The Moderating Role of SME Owner Age in the Relationship between Technological Compatibility and SME Performance in Tanzania

Sophia Mbura
The Open University of Tanzania
E-mail address: sophia.mbura@out.ac.tz.
DOI: ……

Abstract
This quantitative study aimed to determine the moderating influence of SME owner age on the relationship between technological compatibility and SME performance in Tanzania covering Dar es Salaam, Dodoma, Arusha, Mwanza, and Zanzibar regions. An explanatory research design was used, and systematic random sampling was employed to select the sample. The researcher collected primary data by using questionnaires through a survey strategy. A sample of 204 respondents was used for primary data analysis, using the structural equation modeling (CB-SEM) technique through AMOS version 23. Results indicated a positive effect of technological compatibility on SME performance ($\beta = 0.30$, $p < 0.05$), confirming that technological compatibility positively influences SME performance and, thus, is considered an important factor in SME performance in terms of technological adoption and usage. Furthermore, the findings of an indirect relationship, suggesting that the link between technological compatibility and SME performance is moderated by SME owner age ($\beta = 0.97$, $p < 0.05$), indicating that the effect of compatibility on performance differs across SME owner age groups. This study made a significant contribution by expanding innovation adoption research through the assessment SME owner age as a moderating variable, improving the explanatory power of the model of technological compatibility and SME performance. Practically, SMEs should consider the SME demographic profiles in addition to technological compatibility when implementing existing and new technologies resulting to improve sales growth, service delivery, customer satisfaction and ultimately enhance overall SME performance.

Keywords: *SME performance, Technological compatibility, Innovation Diffusion Theory, Demographic factors.*

INTRODUCTION

Small and medium-sized enterprises are a crucial source of economic development, job creation, and enhancement of innovation worldwide. Small and medium-sized enterprises (SME) performance is determined by the implementation of managerial strategies and new technological innovations. Rogers (2003), in his theory of Diffusion of Innovation (DOI), stated that compatibility is one of the factors that significantly affect the adoption of innovations, leading to SME performance. Compatibility ensures that innovation line with business culture, procedures, and the market environment. Empirical research on innovation adoption in African business shows that the adoption of technology greatly boosts competitiveness and SME performance when the technology is thought to be compatible and simple to integrate (Momanyi *et al.*, 2025). Bautista and Lin (2021) defined compatibility as the degree to which technological innovation is consistent with prior experiences, needs, and potential adopters' values. Thus, DOI provides a framework to explain the link between technological compatibility and SME performance.

Currently, SMEs struggle to enhance and maintain performance amid rapid technological change and a competitive market environment, driven by customer switching expectations, rapid digitalisation, and the expansion of rivalry (Purnomo, 2023). Hence, compatibility of technology, particularly e-marketing, drives sustainable SMEs' competitiveness and viability. In additions, the market environment should emphasise the efficient use of technology, focusing on robust infrastructure and current operational procedures (Soelaiman *et al.*, 2023). Dimoso and Utonga (2024) indicated that SME financial performance, and overall competitiveness are strongly related to technological compatibility. Specifically, SME performance can be improved through the successful implementation of various technological innovations. In line with this, SMEs should rely on compatible technology tailored to their organisational context and infrastructure (Purnomo, 2023). Moreover, high compatibility of technological adoption reduces firms' uncertainty and the cost of learning. Thus, increase efficiency, customer involvement, and market response contribute to SME performance (Duan et al., 2024). Hence, the compatibility factor is important in technology adoption, enhancing SME performance.

Despite the fact that the literature has shown that several studies on technological adoption have been conducted in the field of SMEs, there is

scarce information on how technological compatibility relates to SME performance in developing countries, particularly in Tanzania's environment (Alsuwaidi & Alshurideh, 2024; Msuya *et al.*, 2017). However, the present study sought to expand the literature by assessing the effect of technology compatibility on SME performance, examining both direct and indirect relationship. There is still a remaining gap in the available literature, as most previous studies have mainly investigated the direct relationship between age and technology adoption, while other past studies have assessed SME owner age and SME performance, with limited studies on the integration of innovation adoption practices such as technological compatibility, demographic variables, and SME performance. There is also empirical evidence that suggests age contributes to the extent to which technological compatibility influences firm performance (Dimoso and Utonga, 2024).

According to Amiri et al. (2024), age can be an important factor in strengthening the adoption and usage of new technology, leading to the improvement of firm performance. Although previous studies have established the positive influence of technological compatibility on organizational performance, little empirical evidence explains whether this relationship differs across SME owner demographic characteristics in developing economies. Age characteristics may alter SME owners willingness to interact with digital technologies, thereby affecting the returns that SMEs could gain from technology adoption. This unresolved issue provides the rationale for conducting the present study.

The study conducted by Olubiyi (2022) has shown a positive relationship between technological compatibility and SME performance in developing countries, but the study did not consider the moderating role of demographic characteristics such as age in the analysis, which could moderate such a relationship. Therefore, this provided a solid ground for the present research to test the relationship between technological compatibility and SME performance through the moderating role of SME owner age.

The current study focused on supermarkets located in different regions of Tanzania which dealing with retail business managed by owners of different demographic profiles. Supermarkets are a suitable context in assessing the technological compatibility and SME performance relationship since they greatly depend on technologies in their day-to-day operations, including transactions, customer service, inventory

management, and supplier management (Levy *et al.*, 2019), affirming that technological compatibility is a significant factor in business success. The supermarkets can also be assessed utilizing both financial and non-financial indicators. Hence, the present study aimed at examining the relationship between technological compatibility and SME performance under the moderating role of SME owner age based on limited literature, especially in developing countries. Thus, the study contributed to the body of knowledge of existing Tanzania SME literature by introducing the role of SME Owner age in moderating the link between technological compatibility and SME performance. Practically, the compatibility of technology in Tanzania SME is geared to improve operational efficiency, organizational performance, and service quality, and thereby increase the growth of SME and Tanzania nation economy as well.

LITERATURE REVIEW

Technological Compatibility and SME Performance

The theory of diffusion of innovation regarded compatibility as one of the variables that is very different from the others, as it focuses on the psychological and social fit of an innovation rather than only practical performance (Rogers, 2003). Based on the perspective of Diffusion of Innovations (DOI) theory, technological compatibility decreases the disruption related in adopting an innovation and promotes its use and acceptance. In the case of technological solutions that suit existing operations, SMEs can implement them more effectively, which can enhance service delivery, operational efficiency, and productivity, as a result of improved business performance (Rogers, 2003). Recent research has also started to assess compatibility more directly in association with SME performance; for example, a recent study of Huang and Liu (2024) indicated a significant positive relationship between technological compatibility and SME performance.

The study sought to determine the impact of digital content service fit with internal systems and customer interfaces on efficiency under regulatory constraints. The study is based on a quantitative analysis methodology to obtain the results. The study findings suggested that technological compatibility is positively associated with business performance. The findings were similar to the results of Smith et al. (2018). Both studies by Huang and Liu (2024) and Smith et al. (2018) examined technological compatibility and firm performance but differed in their sector focus. Huang and Liu (2024) studied employees of gas companies, while Smith et al. (2018) focused on the energy sector;

however, differences in organisational culture between the two companies limit validation of the findings.

Nevertheless, in South Korea, Nguyen and Tran (2018) argued that technological compatibility in its own right is not a predictor of firm performance effectively, so the study stressed considering user readiness and organisational support to benefit from technological adoption. Generally, the study's findings imply that technological compatibility relates to business performance, which could be adopted temporarily unless additional factors are introduced. However, the study focused on developed countries, while the present study was conducted in a developing country context and considers additional variables in the relationship to extend the literature.

Furthermore, the study by Mairura *et al.* (2016) in Nairobi, Kenya, examined the adoption of new technology by micro and small businesses and its relationship with financial performance. A questionnaire was used to collect data from 129 car mechanics working in an urban business environment. The data were analysed using the regression analysis technique. The findings indicated that technology adoption through compatibility is significantly associated with the performance of micro and small businesses. The findings proposed that micro and small businesses should focus on technologies that are considered simple to use, given the available expertise and tools.

The findings of Mairura *et al.* (2016) are consistent with the findings of Bautista and Lin (2021), which widen the empirical literature that technological compatibility enhances business performance. Although both Mairura et al. (2016) and Bautista and Lin (2021) linked technological compatibility to technology adoption, the studies differ in geographical contexts. The study of Mairura et al. (2016) was conducted in an emerging economy with inadequate sophisticated equipment, whereas the study of Bautista and Lin (2021) was conducted in the USA with an advanced level of technology; because of the variations, it is difficult to generalise the research findings.

The findings of Rajaguru and Matanda (2019) and Srimarut and Mekhum (2020) supported the findings by indicating the positive relationship between firm performance and technological compatibility. However, the study’s findings are limited to the Tanzanian business environment with similar business environment challenges, including scarce resources, poor

infrastructure, and limited technological capabilities, to name a few. The study also fails to test additional variables, such as demographic profiles, that may be associated with technological compatibility and business performance.

Furthermore, the study is based on the automobile sector, whereas the current study has focused on another sector, the SME supermarket, to broaden the literature. Consequently, there is a need for further research on how technological compatibility directly affects SME performance in Tanzania. Therefore, based on the empirical literature review of many studies that found consistent findings of the relationship between technological compatibility and business performance, the present study puts forward the following hypothesis:

H1: Technological compatibility has a positive and significant influence on SME performance in Tanzania.

Interplay Between SME Owner Age, Technological Compatibility, and SME Performance

Drawing on DOI theory, the degree to which an innovation is considered compatible with existing procedures may change with different levels individuals' experience and orientation of technology (Rogers, 2003). SME owners with young and old age may consequently differ in their learning preferences, technological experience and readiness to incorporate technological compatibility into business practices, potentially modifying the extent to which technological compatibility transforms performance. Therefore, SME owner age is theoretically placed as a contextual factor that may moderate the compatibility–performance relationship (Alsuwaidi & Alshurideh, 2024: Rogers, 2003).

Based on empirical research findings, technological compatibility improves the performance of SME by increasing operational efficiency, lowering operational costs, and providing better service (Mairura *et al.*, 2016; Hayes *et al.*, 2015; Ismail, 2024). However, many researchers disregard the integration of SME owner-related factors that could influence firm performance. According to the research conducted by Sharma *et al.* (2022), SME owners' ages contribute to technology responsiveness, usage patterns, and perceptions. SME owner age influences the degree to which technological compatibility contributes to SME performance (Belenzon *et al.*, 2019).

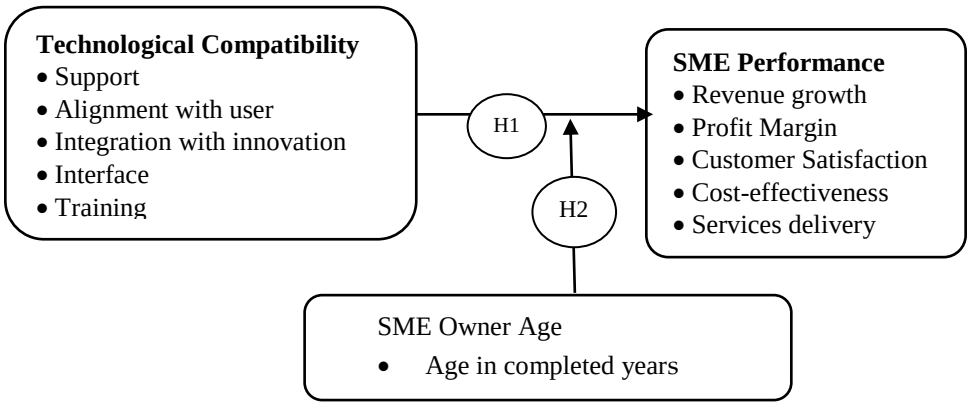
SME owners with a younger age are normally exhibiting higher technological compatibility adoption than SME owners with an older age (Sharma *et al.*, 2022). Young-age SME owners demonstrate greater ability to align with technology strategies and readiness for innovation, enabling them to invest in technological compatibility more efficiently, leading to SME performance (Alsuwaidi & Alshurideh, 2024). Nonetheless, the empirical literature indicated that the incorporation of SME owner age as a moderating variable may help reduce a significant part of the unexplained variance in the link between technological compatibility and SME performance, therefore increasing the explanatory power of the model. Therefore, the inclusion of SME owner age as a moderating variable in the current study is justifiable as there remains a clear empirical gap regarding the conditional effect of SME owner age on the compatibility-performance link. Hence, the following hypothesis is put forward:

H2: SME owner age has positive and significant moderating effect on the relationship between technological compatibility and SME performance in Tanzania.

Conceptual Framework

The conceptual framework depicts the proposed relationship between technological compatibility and SME performance. Additionally, it demonstrates how SME owner age may act as a moderator between technological compatibility and SME performance based on a literature review and the formulation of hypotheses. Thus, Figure1 demonstrates the relationship between the study variables.

Figure 1:
Conceptual Framework of the Study



METHODOLOGY

Research Design, Philosophy, and Study Area

This study employed an explanatory research design, collecting primary data from SMEs in five commercial regions in Tanzania using a structured questionnaire and a self-administered method. The research area was chosen because it is strategically significant to Tanzania's retail SME business sector, particularly supermarkets in Dar es Salaam, Dodoma, Arusha, Mwanza, and Zanzibar, which are expanding rapidly. Moreover, the research area have a considerable number of retail SMEs and actively use technology (Msuya *et al.*, 2017). Nevertheless, the SME sector is characterized by retail-oriented businesses comprises of SME owner age diversity varying with technological compatibility.

Population, Sample Size, and Sampling Procedures

The study's population comprised supermarket SME owners with a total of 316 supermarkets obtained from Tanzanian municipal and regional business records and business directory listings in 2025. The sampling frame comprised an approved list of 315 supermarkets obtained from reliable business registration records, including the Tanzania Revenue Authority, supported by pertinent regional trade offices in the particular regions. The SME sector is characterized by SME owner age diversity and different levels of technological compatibility related to business performance. The researcher concentrated on supermarket SME owners because of their direct involvement in decision-making on technology adoption and performance evaluation; thus, supermarket owners serve as both the unit of analysis and the unit of inquiry. The study involved a systematic random sampling technique to select a sample from the targeted population. The sample of size 210 supermarkets was determined by using the Yamane formula of 1967 (n = N/ (1+N (e) 2) to provide a suitable sample size required in the analysis.

Data Collection and Measurement of the Variables

The primary data were collected by a validated structured questionnaire adopted from previous research instruments. The researcher distributed 210 questionnaires to supermarket owners and collected 204 filled questionnaires through a self-administered method, and applied the drop-and-collect approach, which is very common for its ability to attain good response rates in studies involving many respondents. The researcher measured the dependent variable, the SME performance (SMEP), by using five indicator items, including revenue growth (SMEP1), profit margin (SMEP2), customer satisfaction (SMEP3), cost-effectiveness

(SMEP4), and service delivery (SMEP5) based on Rooh *et al.* (2023). The independent variable, technological compatibility (TC), was also measured by five indicators, such as support (TC1), alignment with the user (TC2), integration with innovation (TC3), interface (TC4), and training (TC5), obtained from Mensah *et al.* (2023). The indicator items were measured by using five Likert scale where respondents rated every indicator item ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Disagree nor Agree, 4 = Agree, and 5 = Strongly Agree. Nevertheless, SME Owner Age (SOA), a moderating variable, was measured as a continuous variable based on respondents' chronological age in completed years.

Common Method Variance

Based on the fact, the same respondents participated in the data collection applied the same structured questionnaire and all variables come from one questionnaire, it was important to check the presence of common method variance (CMV), which could bias the statistical relationships among constructs (Rubenstein et al., 2025). Common method bias in this study was assessed using Harman's single-factor test. The first factor explained less than 50% of total variance, suggesting that common method bias was unlikely to threaten the validity of the findings.

Data Analysis

The data analysis included descriptive statistics using IBM SPSS software version 20 and inferential statistics employed structural equation modeling (CB-SEM) utilising IBM Amos software version 23. CB-SEM was used because of its ability to assess the measurement model and the structural model simultaneously, ensuring that the latent constructs are valid and reliable before testing the hypothesized relationships (Hox & Bechger, 2014). On top of that, CB-SEM accounts for measurement error when assessing moderation effects, thus leading to more accurate estimation results compared to the traditional analytical techniques such as regression (Hair *et al.*, 2020).

The descriptive statistics indicated frequencies and percentages of respondents' demographic characteristics, as recommended by (Pallant, 2020). The study considered data screening procedures such as checking for missing data, outliers, and SEM assumptions before the commencement of the real data analysis to enhance the accuracy and suitability of the data. The missing data were checked by list-wise deletion of the case. The outliers were also checked using boxplots, and

normality assumption was examined by skewness and kurtosis to ensure the data are normally distributed. Furthermore, the linearity was assessed by using bivariate scatter plots. Explanatory factor analysis (EFA) was conducted to examine the underlying factor structure of the measurement items.

After that, the analysis proceeded with the two steps for conducting the SEM analysis. The first step, the measurement model (CFA) was performed to ensure indicator items measure their corresponding constructs based on model fit indices and factor loading before the analysis of the structural model. Following that, internal consistency reliability was assessed by utilizing Cronbach's Alpha value (α) and the composite reliability (CR). The convergent validity was examined through average variance extracted (AVE), while discriminant validity was assessed using the Fornell-Larcker criterion.

The second step, SEM, analyzed both the direct and indirect relationships between technological compatibility and SME performance by assessing the path coefficients, critical ratio values, and p-values. Based on the fact that the study focused on the interaction effect moderation analysis, an interaction term was then created. The multiplication of SME owner age (SOA) and technological compatibility (TC) yielded a new variable called TC_SOA (interaction variable) used during the analysis.

Ethical Approval

The study was conducted based on the permission of Presidents Office-Regional Administration and Local Government (PO-RALG) with reference No. AB.309/343/01/146, that oversee all the field work. The study was also carried out with permission and support of the respective Regional Trade Offices in the five study areas whereby respondent's voluntary participation, verbal and written consent were maintained in the study. The respondents were clearly assured about data confidentiality in the sense that the data were considered as anonymous in the publication to protect their personal identity and opinions. There was no the actual ethical approval issued by Institutional Review Board rather than the research permission granted by PO-RALG.

RESULTS AND DISCUSSION

The age of respondents was considered significant factor in respondents' profiles when determining the influence of technological compatibility on SME performance. The results indicated that 10.3% of the 204

respondents were between 20 and 29 years old, followed by 43.6% between 30 and 39. The results also indicated that 30.1% were between the ages of 40 and 49, and 16% were 50 years of age and above. The majority of respondents (43.6%) were aged 30 to 39, a range usually associated with high levels of productivity and energy and representing the most economically engaged demographic (Pervan et al., 2017). These results imply that the information obtained from the respondents is comprehensive and pertinent, providing a strong basis for deriving meaningful conclusions and making informed decisions.

In this study, missing data were checked by using list-wise deletion of the case through IBM SPSS version 20 to detect missing data for the independent and dependent variables. The results indicated that all variables had no more than 5% missing data. According to Kline (2018), missing data of more than 5% may lead to wrong estimates during the analysis of the models. So obtained results of missing data suggested that the dataset can be used in further analysis to produce quality output.

However, the study considers checking for outliers as suggested by Osborne and Overbay in 2004, because if outliers are unchecked and improperly addressed, they may provide biased results leading to invalid conclusions. The checking of outliers through visual inspection of boxplots indicated that no outliers were identified because all the observations employed during the structural model were restricted to a measurement scale with a range from 1 to 5, which, in a great case minimize the chances of the observations falling outside the predefined ranges.
The study also tested the SEM assumptions before performing the SEM analysis to ensure appropriate results. Normality was checked by skewness and kurtosis to ensure the normal distribution of the data. After calculating the skewness and kurtosis of the variables, the results were 0.142 for skewness and 0.283 for kurtosis. The normal distribution of data was confirmed based on the fact that both values substantially fall within the acceptable range of ±3 as recommended by Tabachnick and Fidell (2013).

According to Hair *et al.* (2020), the linearity of data is usually considered as one of the assumptions in SEM analysis. If left undressed, non-linear data can seriously impair any inferential statistics. This study investigated the linearity of data through the examination of bivariate scatterplots. An

examination of the bivariate scatterplots between the study variables indicated no serious noncompliance with the linearity assumption.

The explanatory factor analysis (EFA) simplifies and improves variable dimensions with the use of factor loading and the design of one-dimensional measurement scales (Pallant, 2020). EFA was performed by using principal axis factoring with varimax rotation to investigate the underlying structure of the 10 indicator items including TC1 = Support, TC2= Alignment with user, TC3 = Integration with innovation, TC4 = Interface, TC5 = Training cater for independent variable and SMEP1 = Revenue growth, SMEP2 = Profit Margin, SMEP3 = Customer Satisfaction, SMEP4 = Cost-effectiveness, SMEP5 = Services deliver for dependent variable. One item from technological compatibility, which is TC2, resulted in low factor loading in relation to its factor, attaining a coefficient of 0.408, below the predetermined cutoff point of 0.5 coefficient. Therefore, the item was not considered for further analysis. The removal of TC2 was appropriate, as supported by Hair *et al.* (2020), who stated that a factor should have at least three retained items loading onto it, so for this case, the researcher re-ran the EFA in order to obtain the correct output. TC had 4 retained items, and SMEP, with 5 items, qualified for subsequent analyses as indicated in Table 1.

Table1:
Exploratory Factor Analysis Results

	Component	
	1	**2**
SMEP2	.704	
SMEP4	.675	
SMEP5	.618	
SMEP1	.609	
SMEP3	.570	
TC3		.678
TC5		.559
TC1		.507
TC4		.593

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

a. Rotation converged in 6 iterations.

Measurement Model

A confirmatory factor analysis (CFA) was performed to assess the measurement model with 9 items. The results of factor analysis indicated that two items (TC5 = 0.402 and SEMP1=0.36) possessed factor loadings

below the threshold of 0.5. These items were removed consecutively depending on their low loadings and insufficient theoretical contribution. After deletion of each item, the measurement model was re-run to achieve the required cutoff point for factor loadings of above 0.5 and significant at $p \leq 0.05$ with an acceptable range of ≥ 1.96 for critical ratio. The model also exhibited an acceptable fit to the data based on the following fit indices: CMIN/DF = 2.485, GFI = 0.981, AGFI = 0.942, CFI = 0.990, RMSEA = 0.069. The obtained values were acceptable thresholds as recommended by Awang *et al.* (2015), implying that the model satisfactorily explained the relationships between the observed variables.

Validity and Reliability Assessment Results

The researcher inspected validity and reliability issues prior to the structural model analysis and hypotheses testing as emphasized by Kline (2011). Internal consistency reliability was examined through Cronbach's Alpha, while the Composite reliability was assessed by CR values. Every construct falls within the acceptable thresholds for $\alpha > 0.70$ and CR > 0.70. For instance, the technological compatibility has shown $\alpha = 0.835$ and CR = 0.896, and SME performance indicated $\alpha = 0.848$ and CR= 0.932 as seen in Table 2. These results exhibited an acceptable degree of internal consistency among the scales and affirmed that the constructs are appropriate to produce quality outcomes.

Convergent validity is established through the statistical significance of each indicator loading in the measurement model, as suggested by Hox and Bechger (2014). Average Variance Extracted (AVE) was utilized to examine convergent validity. AVE values should be 0.5 and above, as recommended by Fornell and Larcker (1981) for convergent validity to be established. Convergent validity was satisfactorily established in this study, where the AVE values ranged from 0.563 to 0.642, which were within the acceptable thresholds indicated in Table 4, thus promoting the success of the SEM analysis results.

Table 2:
Reliability and Convergent Validity Results

Construct	Cronbach's Alpha	CR	AVE
TC	0.835	0.896	0.563
SMEP	0.848	0.932	0.642

Discriminant validity is regarded as the extent to which a measure of a construct focuses on what it is supposed to measure and not on other

constructs, and it was confirmed using the Fornell–Larcker criterion. According to Fornell and Larcker (1981), the discriminant validity was established by comparing the square root of the average variance extracted (AVE) and the correlation of latent constructs, where AVE values should be higher than the squared correlation values. The results showed that the discriminant validity for all items was achieved in the model, with AVE values for each construct indicated in bold exceeding the squared correlation value for all sets of constructs, as shown in Table 3, confirming that the constructs were distinct in the model and their measures are not correlated with other constructs.

Table 3:
Discriminant Validity Results

Construct	TC	SMEP
TC	**0.714**	
SMEP	0.574	**0.723**

Structural model

The study tested the direct relationship between technological compatibility and SME performance using structural model analysis, employing AMOS version 23. It was hypothesized that:

H1: Technological compatibility has a positive and significant influence on SME performance in Tanzania.

The results of the structural model revealed a positive and significant relationship between technological compatibility and SME performance. The results of this hypothesis indicated that technological compatibility is positively related to SME performance ($\gamma = 0.296$; C.R = 3.067; $p = 0.003$), implying that when technological compatibility increases by 1 standard deviation, SME performance increases by 0.296 standard deviations. Therefore, the study indicated that a greater level of technological compatibility would lead to a higher level of SME performance. Thus, H1 was supported as indicated in Table 4. These findings are consistent with the findings obtained by Bautista and Lin (2021) that there is a positive relationship between firm performance and technology compatibility.

The significant results of TC on the effect of SMEP reveal that the dimensions of TC, including organizational support (TC1), such as the provision of important resources to staff and managerial support, contributed to the SMEP. Integration with innovation (TC3) is regarded

as the degree to which an organization is capable of seamlessly applying new technologies or innovations to its existing operational systems. The capability of successful integration of innovations or technology into business operations is a crucial factor of performance, since it may influence SME to have sustainable competitiveness, minimize cost, and improve service quality (Srimarut and Mekhum, 2020).

The interface to technologies (TC4) is also considered the extent to which new technologies or innovations are in line with and correspond to the existing operational system of the SME. This study shows that the interface between new technology and existing systems has a significant effect on the effective implementation of technology and enhances SME performance.

Table 4:
Technology Compatibility and SME Performance SEM Results

Path	Estimate	S.E.	C.R.	P	Standardized Estimates	Results
SMEP<---TC	.198	.052	3.067	.003	.296	Supported
TC4<---TC	1.000				.818	Fixed
TC1<---TC	1.453	.581	13.183	***	.921	Significant
TC3<---TC	1.086	.824	12.852	.011	.867	Significant

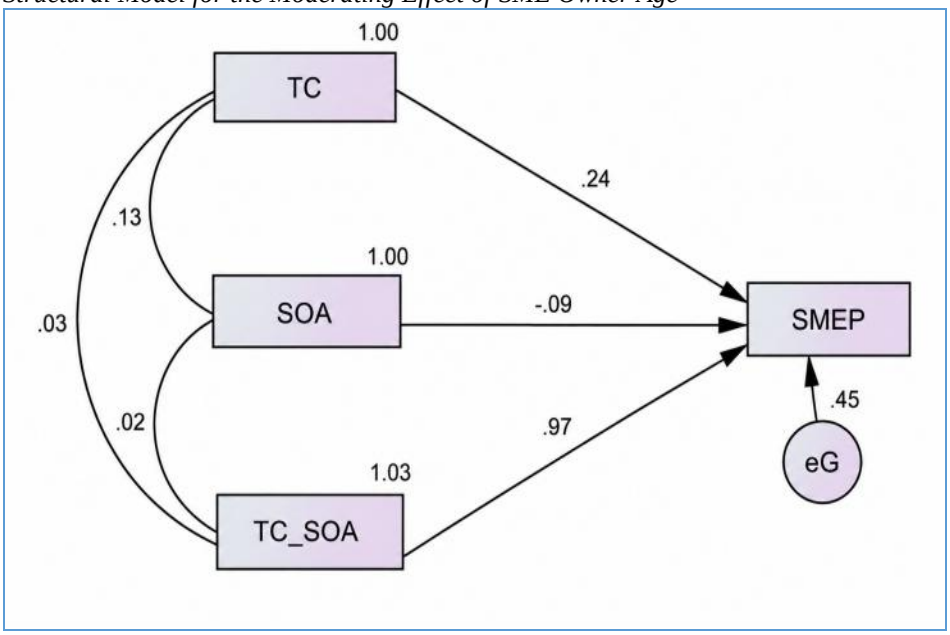
Furthermore, the indirect relationship between the technological compatibility and SME performance using the moderating role of SME Owner Age was lastly performed. The study put out the following hypothesis in order to confirm the moderating effects of SME Owner Age (SOA) on the relationship between technological compatibility (TC) and SME performance (SMEP).

H2: SME Owner Age has positive and significant moderating effect on the relationship between technological compatibility and SME performance in Tanzania.

In the first place, an interaction term was created, which is SOA_TC, to form a new variable in testing the moderating effect of SME Owner Age in the relationship between TC and SEMP. After that, SEM was used to examine the moderating effects of variables using the interaction term (SOA_TC). The results revealed that the path from TC to SMEP indicated a significant relationship between the variables (γ= 0.237; C.R= 7.067; *p*= 0.000), implying that TC is a crucial factor in predicting SMEP.

However, the results also indicated that the path of SOA and SMEP has an insignificant relationship (γ= -0.086; C.R= -.267; *p*= 0.48), expressing that SOA independently could not contribute a significant change to SMEP. The estimated results are indicated in Fig. 2.

Figure 2:
Structural Model for the Moderating Effect of SME Owner Age



Additionally, the moderating effect of TC_SOA indicated a significant effect on SEMP (γ= 0.974; C.R= 14.302; *p*= 0.000). This shows that SOA significantly moderates the relationship between TC and SEMP. Alternatively, it can be explained that SME performance is improved at the point where the SME owner age is compatible with technological benefits (Dimoso and Utonga, 2024; Venkatesh et al., 2016). In the application of the interaction term, there was an adjustment to the relationship between TC and SEMP, which is considered statistically significant. These results affirm that SME owner age (SOA) moderates the relationship between technological compatibility (TC) and the SME performance (SMEP) in Tanzania Supermarket-SMEs. The estimates of TC_SOA on SEMP indicated in Table 5 were within the acceptable threshold and thus confirmed the significant effect of the moderation.

According to Hair *et al.* (2020), the standardized path coefficient (γ) should be at least 0.2 in order to be considered significant and lead to

meaningful discussion. Similarly, Hox and Bechger (2014) stated that a relationship that yielded a critical ratio greater than 1.96 and a p-value less than 0.05 is considered to be significant. All these criteria were met to justify the significance level as indicated in Table 5; hence, based on the study findings, H2 was supported.

Table 5:
Moderation Analysis Results

Path	Estimate	S.E.	C.R.	P	Standardized Estimates	Results
SMEP<---TC	.197	.053	7.067	***	.237	Supported
SMEP<---SOA	-.086	.062	-.267	.483	-.086	Insignificant
SMEP<---TC_SOA	1.653	.050	14.302	***	.974	Significant

The significant moderation results reported in the present study are consistent with Rogers's (2003) findings, which asserted that demographic characteristics, such as age, influence the adoption of innovation in business when applied with other predictors. SME owners of older age are more interested in technologies that are compatible with existing behaviour, as they are normally consistent, stable, and reliable. Similar results were supported by Ainin et al. (2021) and Dwivedi et al. (2023) that the relationship between technological compatibility and SME performance can be moderated so as to increase the strength of the relationship. The findings are also aligned with those findings of Oliveira et al. (2023), who argued that SME owners react more positively to technologies that are consistent with their past experiences and easy to use, resulting in an increase in SME performance.

CONCLUSION AND IMPLICATIONS

Conclusion

The study concluded that there is a positive and significant relationship between technological compatibility and SME performance, particularly in supermarket SMEs. Thus, alignment with technology improves SME performance through increasing in sales, enhanced service delivery, and customer satisfaction. This proposes that the great compatibility signifies technological innovation to stakeholders such as employees, business partners, and customers, and is likely to improve SME performance. For example organisation that supports technology adoption through provision of adequate financial resources, effective training programs, and a good culture may promote constant learning and adaptive environments. The study also concluded that empirical literature related

to the present study shows that support (TC1), integration with innovation (TC3), and interface (TC4) are the significant dimensions of compatibility that may influence SME performance.

Additionally, the study concluded that SME owner age has insignificant relationship with SME performance, implying that the age of SME owners alone is not a contributing factor to SME performance. The study has drawn further conclusion that SME owner age moderates the relationship between technological compatibility and SME performance. Based on the significant moderation effect, business companies should consider the SME demographic profile in addition to internal technological compatibility when implementing existing and new technologies.

Theoretical Implications

This study enhances the explanatory power of innovation diffusion theory by testing technological compatibility as one of its core dimensions against SME performance under moderating role of SME owner age which was under researched in Tanzania context. The significant moderating effect of SME owner age improves the theoretical understanding of the relationship between technological compatibility and SME performance by indicating that the effect of technological compatibility is relying on SME owner characteristics. This implies that technology adoption theories should take into account SME owner age as a valuable contextual factor that contributing the translation of technological compatibility into SME performance. The finding therefore enhances the usability of technology adoption opinions to SMEs by incorporating demographic variables into the illumination of technological based performance results.

Practical Implications

The study provides practical direction for supermarket owners, managers and employees in the supermarket sector and other service organisations. The findings indicate that technological compatibility should be incorporated into organisational plans and operational strategies to improve SME performance. SME owners should also highlight and address challenges that may restricts the contribution of technological compatibility to the performance.

Significantly, since SME owner age moderates the technological compatibility-performance relationship, supermarket- SME owners and

managers should reliase strategies that focus on age-sensitive technology, making sure that technology adoption and implementation are supported by suitable user support, training and operational methods. Instead of basing only on technological compatibility, managers should match technology with business mission, operational efficiency and managerial capabilities to accelerate its effect to performance.

Limitations and Future Research

Even though this study offered significant contribution to the body of knowledge, but there is presence of the few limitations. First, the study based on a cross-sectional research survey, which limits the power to achieve causal relationships between the variables. Based on the fact that the collection of the data was done once in one point, the long-term solid relationships between technological compatibility, SME owner age and SME performance remain unsubstantiated. Future research should use longitudinal survey technique to establish long-term effect of technological compatibility on SME performance changes over the period of time. Second, this study is focused on age of the respondents among the other demographic characteristics thus future studies should consider other moderating variables from the demographic factors, including gender and education, in order to expand knowledge on the relationship between technological compatibility and SME performance.

Third, the study was conducted only in the supermarket-SME sector in Tanzania, which may restrict the generalisability of the findings to other sectors and geographical context. Future researchers are advised to repeat the study in different service industries such as banking, telecommunication and insurance of other countries to increase validity of the findings.

Contribution of the Study

This study made a significant contribution to the literature of technological adoption in the following ways. First, instead of focusing on only technology adoption goals, it expands innovation adoption research by assessing technological compatibility as a factor that improves SME performance. Second, it brings in SME owner age as a moderating variable, improving the explanatory power of the model of technological compatibility and SME performance. Third, it contributes to the scant literature on technology adoption that improves SME performance in developing country contexts by enhancing empirical data for Tanzanian SMEs. The improvement of SME performance will

contribute to the growth of the national economy and thereby improve the standard of living of the citizens.

REFERENCES

Ainin, S., Naqshbandi, M. M., Dezdar, S., & Rezaei, J. (2021). Impact of mobile commerce adoption on SMEs performance: The moderating role of age and experience**.** *Journal of Business Research***,** *124*, 613–623. https://doi.org/10.1007 /s11135-015-0244-7.

Alsuwaidi, M., & Alshurideh, M. (2024). Contextual the technological factors that impact the performance of small and medium enterprises (SMEs) in the UAE. Uncertain Supply Chain Management, 12(4), 2869-2880. https://doi.org/10.5267/ j.uscm.2024.4.016

Amiri, A. M., Kushwaha, B. P., & Mishra, A. (2024). Extending the reach of small to medium enterprises through new-age marketing technologies: Drivers of adoption and their impact on business performance. *International Journal of Technoentrepreneurship, 5*(1), 26–48. https://doi.org/10.1504/IJTE.2024.137529

Awang Z, Afthanorhan A, Asri MAM (2015) Parametric and non-parametric approach in structural equation modeling (SEM): The application of bootstrapping. *Modern Applied Science*, 9(9): 58–74. https://doi.org /10.5539/mas.v9n9p58

Belenzon, S., Shamshur, A., & Zarutskie, R. (2019). *CEO's age and the performance of closely held firms*. *Strategic Management Journal, 40(6)*, 917–944. https://doi.org/10.1002/smj.3003

Bautista, E. P., & Lin, C. C. (2021). Compatibility of sustainability practices and their effect on the performance of multinational companies. *Journal of Business Research, 132*, 456-467.

Dimoso, R. L., & Utonga, D. (2024). A systematic review of digital technology adoption in small and medium-sized enterprises: Implications for performance in developing countries. *International Journal of Development and Management Review, 19*(1), 58–71. https://doi.org/10.4314/ijdmr.v19i1.4

Duan, Y., Maroufkhani, P., & Tiwari, R. (2024). Determinants of digital technology adoption in innovative SMEs. *Journal of Innovation & Knowledge*, 9(4). https://doi.org/10.1016/j.jik.2024.100610

Dwivedi, Y. K., Hughes, D. L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Williams, M. D. (2023). Metaverse adoption and SME Owner Age differences: Implications for Business Performance.

International Journal of Information Management, 68, 102642. https://doi.org/ 10.1016/j.ijinfomgt.2023.102642

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50. https://doi.org/10.2307/3151312

Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2020). *Multivariate data analysis* (8th ed.). Pearson.

Hox, J., & Bechger, T. (2014). An introduction to structural equation modeling. *Family Science Review, 25*(4), 1–17.

Huang, J., & Liu, Q. (2024). Analysis of Incentive Compatibility Mechanism for Content Services of Gas Companies under the Background of Universal Service. *International Journal of Finance and Investment*, *1*(1), 21-26. https://doi.org/10.54097/vghbbj35

Ismail, A. (2024). Driving SME performance through technological absorptive capacity and e-business innovation. *Sustainable Technology and Entrepreneurship*, 4(1), 100089. https://doi.org/10.1016/j.stae. 2024.100089

Karanja, P., & Mwangi, R. (2020). Technology adoption and performance of SME in Kenya. *International Journal of Business and Commerce, 9(3)*, 55–67.

Kline, R. B. (2018). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.

Levy, M., Grewal, D., & Weitz, B. A. (2019). *Retailing management* (10th ed.). McGraw-Hill Education.

Mairura, K. O., Ngugi, P. K., & Kanali, C. (2016). The role of compatibility in technology adoption among automobile mechanics in micro and small enterprises in Kenya. *International Journal of Academic Research in Business and Social Sciences*, *6*(5), 503-511. https://doi.org/10.6007/IJARBSS/v6-i5/2166

Mensah, I. K., Wang, R., Gui, L., & Wang, J. (2023). Exploring the elements influencing the behavioral adoption of e-commerce by Chinese small and medium enterprises (SME). *Information Technology for Development, 29(4)*, 731–756. https://doi.org/10.1177/026666692 11048486

Momanyi, C., Orwaru, M., Agasa, L. O., & Tombe, R. (2025). Digital transformation and SME growth: understanding the role of e-commerce awareness and technology adoption. *International Journal of Business and Economics Research, 14*(5), 211–224. https://doi.org/10.11648/j.ijber.20251405.13

Msuya, C. A., Mjema, E. A. M., & Kundi, B. A. (2017). *ICT* adoption and use in Tanzania SME. *Tanzania Journal of Engineering and Technology*, *36*(1), 23–34. https://doi.org/10.52339/tjet.v36i1.476

Nguyen, L., & Tran, M. (2018). The impact of compatibility on performance in Southeast Asian energy companies. *Energy Economics*, 59, 415-423.

Oliveira, T., Thomas, M., Baptista, G., & Campos, F. (2023). Mobile payment adoption: The role of compatibility and age. *Information & Management, 60*(1), 103735. https://doi.org/10.1016/j.chb.2016.03.030

Olubiyi, T. O. (2022). Measuring technological capability and business performance post-COVID-19 era: evidence from small and medium-sized enterprises (SME) in Nigeria. *Management & Marketing Journal*, *20*(2). https://doi.org/10.52846/ MNMK.20.2.09

Osborne, J. W., & Overbay, A. (2004). The power of outliers (and why researchers should ALWAYS check for them). *Practical Assessment, Research, and Evaluation, 9*(1), 6. http://pareonline.net/getvn. asp?v=9&n=6

Pallant, J. (2020). *SPSS survival manual: A step-by-step guide to data analysis using IBM SPSS* (7th ed.). McGraw-Hill Education.

Pervan, M., Pervan, I., & Ćurak, M. (2017). The influence of age on firm performance: Evidence from the Croatian food industry. Journal of Eastern Europe Research in Business and Economics, 2017, Article 618681, 1–9. https://doi.org/10.5171/ 2017.618681

Purnomo, Y. J. (2023). Digital marketing strategy to increase sales conversion on e-commerce platforms. *Journal of Contemporary Administration and Management (ADMAN)*, *1*(2), 54-62. https://doi.org/10.61100/adman.v1i2.23

Rajaguru, R., & Matanda, M. J. (2019). Role of compatibility and supply chain process integration in facilitating supply chain capabilities and organizational performance. *Supply Chain Management: An International Journal*, *24*(2), 301-316. https://doi.org/10.1108/SCM-05-2017-0187

Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). Free Press.

Rooh, S., El-Gohary, H., Khan, I., Alam, S., & Shah, S. M. A. (2023). An Attempt to Understand Stock Market Investors' Behaviour: The Case of Environmental, Social, and Governance (ESG) Forces in the Pakistani Stock Market. *Journal of Risk and Financial Management*, *16*(12), 50. https://doi.org/10.3390/jrfm 16120500

Rubenstein, A. L., Simon, L. S., Kammeyer-Mueller, J. D., Corwin, E. S., Morrison, H. M., & Whiting, S. W. (2025). On the efficacy of psychological separation to address common method variance: Experimental evidence and a guiding research design framework. *Journal of Applied Psychology, 110*(10), 1297–1317. https://doi.org/10.1037/apl0001283

Sharma, S., Singh, G., Jones, P., Kraus, S., & Dwivedi, Y. K. (2022). Understanding agile innovation management adoption for SME. *IEEE Transactions on Engineering Management, 69*(6), 3546–3557. https://doi.org/10.1109/TEM. 2022.3148341

Smith, J., Walker, D., & Chan, A. (2018). Technological compatibility and performance in the energy sector: An empirical investigation. *Technology and Innovation Management Review*, *8*(3), 20-29.

Soelaiman, L., Selamat, F., & Puspitowati, I. (2023). Exploring the predictive factors of Gen Z readiness for entrepreneurship. *International Journal of Research in Business and Social Science, 12*(5), 10–16. https://doi.org/10.20525/ijrbs.v 12i5.2757

Srimarut, T., & Mekhum, W. (2020). The impact of compatibility on the process integration of the supply chain in improving firm performance: The mediating effect of information technology capability. *International Journal of Supply Chain Management*, *9*(1), 155-167. https://doi.org/10.59160/ijscm.v9i1.4288

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson.

Venkatesh, V., Thong, J. Y., & Xu, X. (2016). Consumer acceptance and usage of information technology: *Extending the unified theory of acceptance and use of technology*. *MIS Quarterly*, *36*(1), 157-178. https://doi.org/10.17705/1jais.00428.