in the digital age. Alvesson & Sveningsson (2020) also found that companies with a flexible culture adapt more quickly to digitalization. Therefore, organizational culture plays an important role in building employee technological readiness.

2.5.5 The Influence of Technological Readiness on Employee Innovation

Technological readiness is an individual and organizational factor that is directly related to the ability to innovate. The Technology Readiness Index model (Parasuraman & Colby, 2015) shows that optimism and a tendency to innovate encourage individuals to utilize technology, which then facilitates the emergence of new ideas. Conversely, discomfort and distrust of technology can be barriers to innovation.

Research by Alsabawy & Cater-Steel, (2021)proves that a high level of technological readiness increases the success of digital-based innovation. Shanker & Bhanugopan, (2020) also state that employees who are confident in using technology are more likely to engage in innovative work behavior. This shows that technological readiness is an important prerequisite for innovation in the digital age.

2.5.6 The Influence of Digital Leadership on Employee Innovation Through Technological Readiness as an Intervening Variable

The relationship between digital leadership and innovation is often mediated by technological readiness. This means that digital leaders can effectively encourage innovation if employees already have skills and a positive attitude toward technology. This mediation theory is in line with *the Resource-Based View* (Barney, 1991) , which states that internal resources such as technological competence serve as a link between leadership strategy and competitive advantage.

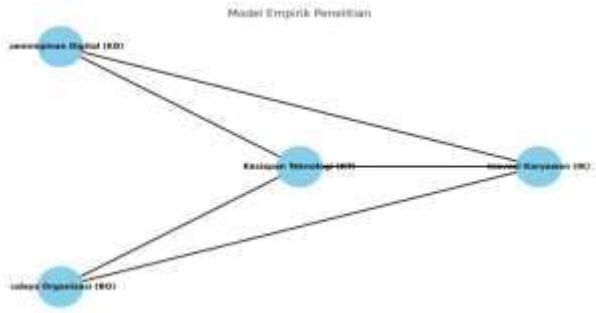
Nguyen et al. (2022) show that digital leadership increases technological readiness, which then has a positive effect on innovation. Thus, technological readiness functions as an intervening variable that strengthens the relationship between digital leadership and employee innovation.

2.5.7 The Influence of Organizational Culture on Technological Readiness for Employee Innovation Through Technological Readiness as an Intervening Variable

An organizational culture that supports change and learning can also increase technological readiness, which in turn encourages innovation. Within the framework of *Innovation Diffusion Theory* (Rogers, 2003), an innovative organizational culture creates an environment conducive to technology adoption, thereby accelerating the birth of innovation.

Puspitadewi's (2019) research found that the implementation of banking digitalization is only successful if it is supported by employee technological readiness, which is influenced by organizational culture. This reinforces the view that organizational culture not only has a direct effect on innovation but also plays a role through technological readiness as a mediator. This section can be reinforced with an empirical model diagram (conceptual framework/hypothesis) that visualizes the direction of the relationship between variables.

The empirical model of this study is constructed based on a review of theory and previous research results. Digital Leadership and Organizational Culture are positioned as exogenous variables that are assumed to influence Employee Innovation both directly and indirectly. Technological Readiness is placed as a mediating variable because, in the context of digital transformation, the influence of leadership and culture on innovation is highly dependent on the extent to which employees are ready to accept, master, and utilize technology.



RESEARCH METHODS

This study uses an explanatory quantitative approach with the aim of testing the influence of digital leadership and organizational culture on employee innovation with technological readiness as an intervening variable at the Sarwodadi Makmur Abadi Semarang Outsourcing Company. The research population consisted of all employees, with the sample determined using purposive sampling based on the criterion of a minimum of one year of service, so that the number of respondents met the requirements for Structural Equation Modeling–Partial Least Squares (SEM-PLS) analysis, which is at least five to ten times the number of indicators used (Hair et al., 2019). Data were collected through a five-point Likert scale questionnaire, which was compiled based on theoretical indicators: digital leadership was measured through communication skills, social skills, team building, change management, technological skills, and digital trust (Van Wart et al., 2019) ; organizational culture through engagement, consistency, adaptability, and mission (Denison et al., 2020); employee innovation through idea exploration, idea development, support seeking, idea implementation, and idea implementation (Jong & Hartog, 2010); and technological readiness through optimism, innovation, discomfort, and distrust (Parasuraman & Colby, 2015). Data analysis was conducted with SEM-PLS using SmartPLS because it is capable of testing structural models with relatively small sample sizes and non-parametric data distributions. Model evaluation included testing the validity and reliability of constructs in the outer model, as well as testing the relationships between latent variables through R^2 values, path coefficients, and bootstrapping significance tests in the inner model. Based on a review of the literature, this study formulates seven main hypotheses that examine the direct influence of digital leadership and organizational culture on employee innovation, the influence of both on technological readiness, and the mediating role of technological readiness in strengthening the relationship between digital leadership and organizational culture with employee innovation. This section can be reinforced with an empirical model diagram (conceptual framework/hypothesis) that visualizes the direction of the relationship between variables.

RESULTS AND DISCUSSION

Descriptive Analysis

1. Outer Model Test

The outer model test shows that all indicators have a loading factor value above 0.70, with Composite Reliability (CR) greater than 0.70 and Average Variance Extracted (AVE) greater than 0.50. This means that all constructs meet the requirements of convergent validity and reliability. Thus, the instruments used are suitable for measuring the research constructs.

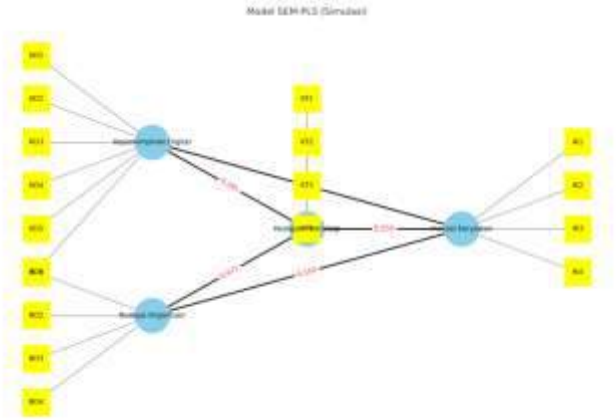
2. Inner Model Test

The inner model analysis results show that Digital Leadership and Organizational Culture can explain 35.5% of the variance in Technology Readiness, while the combination of these exogenous variables and Technology Readiness can explain 24.0% of the variance in Employee Innovation. Furthermore, the bootstrapping results show that most of the paths are significantly influential, except for the influence of Organizational Culture on Employee Innovation, which is only marginally significant. A summary of the tests can be seen in Table 1.

Table 1. Path Coefficients Test Results

Relationship	Coefficient (β)	t-stat	p-value	Description
KT ← KD	0.291	4.458	0.000	Significant
KT ← BO	0.471	6.438	0.000	Significant
IK ← KT	0.255	2.303	0.021	Significant
IK ← KD	0.188	2.268	0.023	Significant
IK ← BO	0.155	1.866	0.062	Marginal

In addition, the estimation results are also visualized in the SEM-PLS path diagram in Figure 1.



Discussion

The results of this study provide a number of important findings regarding the role of digital leadership and organizational culture in encouraging employee innovation through technological readiness. First, the analysis shows that Digital Leadership has a significant positive effect on Technological Readiness. This finding indicates that a leadership style that is able to utilize digital technology effectively will increase employee confidence and readiness to use technology in their daily activities. Van Wart et al. (2019) emphasize that digital leadership encompasses communication skills, technological mastery, change management, and digital trust. Leaders who are able to master these dimensions will be more successful in guiding employees in facing technological disruption.

Second, Organizational Culture has been proven to have a significant effect on Technology Readiness. These results are consistent with the framework proposed by Denison et al. (2020), which explains that an organizational culture characterized by engagement, consistency, adaptability, and a clear mission can increase an organization's responsiveness to technological change. In this context, an adaptive culture will encourage employees to be more open to system updates, digital work methods, and technology-based innovations. In other words, without a supportive culture, digital transformation tends to encounter resistance, even if digital leadership is already well established.

The next finding is that Technological Readiness has a significant effect on Employee Innovation. This shows that the higher the level of employee readiness in using technology, the greater their tendency to generate, develop, and implement new ideas. These results support the findings of Parasuraman & Colby (2015), which confirm that technological readiness is not only related to technical skills but also includes optimism, personal innovation, and a positive attitude towards technology adoption. With this readiness, employees feel more confident to explore innovation-oriented ideas.

In addition, this study found that Digital Leadership has a direct effect on Employee Innovation. This means that leaders who are able to integrate digital technology into the leadership process not only increase employee readiness but also directly encourage their innovative spirit. This is in line with Yukl, (2013) research, which explains that transformational and digital leadership can arouse intrinsic motivation, increase a sense of ownership of work, and stimulate innovative behavior. Digitally-oriented leaders are able to set an example, build a collaborative work climate, and provide space for employees to be creative.

Meanwhile, Organizational Culture toward Employee Innovation only shows a marginal influence. Although the relationship is positive, its statistical significance is weak. This indicates that organizational culture is more effective in encouraging innovation when mediated by technological readiness. These findings reinforce the argument that innovation in the digital era cannot rely solely on cultural values but requires the technical and psychological readiness of employees to adopt new technologies (Hadi, 2020). Thus, the role of technological readiness as a mediator becomes very important.

Overall, the results of this study confirm that technological readiness is a key variable that bridges the influence of digital leadership and organizational culture on employee innovation. This is consistent with the employee innovation theory proposed by De Jong & Den Hartog (2010), which emphasizes that innovation is the result of interactions between individual factors, leadership, and the organizational environment. In this study, leadership and culture factors were found to have a stronger influence on innovation when employees had adequate technological readiness.

The practical implication of these findings is that organizations, especially those engaged in outsourcing such as PT Sarwodadi Makmur Abadi Semarang, need to pay attention to two main things: first, strengthening digital leadership competencies at the managerial level; and second, building an organizational culture that is adaptive to technological changes. Both of these efforts must be directed at increasing employee technological readiness, both in terms of technical skills and mental attitudes towards digital innovation. If these three factors are managed synergistically, the opportunity for sustainable innovation in the workplace will be greater

Conclusion

This study aims to analyze the influence of digital leadership and organizational culture on employee innovation with technological readiness as a mediating variable. Based on the results of the analysis using SEM-PLS, several main conclusions were obtained. First, digital leadership was found to have a significant positive effect on both technological readiness and employee innovation. This shows that leaders with digital competencies are able to encourage employees to be better prepared to face

technological change while also increasing their innovative behavior.

Second, organizational culture has a significant positive effect on technological readiness, confirming that an adaptive and consistent organizational culture can strengthen employees' readiness to face digital transformation. However, the direct effect of organizational culture on employee innovation is only marginally significant, so that the role of culture is stronger when mediated by technological readiness.

Third, technological readiness has a significant influence on employee innovation. Employee readiness in utilizing technology has proven to be a determining factor that enables them to create, develop, and implement new ideas in the workplace.

Overall, the results of this study confirm that technological readiness plays an important mediating role in the relationship between digital leadership and organizational culture with employee innovation. Thus, the success of an organization in driving innovation depends not only on leadership and culture, but also on the readiness of employees to adopt technology that is relevant to the demands of the digital age.

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