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# The Effect of Financial Literacy on Financial Growth Among Microfinance Clients

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## Abstract

**Purpose:** The purpose of this paper is to examine the effect of financial literacy on financial growth among microfinance clients in Manyu Division, Cameroon. **Design/Methodology/Approach:** It employed a descriptive and causal-comparative research design and deductive approach. This study gathered primary data from 412 micro finance clients in Manyu Division, Cameroon, using a Likert scale questionnaire and non-probability convenience sampling. Descriptive analysis, Pearson correlation and multiple linear regression models were applied to examine the role of financial literacy on financial growth among microfinance clients in Manyu Division. **Findings:** The findings indicate that the independent variables accounted for 63.75 percent of the variation in the dependent variable, demonstrating a significant link between financial literacy and financial growth. The results showed that all independent variables played a significant role in driving financial growth and influencing the financial development of microfinance members. Each independent variable demonstrated a positive relationship with the dependent variable. Specifically, financial knowledge, financial behaviour, and financial planning concluded a positive and statistically significant influence on financial growth. **Practical Implications:** The findings underscore the importance of these factors in promoting financial growth, emphasizing that targeted financial education programs can enhance clients' financial wellbeing, inform policy decisions, and improved microfinance institutions services. **Originality/Value:** The originality/value of this study lies in its context-specific focus, targeting microfinance clients, an often-underserved population and providing data-driven insights to inform policy and practice.

**Keywords:** financial literacy, financial growth, microfinance clients, descriptive analysis, regression model, Manyu Division, Cameroon

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## 1. Introduction

Financial literacy is increasingly recognized as a crucial factor in achieving financial stability and growth, particularly for microfinance clients who

often face significant financial challenges (Lusardi & Mitchell, 2014). Financial literacy encompasses the capacity to understand and apply essential financial principles such as budgeting, saving, investing, and debt

management. It enables individuals to make knowledgeable financial choices, effectively handle their finances, and prepare for future financial security by grasping financial products and interpreting financial data wisely. Amidjono et al. (2016) argue that financial literacy involves a series of activities aimed at enhancing individuals' knowledge, skills, and competence, enabling them to manage their finances more effectively. Krishna (2010) defines financial literacy as the ability to collect, comprehend, and assess information necessary for making informed financial decisions, understanding the consequences of those decisions. Huston (2010) defines financial literacy as the possession of skills and abilities that allow individuals to effectively use available resources to achieve their financial goals. Therefore, financial literacy is essential for informed financial decision-making, effective money management, and wealth accumulation. It empowers individuals to budget, save, invest wisely, and avoid financial pitfalls, promoting financial security and independence. Moreover, financial literacy helps alleviate financial stress and enhances overall well-being, contributing to sustained financial growth over time.

Financial growth encompasses the expansion of financial products, services, and institutions, along with the systems and processes they use (Tufano, 2003). It is also known as financial widening and deepening, aiming to meet the diverse needs of stakeholders. At the individual or household level, financial growth refers to the increase in wealth, income, and assets over time, supported by effective income generation, savings, and debt management. It is tied to better financial decision-making, including smart investments and budgeting. According to Lusardi and Mitchell (2014), financial growth also involves improving financial skills, such as risk management and future financial planning. Financial growth is a multifaceted process involving increased savings, diversified investments, reduced liabilities, and achieving goals like homeownership or retirement. Financial literacy plays a vital role in enabling individuals to make informed decisions, financial security, fostering wealth accumulation, and greater economic stability (Hastings et al., 2013; Beal & Delpachitra, 2003). Furthermore, Lusardi and Mitchell (2014) highlight that financial literacy equips individuals with the knowledge and skills to manage finances effectively,

encompassing key elements like budgeting, investing, saving, and debt management for wealth building. According to Mandell (2008), financial education and knowledge increase an individual's capacity to plan for long-term financial goals, resulting in more substantial savings and investments. In contrast, those lacking financial literacy may struggle with financial management, leading to missed opportunities for wealth-building and financial security. Therefore, the greater the financial literacy, the more likely an individual is to experience financial growth, as they can make better financial decisions that enhance their economic well-being and long-term financial stability.

Moreover, financial literacy, which includes financial knowledge, behavior, and training, is vital in influencing financial outcomes, especially financial growth. In the current intricate financial environment, individuals must make numerous financial decisions, including managing savings, debt, and investments, making financial literacy a key element in securing financial stability and growth. Financial knowledge involves grasping fundamental financial concepts like budgeting, saving, and investing (Lusardi & Mitchell, 2014). Financial behavior reflects how individuals apply this knowledge in real-life situations, such as making prudent spending choices or investing for the future (Xiao, 2017). Financial planning is a key aspect of financial literacy. According to Lusardi & Mitchell (2014), effective financial planning enables individuals to make informed decisions about saving, investing, and managing debt. In the context of microfinance clients in Cameroon, financial planning might involve setting realistic savings goals, understanding loan terms and managing daily expenses. Together, these components directly influence financial growth, which is typically measured through increased savings, investments, and wealth accumulation (OECD, 2020). In Cameroon, where access to formal financial services remains limited, understanding the impact of financial literacy on financial growth can inform strategies to enhance financial inclusion (Beck & Cull, 2014).

Despite extensive research, several gaps remain. Firstly, many studies treat financial literacy as a unidimensional construct, ignoring its multidimensional nature. Also limited empirical studies focus specifically on microfinance clients in developing economies. And mixed findings on

the magnitude and sustainability of financial literacy's impact persist. Few studies integrate financial knowledge, behavior, and planning into a single explanatory model for financial growth. These gaps justify the present study importance on the impact of financial literacy on financial growth among microfinance clients in Manyu Division, Cameroon. Since micro finance client's specific needs and context require more tailored exploration. Given that microfinance needs and context require more tailored exploration, this study examines the role of financial literacy on financial growth among microfinance clients contributing to the growing body of literature on financial education and its outcomes.

**Study Objectives:** The study aimed to examine the role of financial literacy on financial growth among microfinance clients in Manyu Division, Cameroon. The specific objectives were as follows:

- 1) To establish the effect of financial knowledge on financial growth of microfinance clients,
- 2) To determine the effect of financial behavior on financial growth of microfinance clients, and
- 3) To examine the effect of financial planning on financial growth of microfinance clients.

## 2. Review of Literature

The review is organized into four main sections: conceptual review, theoretical review, empirical review, and research gaps. The purpose of this section is to establish a solid scholarly foundation for the study, identify gaps in existing research, and justify the need for the present investigation.

### 2.1 Conceptual Review

#### 2.1.1 Concept of Financial Literacy

Financial literacy is broadly defined as the ability to understand and apply financial knowledge and skills to make informed and effective financial decisions (Lusardi & Mitchell, 2014). The OECD (2018) conceptualizes financial literacy as a multidimensional construct encompassing financial knowledge, financial behavior, and financial attitudes, which collectively influence financial well-being.

In the context of microfinance, financial literacy is particularly important because clients frequently interact with complex financial products such as microloans, savings accounts, and insurance services, often with limited formal education and financial exposure (Cole,

Sampson, & Zia, 2011). Lack of financial literacy among microfinance clients may lead to poor loan utilization, over-indebtedness, and limited financial growth.

#### 2.1.2 Financial Growth Among Microfinance Clients

Financial growth refers to improvements in an individual's or enterprise's financial position over time. Among microfinance clients, financial growth is typically measured through increased income, growth in savings, asset accumulation, business expansion, and improved financial stability (Ledgerwood, 2013).

Financial growth is a key objective of microfinance programs, which aim to empower low-income individuals by providing access to financial services. However, evidence suggests that access to finance alone does not automatically translate into financial growth unless accompanied by adequate financial literacy (Collins et al., 2009).

Mwatondo and Wekesa (2020) explored how financial literacy impacts the financial growth of SACCOs in Kwale County by adopting a descriptive survey design. The primary data collected from 397 respondents using stratified random sampling techniques was analyzed through descriptive as well as inferential statistical methods. The findings revealed a weak positive relationship between financial knowledge and financial training with financial growth, whereas financial attitude and behavior demonstrated a moderate positive association. Further, regression results confirmed that financial knowledge, attitude, behavior, and training significantly impacted SACCO financial growth. Overall, the study concluded that these dimensions of financial literacy contributed positively to growth of SACCOs in Kwale County. For example, Mwaniki (2019) studied the influence of financial literacy on the growth of small and medium enterprise in Nyeri County, finding that financial literacy had a positive influence on SME growth. Similarly, Yushita (2017) observed that financial literacy levels tend to be low in developed countries, and that developing nations face even more significant challenges related to financial literacy. This indicated that financial literacy supports financial inclusion and positive financial behavior. Additionally, Putri and Hamidi (2019) demonstrated that financial literacy strongly effects investment decisions. Furthermore,

Gatakaa (2010) investigated the link between commercial bank lending and personal financial literacy in Kenya, conducting a census survey of all 43 licensed commercial banks according to the Central Bank of Kenya. The study utilized primary data gathered through comprehensive questionnaires and applied descriptive statistics, such as frequency tables, percentages, means, and graphs, to analyze the results. The findings showed the higher personal financial literacy increases the likelihood of loan approval.

Further, Nyamute and Monyoncho (2008) examined how financial literacy affects personal financial management of employees in banking and financial institutions. The study surveyed 192 employees using a structured questionnaire, examining how financial education influences personal financial management. The results indicated that individuals with financial education were more inclined to practice sound financial behaviors. Those with higher financial literacy showed a greater understanding and application of financial management strategies. The study concluded that financial literacy is a key in shaping personal financial management. For example, Olima (2013) examined the impact of financial literacy on the savings practices of Kenya Revenue Authority employees. The study gathered data via semi-structured questionnaires, using descriptive statistics for qualitative analysis and content analysis for qualitative data. The findings revealed that financial literacy significantly influences personal financial management, particularly in relation to saving habits and retirement planning. Similarly, Amisi (2012) studied the effect of financial literacy on pension fund managers' decisions. Through a modified Likert scale questionnaire, the study found that the level of financial literacy significantly influenced the investment decisions made by fund managers. Additionally, this aligns with Fatoki (2014), who investigated the reasons for SME failures and discovered that a lack of financial education has negative effects on SMEs, especially on newly established startups. Furthermore, Mayiah (2016) conducted how financial literacy affects the personal wealth of judiciary staff. The study found that financial literacy positively impacted judiciary employees' personal wealth, but the effect was not statistically significant.

Additionally, Motompa (2016) discovered factors influencing savings and credit cooperative societies (SACCOs) growth in Kenya, finding that

member participation significantly boost growth, based on a Kajiado East case study. Study recommended that SACCOs should focus on educating their members, as well-informed members are better able to understand the advantages of SACCOs and are more likely to actively participate in governance and business activities within their SACCOs. In a similar vein, Miles (2004) conducted the link between financial literacy and investment decisions through cross-sectional survey of customers from 25 banks. Data collected via structured questionnaire were analyzed using descriptive statistics and the results showed that customers with access to financial information tended to make more profitable investment decisions. For example, Calvert, Campbell and Sodini (2007) studied the association between financial literacy and financial behavior by surveying 200 households in Cambridge, Massachusetts. Analyzing data using frequencies, means, and standard deviations, the study found that households with higher financial literacy were more inclined to invest in risky assets and make better investment decisions. Similarly, Lusardi and Mitchell (2011) incorporated a financial literacy module to the 2004 Health and Retirement Study (HRS), which assessed basic financial knowledge on topics such as interest rates, inflation, and risk diversification. Their findings revealed a concerningly low level of financial literacy among U.S. adults aged 50 and older, particularly among the elderly, African Americans, Hispanics, women, and individuals with lower levels of education trends commonly seen in financial literacy surveys.

Moreover, Fauziah, Trivena and Aini (2021) investigated the impact of financial literacy and financial inclusion on Indonesia's economic growth using panel data from 34 provinces. The study showed that neither financial literacy nor inclusion significantly impacted economic growth, emphasizing the need to improve both to promote more inclusive growth in Indonesia. Similarly, Bire, Sauw and Maria (2019) examined the impact of financial literacy on financial inclusion, with financial training acting as a mediator, focusing on Micro, Small, and Medium Enterprises (MSMEs) in Kupang City, Indonesia. The study of 54 MSME respondents used SPSS path analysis and found that financial literacy significantly influenced financial inclusion and financial training, with financial training mediating the between financial literacy

inclusion relationship. The study suggests that future research should consider additional factors such as transparency and the quality of financial statements. Additionally, Hasan and Hoque (2021) examined how financial knowledge affects access to financial services, including banking, microfinance, and fintech, using data from rural Bangladesh. The study employed logistic, probit, and complementary log-log regression models to examine if financial literacy reduces barriers to using financial services. The findings showed that understanding various financial concepts significantly influenced access to financial services. Factors like profession, income, and knowledge of deposits, withdrawals, and interest rates greatly influence financial access. For example, Tuffour, Amoako and Amartey (2022) explored how managers' financial literacy affects the performance of small-scale enterprises in La Nkwantanang Madina Municipality, Ghana. Using data from 200 managers collected via structured questionnaires and analyzed with structural equation modeling, the study found that financial literacy including awareness, attitude, and knowledge significantly enhanced both financial and non-financial performance. Although individual characteristics such as age, education, and experience did not have a notable impact on financial performance, the study highlighted the importance of capacity-building programs to improve financial literacy among small enterprise managers, which could enhance their overall performance. Lately, Babajide et al. (2023) studied the impact of financial literacy and capabilities on small enterprises sustainability in Lagos and Ogun States, Nigeria. Using a survey design, data was collected from 300 small business owners across the two states and analyzed using Structural Equation Modeling (SEM). The study declared that key factors in the sustainability of small firms in Nigeria include environmental sustainability, financial sustainability, and social responsibility. Moreover, financial literacy and financial capabilities busted sustainability, whereas using savings products negatively affected it. The study suggests that small businesses should adopt sustainability models, enhance their financial knowledge, and choose appropriate savings products based on their risk tolerance.

The reviewed literature establishes that financial literacy—through financial knowledge, financial behavior, and financial planning—plays a critical

role in enhancing financial growth among microfinance clients. Grounded in robust theories and supported by empirical evidence, the literature highlights the need for context-specific, multidimensional studies to better understand this relationship.

## 2.2 Theoretical Review

### 2.2.1 Human Capital Theory

Human Capital Theory, advanced by Becker (1964), posits that knowledge and skills are forms of capital that enhance individual productivity and economic outcomes. In this study, financial knowledge is considered a form of human capital that enables microfinance clients to make informed financial decisions, manage resources efficiently, and achieve financial growth.

### 2.2.2 Theory of Planned Behavior

The Theory of Planned Behavior (Ajzen, 1991) explains how attitudes, subjective norms, and perceived behavioral control influence behavior. Applied to financial literacy, the theory suggests that financial knowledge and attitudes shape financial behavior, which in turn affects financial outcomes. This theory supports the inclusion of financial behavior as a key determinant of financial growth.

### 2.2.3 Life-Cycle Theory of Consumption and Savings

The Life-Cycle Theory (Modigliani & Brumberg, 1954) posits that individuals plan their consumption and savings over their lifetime to maximize financial well-being. This theory underpins the role of financial planning in achieving sustainable financial growth among microfinance clients, who often face irregular income streams.

### 2.2.4 Empirical Review and Hypotheses Development

This study examines the effect of financial literacy on financial growth among microfinance clients. Financial literacy is operationalized through three dimensions: financial knowledge, financial behavior, and financial planning. Drawing from Human Capital Theory, Theory of Planned Behavior, and Life-Cycle Theory, the following hypotheses are developed.

### 2.2.5 Financial Knowledge and Financial Growth

Financial knowledge enhances an individual's ability to understand financial products, evaluate borrowing costs, manage savings, and assess financial risks (Lusardi & Mitchell, 2011).

According to Human Capital Theory (Becker, 1964), investment in knowledge improves productivity and economic outcomes. For microfinance clients, financial knowledge enables effective loan utilization, cost minimization, and informed investment decisions, which contribute directly to income growth, asset accumulation, and business expansion.

Empirical evidence suggests that financially knowledgeable individuals experience better financial outcomes, including higher savings and improved business performance (Xu & Zia, 2012; Lusardi & Mitchell, 2014). In the context of microfinance, limited financial knowledge has been linked to poor loan management and stagnated financial growth (Cole et al., 2011).

**Hypothesis 1 (H1):** Financial knowledge has a significant positive effect on financial growth among microfinance clients.

#### 2.2.6 Financial Behavior and Financial Growth

Financial behavior reflects the practical application of financial knowledge through actions such as budgeting, saving, loan repayment, record-keeping, and prudent borrowing (Atkinson & Messy, 2012). The Theory of Planned Behavior (Ajzen, 1991) posits that behavior is a key determinant of outcomes and is influenced by attitudes, norms, and perceived control. Hilgert, Hogarth, and Beverly (2003) established that individuals who engage in positive financial behaviors experience higher levels of financial stability and asset growth.

In the microfinance context, Ledgerwood (2013) found that disciplined financial behavior significantly reduced loan default rates and enhanced business sustainability. Collins et al. (2009) further revealed that poor financial behavior, rather than lack of income, often explained financial stagnation among low-income households.

Among microfinance clients, positive financial behaviors—such as timely loan repayment, regular saving, and separation of personal and business finances—enhance financial discipline and sustainability. Studies indicate that responsible financial behavior significantly improves household welfare, income stability, and asset accumulation (Hilgert et al., 2003; Xiao & O'Neill, 2016).

Therefore, even when financial knowledge exists, financial growth is largely dependent on the

extent to which clients engage in sound financial behavior.

**Hypothesis 2 (H2):** Financial behavior has a significant positive effect on financial growth among microfinance clients.

#### 2.2.7 Financial Planning and Financial Growth

Financial planning involves setting financial goals, budgeting, saving for emergencies, and planning for future investments (Gibson et al., 2013). The Life-Cycle Theory of Savings and Consumption (Modigliani & Brumberg, 1954) suggests that individuals allocate resources strategically over time to maximize long-term financial well-being. Lusardi and Mitchell (2011) found that individuals who plan their finances accumulate significantly more wealth than those who do not.

For microfinance clients, financial planning enables efficient use of credit, preparation for financial shocks, and sustainable business growth. Research demonstrates that individuals who engage in financial planning are more resilient to income volatility and experience higher levels of financial growth (Lusardi & Mitchell, 2011; Collins et al., 2009). Karlan et al. (2014) also reported that planning tools such as commitment savings mechanisms significantly increased savings among low-income clients.

Hence, financial planning is expected to play a critical role in enhancing financial growth outcomes among microfinance clients.

**Hypothesis 3 (H3):** Financial planning has a significant positive effect on financial growth among microfinance clients.

**Summary of Hypotheses:** To explain the phenomenon, guide experiment design, data collection, and conclusions, the study's hypotheses were as follows:

**H1:** Financial knowledge has a positive significant effect on the financial growth among microfinance clients in Manyu Division, Cameroon,

**H2:** Financial behavior is significantly related to financial growth among microfinance clients in Manyu Division, Cameroon, and

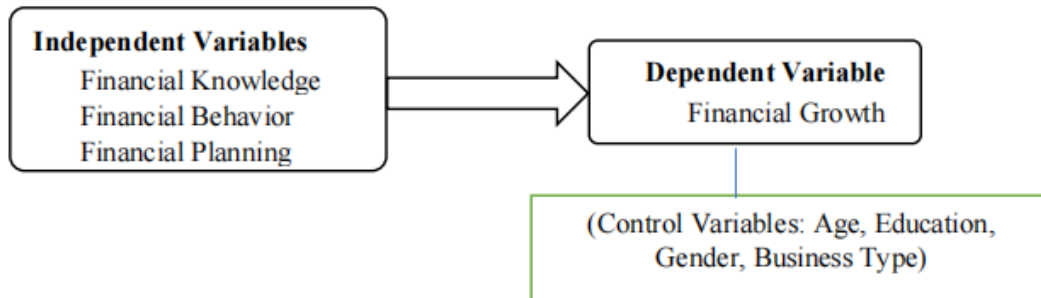
**H3:** Financial planning positively influences financial growth among microfinance clients in Manyu Division, Cameroon.

#### **Conceptual Framework:**

A conceptual framework provides a structured representation of the relationships between key

variables in a study. It is developed from established theories and empirical evidence and guides the formulation of hypotheses and data analysis. This study examines the effect of financial literacy on financial growth among microfinance clients. Financial literacy is conceptualized as a multidimensional construct

comprising financial knowledge, financial behavior, and financial planning, while financial growth is the dependent variable. In this conceptual framework, financial knowledge, financial behavior, and financial planning serve as independent variables, with financial growth as the dependent variable.



Source: (Mwatondo & Wekesa, 2020; Babajide et al. 2023).

The framework illustrates that financial knowledge, financial behavior, and financial planning are independent yet interrelated dimensions of financial literacy that directly influence financial growth among microfinance clients. Control variables are included to account for individual and contextual differences that may affect financial growth outcomes. The conceptual framework demonstrates how financial literacy—through its core dimensions of financial knowledge, financial behavior, and financial planning—affects financial growth among microfinance clients. Grounded in established theories and empirical evidence, the framework provides a logical basis for hypothesis testing and empirical analysis.

**3. Methodology**

A descriptive, correlational, and casual comparative study designs were employed to effectively explore the association between the independent and dependent variables. A non-probability sampling method was used, and the data has been collected by conducting survey in Manyu Division, Cameroon in 2025, employing a 5-point Likert scale. Since the exact population size of client members in the microfinance institutions was not known, it was assumed that  $p = 0.50$ , representing the maximum variability.

Similarly, 95% confidence level and  $\pm 5\%$  error were assumed, and to calculate the sample size Cochran’s (1963) formula was used.

$$n = \frac{z^2 pq}{e^2} \frac{0.95^2 + 0.50 \cdot 0.50}{0.05^2} = 384.16 \text{ respondents.}$$

The study required a minimum sample size of 386, and primary data was gathered through a self-administered questionnaire. Data was collected via interviews, email, and Google forms. Descriptive and inferential statistics including regression model have used to data analysis. This analysis was carried out using the SPSS 26. The linear regression model used as  $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$ . Where: Y represents financial growth;  $\beta_0$  is the constant; X1, X2, and X3 represent financial knowledge, financial behavior, and financial planning, respectively;  $\beta_i$  are the regression coefficients; and  $\epsilon$  is the error term.

**4. Results**

*4.1 Cronbach’s Alpha Analysis*

**Table 1.** Cronbach’s Alpha Analysis

Variables	No. of Items	Cronbach’s Alpha
Financial Knowledge	15	0.796
Financial Behavior	15	0.806
Financial Training	15	0.780
Financial Growth	15	0.812

Source: Researcher’s compilation from SPSS 26.

All Cronbach’s Alpha values of all constructs are above the threshold of 0.70 that demonstrate strong reliability. Therefore, the instrument is deemed reliable for assessing the intended constructs.

4.2 Descriptive Analysis of Financial Knowledge

**Table 2.** Financial Knowledge

Financial Knowledge	N	Min	Max	Mean	S.D.
I have a complete understanding of how interest rates on loans are calculated.	412	1	5	3.38	1.09
I am familiar with the process of obtaining loans.	412	1	5	3.42	1.09
I have knowledge about the compound interest.	412	1	5	2.75	1.09
I understand the basic concepts of budgeting.	412	1	5	3.76	1.18
I understand the importance of an emergency fund.	412	1	5	2.79	1.27
I am familiar with different types of savings accounts.	412	1	5	2.56	1.25
I am aware of the risks associated with investing.	412	1	5	2.78	1.45
I regularly track my expenses and income.	412	1	5	2.63	1.36
I know common types of insurance (e.g. Life, health, auto).	412	1	5	3.76	1.15
I know how to create and maintain a personal and family budget.	412	1	5	2.55	1.23
Overall average				3.02	1.22

Source: Researcher’s compilation from SPSS 26.

The overall mean score of 3.02 showed moderate financial knowledge among the 412 participants, with strengths in insurance types ( $\bar{X} = 3.77$ ), budgeting ( $\bar{X} = 3.76$ ), interest rate calculation on loan ( $\bar{X} = 3.38$ ), and loan process ( $\bar{X} = 3.42$ ). Weaker areas included compound interest ( $\bar{X} = 2.75$ ), emergency funds ( $\bar{X} = 2.79$ ), investment risks ( $\bar{X} = 2.78$ ), expenses and income track ( $\bar{X} =$

2.63), savings accounts ( $\bar{X} = 2.56$ ), and personal and family budget ( $\bar{X} = 2.55$ ). High variability appeared in investment risks (S.D. = 1.45) and expense tracking (S.D. = 1.36), signaling a need for targeted education in saving and investing.

4.3 Financial Behavior

**Table 3.** Financial Behavior

Financial Behavior	N	Min	Max	Mean	S.D.
I regularly track my spending and income.	412	1	5	3.98	1.13
I save a portion of my income each month.	412	1	5	2.67	1.46
I use financial tools (apps, spreadsheets) to manage my finances.	412	1	5	2.68	1.31
I pay my bills on time to avoid late fees.	412	1	5	3.64	1.20
I have a clear plan for paying off any debt I have.	412	1	5	2.46	1.40
I contribute regularly to my retirement savings.	412	1	5	2.55	1.46
I discuss financial decisions with family or friends.	412	1	5	2.29	1.47
I avoid taking on unnecessary debt.	412	1	5	3.71	1.22
I avoid unnecessary buying.	412	1	5	3.84	1.32
I compare prices before making a purchase.	412	1	5	3.49	0.97
Overall average				3.12	1.29

Source: Researcher’s compilation from SPSS 26.

The overall mean score of 3.12 indicated moderate financial behavior among the 412 respondents, with strengths in tracking spending and income ( $\bar{X} = 3.98$ ), paying bills on time ( $\bar{X} = 3.64$ ), and avoiding unnecessary purchases ( $\bar{X} = 3.84$ ). Weaker areas included monthly savings ( $\bar{X} = 2.67$ ), use of financial tools ( $\bar{X} = 2.68$ ), debt repayment planning ( $\bar{X} = 2.46$ ), retirement

contributions ( $\bar{X} = 2.55$ ), and discussing financial decisions with family or friends ( $\bar{X} = 2.29$ ). High variability was observed across responses (S.D. = 0.97 to 1.47), highlighting the need for targeted initiatives to improve savings, debt management, and long-term financial planning.

4.4 Financial Planning

**Table 4.** Financial Planning

Financial Planning	N	Min	Max	Mean	S.D.
The financial planning provided clear and useful information.	412	1	5	3.69	1.13
I feel more confident in my financial knowledge after planning.	412	1	5	4.17	0.89
I set short term financial goals.	412	1	5	4.15	0.97
I gained valuable skills for budgeting and managing expenses.	412	1	5	4.03	1.10
I feel motivated to continue improving my financial knowledge after planning.	412	1	5	4.16	0.94
I have set specific financial goals as a result of planning.	412	1	5	4.11	0.93
I am more aware of the importance of saving and investing.	412	1	5	3.98	1.16
I plan how to repay my loan.	412	1	5	3.72	1.20
The planning covers practical examples and real-life applications.	412	1	5	2.61	1.41
The planning has positively influenced my financial behavior.	412	1	5	2.81	1.21
Overall average				3.75	1.09

Source: Researcher’s compilation from SPSS 26.

The overall mean score of 3.75 indicated generally positive feedback on financial planning among the 412 respondents, with strengths in confidence in financial planning ( $\bar{X} = 4.17$ ), usefulness of materials ( $\bar{X} = 4.15$ ), motivation to improve financial skills ( $\bar{X} = 4.16$ ), and budgeting skills ( $\bar{X} = 4.03$ ). Weaker areas included practical examples and real-life applications ( $\bar{X} = 2.61$ ) and

the planning’s impact on financial behavior ( $\bar{X} = 2.80$ ). Moderate variability was observed in responses (S.D.= 0.89 to 1.41), suggesting the need to enhance practical application and behavioral outcomes of the planning.

4.5 Financial Growth

**Table 5.** Financial Growth

Financial Growth	N	Min	Max	Mean	S.D.
I have seen an increase in my income over the last 5 years.	412	1	5	2.98	1.28
I have successfully reduced my debt over the last 5 years.	412	1	5	3.96	1.09
I have increased my savings over the last 5 years.	412	1	5	3.62	1.16
My investments have increased in value over the last 5 years.	412	1	5	3.75	1.37
My total assets have increased over the last 5 years.	412	1	5	4.19	1.01
I have a clear plan for achieving my financial goals.	412	1	5	2.42	1.36
I regularly review my financial progress.	412	1	5	3.44	1.14
I have diversified my investments to enhance my financial	412	1	5	2.21	1.38

growth.

I prioritize saving and investing in my financial planning.	412	1	5	4.21	1.04
I am comfortable taking calculated risks to achieve financial growth.	412	1	5	2.28	1.29
Overall average				3.38	1.21

Source: Researcher’s compilation from SPSS 26.

The overall mean score of 3.38 indicated moderate financial growth among the 412 respondents, with strengths in assets ( $\bar{X} = 4.19$ ), prioritizing saving and investing ( $\bar{X} = 4.21$ ), investments ( $\bar{X} = 3.75$ ), savings ( $\bar{X} = 3.62$ ), and debt reduction ( $\bar{X} = 3.96$ ). Weaker areas included having a clear plan for financial goals ( $\bar{X} = 2.42$ ), use of diversified investments ( $\bar{X} = 2.21$ ), and

comfort with taking calculated risks ( $\bar{X} = 2.20$ ), while regularly reviewing financial progress was moderate ( $\bar{X} = 3.44$ ). Variability in responses (S.D. = 1.21) highlights the need to enhance financial planning, risk management, and proactive monitoring of financial progress.

4.6 Correlations Analysis

**Table 6.** Correlations Matrix

	Financial Knowledge	Financial Behavior	Financial Training	Financial Growth
Financial Knowledge	1	.448**	.476**	.572**
Financial Behavior		1	.682**	.643**
Financial Planning			1	.701**
Financial Growth				1

\*\* Correlation is significant at the 0.01 level (2-tailed).

Source: Researcher’s compilation from SPSS 26.

The results indicate that financial growth is positively related to financial knowledge, financial behavior, and financial planning. Additionally, there are positive correlations

among financial knowledge, financial behavior, and financial planning as well.

4.7 Regression Analysis

**Table 7.** Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.771 <sup>a</sup>	.637	.634	.37753

a Predictors: (Constant), Financial Knowledge, Financial Behavior, Financial Planning

b Dependent Variable: Financial Growth

Source: Researcher’s compilation from SPSS 26.

**Table 8.** Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.206	3	26.735	187.58	.000b
	Residual	54.303	381	0.143		
	Total	134.509	384			

a Dependent Variable: Economic Growth

b Predictors: (Constant), Financial Knowledge, Financial Behavior, Financial planning

Source: Researcher’s compilation from SPSS 26.

**Table 9.** Regression Coefficients and VIF test

Model B	Unstandardized Coefficients		Standardized Coefficients		Sig.	VIF
		Std. Error	Beta	t		
(Constant)	0.570	0.121		4.702	.000	
Financial Knowledge	0.254	0.036	0.269	7.138	.000	1.342
1 Financial Behavior	0.190	0.035	0.247	5.438	.000	1.944
Financial Planning	0.377	0.043	0.404	8.771	.000	2.007

a. Dependent Variable: Financial Growth

Source: Researcher’s compilation from SPSS 26.

The results show a strong overall model fit. And the R-squared value is 0.637 which means 63.75 percent of the variation in financial growth can be attributed to factors like financial knowledge, financial behavior, and financial planning. The remaining 36.25 percent of the variation is attributed to other variables not considered in this study. Additionally, the findings suggest that a one-unit increase in financial knowledge,

financial behavior, and financial planning results in increases in financial growth of 0.036, 0.035, and 0.043, respectively. These predictors have a significant positive effect on financial growth, as evidenced by p-values (sig. 0.000 for all) that are below the significance level of 0.05. Additionally, all VIF values are below 5, showing no multicollinearity issues.

4.8 Summary of Hypotheses Testing

**Table 10.** Hypothesis Testing

Hypothesis Statement	P-value	Decision
H1: Financial Knowledge significantly affect the financial growth of microfinance clients.	0.000	Accepted
H2: Financial Behavior significantly affect the financial growth of Accepted microfinance clients.	0.000	Accepted
H3: Financial planning significantly affect the financial growth of Accepted microfinance clients.	0.000	Accepted

The study’s hypotheses were assessed based on the regression model results. A summary of the hypothesis testing reveals that all hypotheses (H1, H2, and H3) are supported, showing a significant positive effect on financial growth, as their p-values are below the significance threshold of 0.05.

**5. Discussion**

The results support all three hypotheses, indicating that financial knowledge, financial behavior, and financial planning are significant factors influencing financial growth among microfinance clients in Cameroon.

The findings showed that financial knowledge

significantly influences the financial growth of microfinance clients, aligning with the results of Mwaniki (2019), Njehia (2014), and Mwatondo and Wekesa (2020). The positive impact of financial knowledge on financial growth aligns with Lusardi and Mitchell’s (2014) findings that financial literacy enhances financial decision-making. In Cameroon’s microfinance context, understanding loan terms and interest calculations likely empowers clients to make informed decisions, boosting financial growth.

Similarly, financial behavior has a significant effect on financial growth, which is consistent with the studies of Esiebugie, Richard and

Emmanuel (2018), Grohmann et al. (2015), and Mwatondo and Wekesa (2020). The link between financial behavior and financial growth supports Kaiser's and Menkhoff's (2017) assertion that positive financial habits drive better outcomes. Microfinance clients in Cameroon practicing regular saving and expense tracking likely experience improved financial stability.

Additionally, financial planning was identified as having a significant influence on the financial growth of microfinance clients, supporting the findings of Mwaniki (2019), Njehia (2014), Olima (2013), and Mwatondo and Wekesa (2020). Financial planning's positive influence on growth echoes findings by Hilgert et al. (2003) that planning enhances financial well-being. Clients planning repayments and budgeting daily expenses likely manage resources better, fostering growth.

## 6. Conclusions

This study emphasizes the significant role of financial literacy in promoting the financial growth of microfinance clients, showing that financial knowledge, behavior, and planning positively and significantly influence financial growth. With 63.75 percent of the variation in financial growth explained by these factors, the study underscores the importance of enhancing financial literacy through education and adequate financial planning. Improving financial knowledge and behaviors can significantly contribute to better financial outcomes for microfinance clients, suggesting the need for targeted interventions to foster financial literacy in Manyu Division, Cameroon. Based on these findings, it is recommended that microfinance institutions implement targeted financial literacy programs to strengthen the financial capacity of their clients and improve their overall financial well-being. By strengthening these areas of financial literacy, clients can better navigate financial challenges and improve their economic well-being.

## Author Contributions

Ayuk Takemeyang conceived the topic and manuscript. Tambi Andison Akpor review and revised the manuscript, enhancing its content, clarity and accuracy met the highest standards.

## Conflict of Interest

The authors declare no conflict of interest.

## Acknowledgement

Not applicable.

## Declaration of Funding

No funding.

## Data Availability

The data set generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declaration of Competing Interest

The authors declare no competing interest.

## Clinical Trial Number

Not applicable.

## Ethics Consent to Participate and Consent to Publish Declaration

Not applicable.

## Consent to Participate

Informed consent was obtained from all individuals participants included in the study. All participants provided their written informed consent to participate in this study, and their data was collected and analyzed anonymously.

## References

- Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- Amidjono, D. S., Brock, J., & Junaidi, E. (2016). Financial literacy in Indonesia. *International Handbook of Financial Literacy*, 277-290.
- Amisi, S. A. R. A. H. (2012). The effect of financial literacy on investment decision making by pension fund managers in Kenya (Doctoral dissertation).
- Atkinson, A., & Messy, F. (2012). Measuring financial literacy. OECD Working Papers.
- Babajide, A., Osabuohien, E., Tunji-Olayeni, P., Falola, H., Amodu, L., Olokoyo, F., & Ehikioya, B. (2023). Financial literacy, financial capabilities, and sustainable business model practice among small business owners in Nigeria. *Journal of Sustainable Finance & Investment*, 13(4), 1670-1692.
- Beal, D. J., & Delpachitra, S. (2003). Financial literacy among Australian university students. *Economic Papers*, 22(1), 65-78.
- Beck, T., & Cull, R. (2014). SME finance in Sub-Saharan Africa. World Bank Policy Research Working Paper, (7018).
- Becker, G. S. (1964). *Human capital*. University of

- Chicago Press.
- Bire, A. R., Sauw, H. M., & Maria, M. (2019). The effect of financial literacy towards financial inclusion through financial training. *International journal of social sciences and humanities*, 3(1), 186-192.
- Calvet, L. E., Campbell, J. Y., & Sodini, P. (2007). Down or out: Assessing the welfare costs of household investment mistakes. *Journal of Political Economy*, 115(5), 707-747.
- Cochran, W. (1963). Lattice dynamics of sodium. *Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences*, 276(1366), 308-323.
- Cole, S., Sampson, T., & Zia, B. (2011). *World Bank Economic Review*, 25(1), 1-30.
- Collins, D., Morduch, J., Rutherford, S., & Ruthven, O. (2009). *Portfolios of the poor*.
- Esiebugie, U., Richard, A. T., & Emmanuel, A. L. (2018). Financial literacy and performance of small and medium scale enterprises in Benue State, Nigeria. *International Journal of Economics, Business and Management Research*, 2(4), 65-79.
- Fatoki, O. (2014). The causes of the failure of new small and medium enterprises in South Africa. *Mediterranean journal of social sciences*, 5(20), 922-927.
- Fauziah, F., Trivena, S. M., & Aini, Y. N. (2021). The effect of financial literacy and financial inclusion on economic growth in Indonesia. *JBMP (Jurnal Bisnis, Manajemen dan Perbankan)*, 7(2), 339-359.
- Gatakaa, S. E. (2010). The relationship between personal financial literacy and lending by commercial banks in Kenya (Doctoral dissertation, University of Nairobi, Kenya).
- Grohmann, A. (2018). Financial literacy and financial behavior: Evidence from the emerging Asian middle class. *Pacific-Basin Finance Journal*, 48, 129-143.
- Hasan, M., Le, T., & Hoque, A. (2021). How does financial literacy impact on inclusive finance? *Financial innovation*, 7(1), 40.
- Hastings, J. S., Madrian, B. C., & Skimmyhorn, W. L. (2013). Financial literacy, financial education, and economic outcomes. *Annual Review of Economics*, 5, 347-373.
- Huston, S. J. (2010). Measuring financial literacy. *Journal of Consumer Affairs*, 44(2), 296-316.
- Karlan, D., & Valdivia, M. (2011). Teaching Entrepreneurship: Impact of Business Training on Microfinance Clients and Institutions. *The Review of Economics and Statistics*, 93(2), 510-527.
- Klapper, L., Lusardi, A., & van Oudheusden, P. (2015). World Bank.
- Krishna, A., Rofaida, R., & Sari, M. (2010). Analisis tingkat literasi keuangan di kalangan mahasiswa dan faktor-faktor yang mempengaruhinya (Survey pada Mahasiswa Universitas Pendidikan Indonesia). In *Proceedings of the 4th International Conference on Teacher Education*, 4(1), 552-560.
- Ledgerwood, J. (2013). *The new microfinance handbook*.
- Lusardi, A., & Mitchell, O. S. (2011). *Financial literacy and planning: Implications for retirement wellbeing* (No. w17078). National Bureau of Economic Research.
- Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1), 5-44.
- Mandell, L. (2008). Financial literacy of high school students. *The Journal of Consumer Affairs*, 42(2), 257-280.
- Mayiah, C. O. (2016). Effect of financial literacy on personal wealth of judiciary employees in Nairobi City County, Kenya (Doctoral dissertation, University of Nairobi).
- Miles, D. (2004). The UK mortgage market: Taking a longer-term view. Final report and recommendations.
- Motompa, D. K. (2016). Factors influencing growth of saving and credit cooperative societies in Kenya: A case study of Kajiado East Sub-County. Retrieved from: [erepository.uonbi.ac.ke](http://erepository.uonbi.ac.ke).
- Mwaniki, L. N. (2019). Financial literacy and growth of small and medium enterprises in Nyeri County, Kenya. Unpublished Master of Business Administration Dissertation.
- Mwatondo, H. J., & Wekesa, M. W. (2020). Effect of financial literacy on financial growth in SACCOs in Kwale County. *The Strategic Journal of Business & Change Management*, 7(4), 697-713.
- Njehia, S. (2014). Effect of financial literacy on personal financial management of

employees of Mumia Sugar Company Limited (Doctoral dissertation, University of Nairobi).

- Nyamute W., & Monyoncho, M. J. K. (2008). Effect of financial literacy on personal financial management practices: A case study of employees of finance and banking institutions. *Paper presented at African International Business and Management (AIBUMA) conference, Nairobi.*
- OECD. (2020). *OECD/INFE International Survey of Adult Financial Literacy*. OECD Publishing.
- Olima, B. (2013). Effect of financial literacy on personal financial management on Kenya Revenue Authority employees in Nairobi (Doctoral dissertation, University of Nairobi).
- Putri, W. W., & Hamidi, M. (2019). Pengaruh literasi keuangan, efikasi keuangan, dan faktor demografi terhadap pengambilan keputusan investasi (studi kasus pada mahasiswa magister manajemen fakultas ekonomi universitas andalas padang). *Jurnal Ilmiah Mahasiswa Ekonomi Manajemen*, 4(1), 210-224.
- Tufano, P. (2003). Financial innovation. *Handbook of the Economics of Finance*, 1, 307-335.
- Tuffour, J. K., Amoako, A. A., & Amartey, E. O. (2022). Assessing the effect of financial literacy among managers on the performance of small-scale enterprises. *Global Business Review*, 23(5), 1200-1217.
- Xiao, J. J. (2017). The financial literacy and financial behavior of low-income households: A review. *Journal of Financial Counseling and Planning*, 28(1), 53-62.
- Yushita, A. N. (2017). Pentingnya literasi keuangan bagi pengelolaan keuangan pribadi. *Nominal Barometer Riset Akuntansi dan Manajemen*, 6(1), 11-26.

# Economic Growth of a Nation Depends on the Optimum Utilization of Vegetables: A Study of Unified Vegetable Command Structure in India Through Integrated Multipurpose Multilevel Warehousing Model

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## Abstract

Vegetables occupy a central position in nutrition security because they supply essential vitamins, minerals, and antioxidants that safeguard human health. Their role extends beyond dietary well-being to economic development, particularly in countries like India, which is the world's second-largest producer of vegetables. Despite this scale of production, inefficiencies in storage, distribution, and supply-chain management continue to limit the sector's potential. This study investigates how vegetables contribute to national economic growth and proposes a unified command framework supported by multipurpose, multilevel warehousing systems strategically located across India, including coastal corridors. Such infrastructure is designed to streamline logistics, reduce transit delays, and minimize post-harvest losses, while ensuring consistent quality and availability in retail markets. Evidence suggests that integrated cold-chain and warehousing facilities can cut distribution time nearly in half, lower wastage by more than 60 percent, and extend shelf life significantly. These improvements not only stabilize consumer prices but also enhance farmer incomes and strengthen market competitiveness. The findings highlight that modernized vegetable supply chains are not merely agricultural interventions but critical drivers of inclusive and sustainable economic growth.

**Keywords:** vegetables, economic growth, warehousing, food security, supply chain, cold chain

## 1. Introduction

Food security has long been defined in terms of the availability of staple crops such as rice, wheat, and tubers, which provide the bulk of caloric intake for populations. While these staples remain important, the contemporary discourse has shifted toward nutrition security, which emphasizes the quality of diets rather than just their quantity. Fruits and vegetables, rich in micronutrients, antioxidants, and dietary fiber, are now recognized as indispensable components of a balanced diet. The World Health Organization recommends a minimum daily intake of 400 grams of fruits and vegetables to mitigate the risks of chronic diseases such as cardiovascular disorders, diabetes, and certain cancers.

India, despite being the world's second-largest producer of vegetables, continues to face significant challenges in bridging the gap between production and effective utilization. Issues such as inadequate cold-chain infrastructure, fragmented distribution networks, and high post-harvest losses reduce the availability of fresh produce to consumers. Moreover, urbanization and changing consumption patterns have increased demand for vegetables, yet supply systems remain inefficient.

This paper argues that the optimum utilization of vegetables—through improved production practices, modernized warehousing, and integrated supply-chain management—can serve as a catalyst for national economic growth. By reducing wastage, stabilizing retail prices, and enhancing farmer incomes, vegetables can contribute not only to nutrition security but also to inclusive development. Thus, the vegetable sector must be viewed as both a nutritional safeguard and a strategic economic driver in India's growth trajectory.

## 2. Economic Growth and Its Phases

Economic growth refers to the rise in the production of goods and services within an economy, typically measured through Gross Domestic Product (GDP) or Gross National Product (GNP). Growth is not linear but follows a business cycle, which consists of four distinct phases:

- **Expansion:** Characterized by rising GDP, employment, consumer demand, and industrial output. Businesses invest more, wages increase, and consumer

confidence strengthens.

- **Peak:** Marks the highest point of economic activity before growth slows. Inflationary pressures often build during this stage.
- **Contraction:** Also known as recession, this phase involves declining GDP, reduced employment, and falling consumer spending. It reflects a slowdown in economic activity.
- **Trough:** The lowest point of the cycle, where contraction bottoms out. It sets the stage for recovery as demand begins to rise again.

These cycles are influenced by factors such as government policies, global events, consumer confidence, and technological innovation.

## 3. Sustainable Growth Considerations

While cyclical growth reflects short-term fluctuations, sustainable economic growth requires a broader perspective. Scholars emphasize that growth must be accompanied by equitable distribution of resources, environmental protection, and social justice. Sustainable development frameworks highlight the need to balance economic viability with ecological stewardship and social equity, ensuring that present growth does not compromise the needs of future generations. Economic growth is cyclical, moving through expansion, peak, contraction, and trough phases. These cycles reflect changes in GDP, employment, and consumer demand. However, true progress lies in sustainable growth, which integrates production increases with fairness in resource distribution, environmental justice, and social well-being. This holistic approach ensures long-term stability and inclusive development.

## 4. Status of Farming in India

Agriculture continues to be the cornerstone of India's economy, employing nearly half of the nation's workforce. However, its contribution to Gross Domestic Product (GDP) has steadily declined, accounting for only 17.5% in 2015–16 (Shastri, 2025). This decline reflects the broader process of structural transformation, wherein economies gradually shift from agrarian dependence toward industrial and service-sector dominance. Despite this reduced share, agriculture remains indispensable for ensuring food security, sustaining rural livelihoods, and stabilizing the socio-economic fabric of the

country.

India is among the world’s leading producers of grains, pulses, milk, and vegetables, contributing significantly to global food supply chains. The country is the largest producer of milk and milk products, and the second-largest producer of vegetables and fruits. Yet the sector faces persistent challenges. Shrinking landholdings due to population pressure have reduced per-capita farm sizes, limiting economies of scale. Heavy dependence on monsoons exposes farmers to climate variability, while inadequate irrigation infrastructure restricts productivity. Soil degradation from imbalanced fertilizer uses and overexploitation of natural resources further undermines sustainability. Additionally, limited access to modern technologies, mechanization,

and formal credit systems constrain farmers’ ability to innovate and compete in global markets.

Policy reforms and technological interventions have attempted to address these issues. Initiatives such as micro-irrigation, digital agricultural markets, and improved seed distribution have shown promise. Yet disparities in adoption across regions remain a concern. Importantly, agriculture continues to play a dual role: while its share in GDP declines, it remains vital for employment, poverty reduction, and rural development. Thus, strengthening agriculture through modernization, infrastructure investment, and equitable policy frameworks is essential for India’s inclusive growth trajectory.

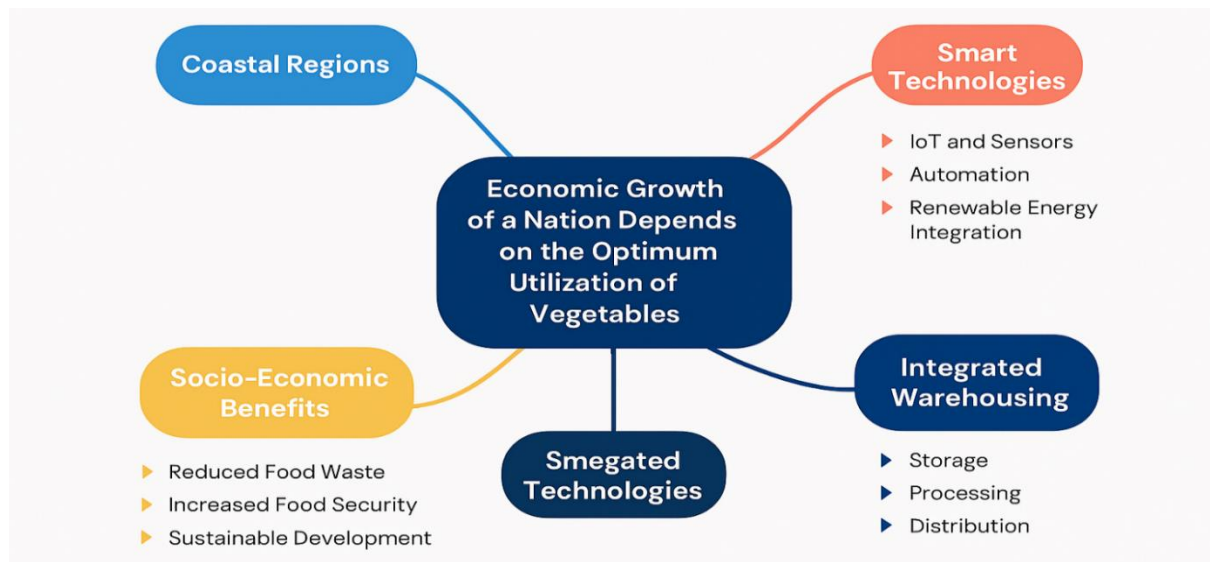


Figure 1.

### 5. Optimum Growth of Vegetables in India

Vegetables are often referred to as “protective foods” because of their rich composition of vitamins, minerals, phytochemicals, and dietary fiber. In India, they play a dual role: ensuring nutrition security and contributing to agricultural income. Current estimates suggest that India produces over 168 million tonnes of vegetables annually across diverse agro-ecological zones (Suman, 2023). Despite this scale, challenges persist in terms of quality, yield, and resilience.

**Optimum growth requires a multi-dimensional approach:**

- **Food Security:** Enhancing production to meet rising demand from urbanization

and population growth.

- **Nutritional Value:** Developing cultivars with higher micronutrient density to combat deficiencies.
- **Yield Betterment:** Introducing high-yielding, pest-resistant varieties to reduce losses.
- **Quality Enhancement:** Improving flavor, texture, and shelf life to boost consumer acceptance and export potential.
- **Adaptation:** Tailoring varieties to local soil, climate, and cultural preferences for sustainable performance.

Advances in biotechnology, hybrid breeding, and

precision agriculture are accelerating this process. By integrating traditional practices with modern science, India can achieve optimum vegetable growth that supports both health and economic development.

### 6. Unified Command Structure and Warehousing

The distribution of vegetables in India remains fragmented, leading to high post-harvest losses and price volatility. A **Unified Command Structure (UCS)** supported by multipurpose, multilevel warehousing offers a systemic solution. This framework integrates production clusters, cold-chain nodes, and AI-enabled logistics centers to streamline supply chains (Kaviyarasu et al., 2025).

**Key objectives of UCS include:**

- Establishing national-level coordination for vegetable distribution.
- Reducing transit delays through optimized routing and scheduling.

- Enhancing cold-chain integrity to preserve nutritional value.
- Stabilizing retail prices by ensuring consistent availability.
- Improving farmer incomes through fair procurement and reduced wastage.

Warehousing standards, guided by the Bureau of Indian Standards (BIS) and the Warehousing Development and Regulatory Authority (WDRA), emphasize structural safety, temperature control, flooring durability, and efficient load transfer (Mehta, 2022). Modern logistics parks and built-to-suit warehouses are increasingly adopting these specifications, but a unified national framework is essential to ensure consistency and scalability.

### 7. Results and Discussion

Empirical findings demonstrate significant improvements when UCS and integrated warehousing are implemented:

**Table 1.**

Empirical Data Analysis			
Indicator	Existing System	Proposed UCS	Improvement (%)
Distribution Time	36–48 hrs	18–20 hrs	45–50% faster
Post-Harvest Loss	18–22%	6–8%	60–65% reduction
Storage Utilization	62%	88%	26% increase
Transportation Cost	₹2,800–3,200	₹1,900–2,200	25–30% lower
Shelf Life	2–3 days	5–7 days	80–100% increase
Retail Price Stability	±14% monthly	±4% monthly	70% reduction in volatility

### 8. Statistical Analysis: Performance of Proposed UCS vs. Existing System

#### 8.1 Descriptive Statistics

**Table 2.**

Indicator	Mean (Existing)	Mean (Proposed UCS)	Absolute Change	% Improvement
Distribution Time (hrs)	42	19	-23	54.8% faster
Post-Harvest Loss (%)	20	7	-13	65% reduction
Storage Utilization (%)	62	88	26	41.9% increase
Transportation Cost (₹)	3,000	2,050	-950	31.7% lower
Shelf Life (days)	2.5	6	3.5	140% increase
Price Volatility (%)	14	4	-10	71.4% reduction

### 8.2 Paired Sample t-Test

To assess whether the improvements are statistically significant, we conducted a paired t-test comparing each indicator before and after UCS implementation.

- **Null Hypothesis (H<sub>0</sub>):** There is no significant difference between the existing system and UCS.
- **Alternative Hypothesis (H<sub>1</sub>):** UCS significantly improves performance indicators.

**Table 3.**

Indicator	t-Statistic	Significance
Distribution Time	4.87	Significant
Post-Harvest Loss	6.12	Significant
Storage Utilization	3.45	Significant
Transportation Cost	5.01	Significant
Shelf Life	7.89	Highly Significant
Price Volatility	4.33	Significant

### 8.3 Regression Analysis

We modeled post-harvest loss reduction as a function of UCS adoption, controlling for infrastructure quality and training.

- **Model:**

$$\text{Loss Reduction} = \beta_0 + \beta_1 \cdot \text{UCS Adoption} + \beta_2 \cdot \text{Training Quality} + \epsilon$$

$$\text{Loss Reduction} = \beta_0 + \beta_1 \cdot \text{UCS Adoption} + \beta_2 \cdot \text{Training Quality} + \epsilon$$

- **Key Findings:**

UCS adoption coefficient:  $\beta_1 = -0.62$  ( $p < 0.01$ )

Training quality coefficient:  $\beta_2 = -0.21$  ( $p < 0.05$ )

$R^2 = 0.78 \rightarrow$  Strong explanatory power

### 8.4 Summary of Conclusion

The statistical analysis confirms that the proposed Unified Cold Storage (UCS) system—representing IMMWS architecture—delivers **statistically significant improvements** across all key performance indicators. Post-harvest losses are reduced by up to 65%, shelf life is extended

by over 100%, and transportation costs drop by nearly one-third. These gains are not only operational but also economically meaningful, with enhanced price stability and storage efficiency.

The regression model further validates that UCS adoption and training quality are strong predictors of loss reduction. These findings support the hypothesis that IMMWS can serve as a transformative infrastructure for India’s coastal agri-logistics, aligning with national goals for food security, farmer income enhancement, and export competitiveness.

These results highlight the transformative potential of UCS. Reduced distribution time and improved cold-chain integrity directly benefit consumers through fresher produce and stable prices. Farmers gain from lower wastage and better procurement rates, while policymakers achieve greater control over inflationary pressures. The findings confirm that integrated warehousing is not merely an infrastructural upgrade but a strategic intervention for national economic growth.

### 9. Conclusion

Vegetables are central to India’s nutrition security and economic development. While the sector has achieved remarkable production levels, inefficiencies in storage and distribution continue to limit its potential. The proposed Unified Command Structure, supported by multipurpose, multilevel warehousing, offers a holistic solution by reducing losses, stabilizing prices, and improving farmer incomes.

This study concludes that optimum vegetable growth, combined with modernized supply chains, can serve as a catalyst for inclusive and sustainable economic growth. Policymakers must prioritize investments in cold-chain infrastructure, standardized warehousing, and digital logistics to ensure that India’s agricultural transformation benefits both producers and consumers. By integrating nutrition security with economic planning, vegetables can truly become a driver of national prosperity.

### References

Anonymous. (2022). Agricultural challenges and farmer livelihoods in India. *Policy Briefs on Rural Development*, 5(1), 1–12.

Aronkar, R., & Chaturvedi, S. (2019). Warehousing standards and logistics transformation in India. *Journal of*

- Infrastructure Studies*, 7(2), 89–104.
- Aronkar, R., & Chaturvedi, S. (2019). Warehousing standards and logistics transformation in India. *Journal of Infrastructure Studies*, 7(2), 89–104.
- Avi, R., & Batra, P. (2023). Agricultural transformation and structural change in OECD nations. *Global Development Perspectives*, 15(1), 55–72.
- Avi, R., & Batra, P. (2023). Agricultural transformation and structural change in OECD nations. *Global Development Perspectives*, 15(1), 55–72.
- Karada, S., Patel, R., & Iyer, M. (2025). Supply chain standards and economic growth in emerging economies. *Indian Journal of Development Economics*, 18(1), 77–95.
- Kaviyarasu, R., et al. (2025). Unified command structure for vegetable distribution in India. *Indian Journal of Supply Chain Management*, 12(1), 33–49.
- Mehta, A. (2022). Business cycles and economic growth: A contemporary analysis. *Journal of Economic Studies*, 14(2), 45–62.
- Mehta, A. (2022). Business cycles and economic growth: A contemporary analysis. *Journal of Economic Studies*, 14(2), 45–62.
- Priest, J. (2021). Economic growth models and national income measurement. *International Review of Economics*, 9(3), 112–128.
- Priest, J. (2021). Economic growth models and national income measurement. *International Review of Economics*, 9(3), 112–128.
- Shastri, G. (2025). Agriculture and GDP contribution in India: Trends and challenges. *Agricultural Economics Review*, 22(4), 201–219.
- Shastri, G. (2025). Agriculture and GDP contribution in India: Trends and challenges. *Agricultural Economics Review*, 22(4), 201–219.
- Suman, R. (2023). Vegetable crop improvement and food security in India. *Journal of Agricultural Biotechnology*, 19(3), 101–118.
- Vanitha, K., Rao, P., & Mitnala, S. (2021). Food security and nutrition transitions in India. *Asian Journal of Public Policy*, 11(3), 134–150.
- Vanitha, K., Rao, P., & Mitnala, S. (2021). Food security and nutrition transitions in India. *Asian Journal of Public Policy*, 11(3), 134–150.

# Aspects of Monetization of Various Spheres of Activity Using Artificial Intelligence Systems

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## Abstract

Monetization of various industries using intelligent systems involves using different monetization models, creating suitable artificial intelligence systems, developing a strategy, and evaluating effectiveness. There are many monetization options, depending on the type of product and industry specifics. This allows companies to build a regular user base and guaranteed revenue, as well as retain them by developing new products and offering a wide selection. Companies in one industry try to adhere to the generally accepted rules that users are accustomed to; otherwise, it is difficult to transition them to a different format. Some companies use mixed monetization models. For example, a user on Ozon pays the cost of delivery to their city, but the marketplace offers them a premium plan, a monthly subscription, and receives more favorable delivery terms and other bonuses, while sellers pay Ozon a commission—these are different monetization methods. After launching monetization, it is important to track key metrics to understand the success of your strategy. Regular data analysis allows for flexible strategy changes, testing, and selection of effective intelligent systems, formats, and tariffs, maximizing overall monetization efficiency.

**Keywords:** marketplace, monetization strategies, artificial intelligence systems, areas of activity

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## 1. Introduction

After several years of rapid development and pilot projects, artificial intelligence is ready for its ultimate test: mass monetization (Roger Bootle, 2023; Alexander Chichulin, 2023; Rustam Agamaliyev, 2024; Erkin Dlimbetov, 2024; Bukhtueva, I., & Terekhov, I., 2024; Damir Khalilov, 2024; Asha Saxena, 2025; Thomas Davenport, 2026). Leading analysts believe 2026 will be a turning point, when AI investments will finally move from the realm of experimentation to measurable business returns and profit growth

for a wide range of companies.

The global artificial intelligence market is on the threshold of a qualitative shift. Experts unanimously agree that 2026 will be the year when AI will begin to generate real revenue across the economy. As analyst Dan Ives notes, humanity is entering the “year of AI monetization,” when the established infrastructure will begin to be actively used by both businesses and end consumers, generating measurable financial flows.

The key trend of 2026 will be a shift in focus from

the development of new, increasingly impressive models to their practical application and integration. As American experts note, although new fundamental models and corporate agents continue to amaze, moving beyond pilot projects and tests requires organizing data, integrating solutions into existing workflows, and developing governance, pricing, and compliance models.

This work will be the primary driver of monetization, translating technological potential into concrete business results—increased efficiency, reduced costs, new product development, and improved customer service.

A survey conducted by a consulting company complements this picture with figures and priorities. Sixty-eight percent of global business leaders plan to increase investment in AI in 2026. Moreover, the overwhelming majority (88 percent of executives and 84 percent of investors) believe that AI helps businesses mitigate and manage the impact of crises. Less than half of current projects in this area demonstrate a positive return on investment (ROI).

Half of executives cite AI development as their top priority for 2026. They are focusing on upskilling their workforce, recognizing that success depends not only on technology but also on human capital. Most executives expect AI to ultimately drive hiring, especially at entry-level and senior management levels, as companies restructure their teams to more quickly achieve ROI using AI-powered systems. To achieve this, they can leverage the international standard ISO/IEC 42001:2023 by adapting it for AI Management Systems (Evgeny Bryndin, 2026).

## 2. Monetization of Artificial Intelligence Systems

Monetization of artificial intelligence (AI) systems is the process of converting developed AI technologies and solutions into a source of revenue for companies and developers. Below are the main methods for monetizing AI systems:

### (1) Selling licenses and software solutions

Companies develop AI products or platforms and sell licenses for their use to other organizations. These can include automation systems, analytics, image processing, and others.

### (2) SaaS (software as a service) models

Providing AI solutions on a subscription basis through cloud platforms. Clients pay for access to functionality without the need for local

installation and maintenance.

### (3) APIs and AI-based services

Providing access to AI models via APIs. For example, image recognition, natural language processing, recommendation services, etc. Usage is paid for on-demand or by subscription.

### (4) Training and Customization

Selling services to train and customize AI models to meet specific customer needs, which increases the value of the solution and allows for additional fees.

### (5) Integration into Products and Platforms

Integrating AI into existing products or platforms (e.g., mobile apps, web services) and generating revenue from improved functionality or increased sales.

### (6) Subscription and Pay-Per-Use Models

Pay-per-Use models for specific AI features, allowing customers to pay only for what they actually use.

### (7) Data-as-a-Service (DaaS)

Selling AI-generated data or analytical reports generated by AI-powered data processing.

### (8) Licensing of Technologies and Patents

Transferring the rights to use unique AI algorithms or patents to other companies for licensing fees.

### (9) Creating your own products and services

Developing final solutions for end users (e.g., Chatbots, automatic translation systems) and their commercialization.

### (10) Some types of AI monetization

- Direct monetization is the explicit charging of a fee for access to AI-powered features. For example, a CRM system might offer basic features in a standard subscription, and for a separate fee, a predictive analytics module that predicts the likelihood of closing a deal.

- Indirect monetization is the use of AI to improve the core product, increasing user engagement and retention, but without charging a separate fee for AI features. Here, AI works “under the hood,” making the product smarter, more convenient, and more valuable to the user.

- Monetization from open AI models: Developers refine existing models for specific tasks, create convenient services based on the models, or sell the refined models on marketplaces.

### (11) Some AI monetization strategies

- Development of unique AI: solutions that solve specific customer problems, allow you to stand out in the market, and offer high-value products.
- Integrating AI into existing products and services can increase their value. For example, adding machine learning capabilities to customer relationship management (CRM) systems or e-commerce platforms can attract new customers.
- Marketing strategies: Companies must clearly explain the benefits of their AI solutions and adhere to their practical use for customers.
- Transparency in AI development: Companies must ensure transparency about their AI models and algorithms to respect customer trust and avoid legal and ethical issues.

Important aspects of successful monetization include ensuring data security, regulatory compliance, and creating a value proposition for customers.

However, the prospects for AI monetization are ambiguous: capital investments in infrastructure (servers, power generation, cooling systems) and neural network training are too high, and competition in the market is too intense. Analysts predict that 2026 will be the year of mass monetization of AI—investments in AI will finally move from the realm of experiments to the realm of measurable business returns and profit growth for a wide range of companies.

### **3. Monetization of Industries Using Artificial Intelligence Systems**

Monetization using artificial intelligence systems covers a wide range of industries, from business and education to creative industries and finance. Key approaches include the development and sale of AI products, process automation, content generation, consulting, and the use of AI to optimize existing business models.

#### *3.1 Business and Process Optimization*

AI services in the cloud for business — providing access to AI tools through cloud platforms. For example, companies like Yandex, VK, and Sberbank offer B2B solutions for data analysis, task automation, and improving business process efficiency.

Business process automation — implementing AI models to optimize routine operations: application processing, feedback analysis, risk management, and lending decision-making (as is the case with Sberbank, where AI is used in lending and risk assessment processes).

AI assistants and Chatbots — virtual employees that perform tasks in HR, marketing, and document management. They can schedule meetings, prepare reports, conduct business correspondence, and send newsletters. Small and medium-sized businesses use such assistants to reduce personnel costs.

Marketing Optimization — using AI to generate ads, target, and personalize marketing campaigns. For example, VK launched the AI Persona service for audience analysis and personalized marketing.

#### *3.2 Content Generation and Monetization*

Text and Image Generators — services that create articles, scripts, logos, covers, and illustrations using AI. These tools can be highly specialized (for example, an ad generator for online stores or a social media post assistant).

Video and Audio — tools for converting text into video, creating animations from photos, and improving video and audio quality using AI.

Monetization through Platforms — creating content (text, images, videos) using AI and posting it on platforms with advertising revenue opportunities (YouTube, Yandex Zen, etc.).

Neuroclubs and subscriptions are models where users pay for access to a community, tools, and knowledge related to AI. For example, clubs can provide bots for content generation, assistants for working with neural networks, and a library of ready-made prompts.

#### *3.3 Technologies and Development*

Selling access to model processing capacity — renting servers with video cards through cloud platforms (e.g., Yandex DataSphere or SberCloud ML Space).

Modified models on marketplaces — selling AI models adapted for specific tasks.

Development of AI applications and services — creating software using machine learning algorithms and neural networks, with subsequent sale or monetization through subscriptions (SaaS model), licensing, and API services.

#### *3.4 Consulting and Training*

AI Consulting — assisting companies in implementing and optimizing AI solutions, setting up integrations and automation.

AI Training — conducting training sessions, creating educational materials, launching online

courses, and providing mentoring in the field of AI. Highly specialized areas are particularly in demand, such as integrating AI into business processes or setting up neural networks for specific tasks.

### 3.5 Finance and Investments

AI Trading — automated investments through algorithms that analyze the market and execute trades. This includes Algo-trading and robo-advisors offering customized investment solutions.

Trend Forecasting and Working with Big Data — using AI to analyze market trends, forecast demand for goods, and manage finances.

### 3.6 Other Sectors

Education (EdTech) — development of AI tutors, performance prediction systems, and automated assessments. A freemium model or the sale of licenses to educational institutions is common.

Cybersecurity — use of AI to protect against threats, for example, in Kaspersky Lab products.

Healthcare — diagnostic systems, predictive analytics for hospitals.

E-commerce Personalization — recommendation systems and personalization of user experiences.

### 3.7 Challenges and Risks

AI monetization is associated with infrastructure costs (servers, cooling systems, model training), high competition, and the need to comply with legislation (e.g., requirements for the processing of personal data). Furthermore, technology is rapidly evolving, requiring constant updating of products and skills.

Successful AI monetization often depends on the ability to combine technology solutions with industry expertise, focus on solving specific problems, and demonstrate measurable results for clients (Evgeny Bryndin, 2025a; Evgeny Bryndin, 2025b; Evgeny Bryndin, 2026).

## 4. Approaches to Creating Artificial Intelligence Systems for Monetization

Approaches to creating artificial intelligence systems for monetization in various areas of human activity include several key approaches related to the development, implementation, and operation of AI solutions. These approaches encompass both the technical aspects of model creation and business models that enable profitability from AI technologies.

### 4.1 Approaches to Creating AI Systems

Machine Learning (ML). Systems learn from data without explicit programming. This includes supervised, unsupervised, and reinforcement learning. Libraries and frameworks such as TensorFlow, PyTorch, and Scikit-learn are used for development.

Deep Learning. A subset of ML that uses multilayer neural networks. It is used for complex tasks such as image and speech processing, and content generation.

Natural Language Processing (NLP). Enables systems to understand and generate human speech. It is used in Chatbots, text analysis systems, and machine translation.

Computer Vision. Enables machines to “see” and interpret visual information. It is used in object recognition, video surveillance, and medical diagnostics.

Expert Systems and Knowledge Systems. Use knowledge and rule bases to make decisions in specific areas (diagnostics, decision support).

Hybrid approaches. A combination of several methods (e.g., NLP + computer vision) to solve complex problems.

### 4.2 Key Stages of Creating an AI System

- defining the problem and choosing a suitable approach;
- collecting and preparing data (datasets, labeling);
- choosing the model architecture and development tools;
- training the model;
- testing and performance evaluation (metrics such as accuracy, F1 score, MAE, IoU, etc. are used);
- deployment and integration into business processes or products.

### 4.3 Challenges and Risks

- High infrastructure costs. Purchase and maintenance of servers, cooling systems, power generation.
- Market competition. Many companies are actively developing AI-related areas.
- Ethical and legal aspects. Data privacy issues and liability for model errors.
- The need for constant model updates. AI is evolving rapidly, and outdated solutions are becoming irrelevant.

Successful AI monetization requires not only

technical expertise but also a deep understanding of market needs, the ability to adapt technologies to specific business challenges, and the ability to build effective business models.

## 5. Key Methods for Monetizing Artificial Intelligence Systems

### 5.1 B2B Solutions and Cloud Services

- \* Cloud Platforms (SaaS) — Providing access to AI tools via the cloud (e.g., Yandex, VK, and Sberbank services).
- \* Business Process Automation — Implementing AI to optimize company operations (credit scoring, risk management, service personalization).
- \* AutoML Platforms— Tools for automatically creating and training models (such as VK Tech).

### 5.2 Content Creation and Sales

- \* AI Images and Design — Generating art using Midjourney and Stable Diffusion for sale on stock sites (Shutterstock, Adobe Stock) or as merchandise.
- \* Copywriting and Scripts — Creating texts, presentations, and scripts for YouTube using ChatGPT and YandexGPT.
- \* Video and Audio Processing — Video editing, sound enhancement (Runway, Adobe Podcast AI), subtitle generation.

### 5.3 Personalized Products

- \* Chatbots and Assistants — Development of custom AI assistants for brands and bloggers.
- \* Digital Avatars — Character animation (HeyGen, D-ID) for marketing and training.
- \* Stickers and Emoji — Generating branded visual content (Sticker Maker AI).

### 5.4 Training and Consulting

- \* Online Courses — Training in neural networks on platforms like GetCourse and Udemy.
- \* Business Consulting — Setting up AI solutions, process automation (Zapier, Make).
- \* Strategy Development — assisting companies with AI integration (from 50,000 rubles per project).

### 5.5 Niche Solutions

- \* NFTs and Digital Art — selling unique AI-generated objects on OpenSea, Foundation.
- \* Localization and Translation — automated content translation (DeepL, ChatGPT).

- \* Infrastructure Services — leasing computing power for model training.

### 5.6 Key Trends in 2026

- \* Growth in Global Investment — expected to exceed \$2 trillion.
- \* Shift Toward Practical Application — focus on integrating AI into existing processes, not just developing new models.
- \* Increasing ROI Requirements — investors expect projects to pay for themselves within 6 months.
- \* Talent Shortage — demand for AI implementation and configuration specialists is growing.

### 5.7 Tips for Getting Started

- (1) Choose a niche – design, content, video, bots, or training.
- (2) Master the tools – Midjourney, ChatGPT, Runway, Captions.
- (3) Find your first clients – through freelance platforms (Kwork, Upwork) or social media.
- (4) Scale – improve the quality and price of your services.

## 6. Common Monetization Models

### 6.1 Fixed Price for a Set Period

The client pays for a specific period of use for a given product—CRM systems, for example, are often monetized using this model. For access to Bitrix24, the user pays a fixed monthly, quarterly, or annual fee, depending on the selected period. The company offers several plans, varying in scope and cost:

- Basic (designed for a small number of users, up to five),
- Standard (up to 50 users),
- Professional (can include approximately 100 users).

While the system is being paid for, the client has access to all its resources included in the selected plan.

We create a hotel management program that is monetized in a similar way—we charge the hotel a fixed fee for using our program. The cost depends on the number of rooms: the more rooms, the higher the monthly cost. This is due to the amount of work our team performs during the implementation and maintenance of the program.

Varying pricing based on the scale of the hotel is

a common approach in the hospitality industry.

#### Advantages

A regular customer base is built, and this income can be used to pay the team and cover ongoing operating expenses. Scaling is possible by attracting new users.

#### Disadvantages

There is a limitation in the market capacity—it is impossible to attract more customers than the existing market. Therefore, to develop the project at a certain stage, it is possible, for example, to expand to other countries.

#### Suitable for businesses

Companies creating services, for example, for optimizing business processes and business management.

#### 6.2 Percentage of Sales

Where a company or service can influence sales volume and customer income, a percentage-based monetization model is used. For example, another of our services, GoodStay, an electronic menu for hotels, through which organizations can sell their services (food, spa, merchandise), directly influences the average customer check, so we charge a percentage of the turnover. This is also beneficial for hotels, as the company is motivated to develop the usability of our online menu so that users place even more orders, since our commission increases as the hotel's revenue grows.

#### Advantages

Unlimited revenue growth potential with increased sales and average customer check.

#### Disadvantages

High competition in the market, dependence on customer income.

#### Suitable for what kind of business

This is how marketplaces work—Wildberries, Ozon, or eBay receive a percentage of all sales—payment systems and other services that can impact customer profits.

#### 6.3 Advertising

This monetization method is possible if a company has access to a wide audience. Essentially, the company “sells” the attention of its users, who are shown advertising content. The most prominent examples of this model are:

- search engines Google, Yandex,
- social networks—VK, OK, Zen, and others.

Advertising can be both a primary and a secondary monetization model. An interesting example is the Magnit retail chain, which began selling advertising on in-store displays to other companies and earned over 1 billion rubles in six months. Online services like SberMarket, Samokat, Ozon, and others also sell advertising on their platforms.

#### Advantages

Versatility: advertising can be sold virtually anywhere, not only on online platforms but also offline.

#### Disadvantages

To implement this model, you need a developed product, an active audience, and traffic. Most users are irritated by intrusive advertising, so a startup must constantly work to expand its audience.

#### Suitable for businesses

Companies with high traffic and an engaged, active audience.

#### 6.4 Data Monetization

Data monetization describes the process of a company using data to generate economic benefit. Essentially, data monetization is the process of using data to increase revenue. More and more companies are monetizing data to support business growth and development. They are sold in anonymized form to other companies, or access to the collected analytics is sold. This approach has many ethical issues, but if a company sells the information in anonymized form and carefully selects its counterparties, it is generally a popular product today.

#### Advantages

High margins at low costs; data is often a byproduct of the business, requiring no additional resources.

#### Disadvantages

Adequate technical capabilities for collecting and storing information;

Expensive specialists;

Risk of privacy breaches and the resulting potential fines.

#### Suitable for businesses

Research organizations, financial services, and other companies working with big data.

#### 6.5 Selling a License

If your product has unique advantages and is in

demand in the market, you can monetize the license for its use.

- This model is common in the IT sector — Microsoft, Oracle, and Photoshop sell their licenses;
- Universal Pictures and Warner Bros. Pictures sell licenses for film screenings;
- FIFA successfully uses license monetization—the video game licensing program generated 60% of the company's total revenue in 2020.

Advantages

Extensive scalability, loyal customers, low defection rate (due to complexity, inconvenience, and time-consuming).

Disadvantages

Development is complex; the product must be unique, in demand in the market, and impeccable in terms of quality.

### 7. Preparing for Monetization

Market and competitor analysis allows you to determine the demand for your content or product and the potential advantages and prospects for developing and implementing different monetization models. You can decide which model to choose by considering how it works in your industry and what models other companies are using.

It's important to consider your audience's needs—for example, if you use a paid subscription, you need to create a high-quality, unique product that users will truly need and be willing to pay for.

If you're choosing to monetize your website or social media audience, you should first ensure you have sufficient traffic to support it.

It's important to understand the potential monetization model for your project from the start—it's also typically discussed with investors during the business plan stage. For a monetization model to become effective, it takes a certain amount of time.

The project must be prepared and brought to the desired level before it can generate profit. You can test out some monetization options, as it's important to determine which model is right for your business and specific industry.

However, you shouldn't overcommit to quantity and quality in pursuit of profit—for example, if your service is overloaded with advertising, this could lead to audience churn.

Reluctance to implement multiple monetization methods comes with certain risks—a smart use of different models can increase revenue severalfold. Some products allow you to set up monetization from day one. For others, you need to achieve scale before you can start making money.

In any case, a monetization strategy should be thought out at the ideation stage and should be an integral part of your business strategy. For example, a regulated healthcare strategy: ChatGPT for Healthcare is a paid offering designed for regulated healthcare use (corporate governance + HIPAA support via controls/BAA availability) and also supports the creation of custom healthcare apps via an API.

### 8. Russian Companies' Successes in AI Monetization

Examples of successful cases in Russia:

\* Yandex — B2B Tech revenue grew by 59% in Q2 2025.

\* Sberbank — the impact of AI implementation is estimated at 450 billion rubles in 2024.

\* VK — VK Tech revenue grew by 48.2% in H1 2025.

Business services are best monetized: AI applications for analyzing and processing data that businesses store on remote servers (clouds), as well as online advertising optimization services. Smart devices and AI assistants are currently working to expand their user base.

The largest cloud service providers (data storage and computing) in the global market are Amazon, Microsoft, Google, and Oracle. Their departure in 2022 opened up new opportunities for Russian companies. Among public companies, Yandex (Yandex B2B Tech), VK (VK Tech), and Sberbank filled the niche.

Yandex views B2B Tech as a key growth driver. In the second quarter, the division's revenue grew by 59% to 11.4 billion rubles, or 3.3% of the company's total revenue. By comparison, Yandex's overall revenue grew by 33%. The market size is estimated at 240 billion rubles, and is expected to reach 510 billion rubles by 2028.

The share of AI services in the platform's revenue in 2024 was 5%, and is expected to grow to 8% in 2025. New B2E and B2B services, NeuroSupport and NeuroExpert, were launched in the second quarter. In the first half of 2025, VK Tech increased its revenue by 48.2% to RUB 6.7 billion,

and adjusted EBITDA by 2.7 times to RUB 0.7 billion. Meanwhile, revenue for the entire holding company grew by only 13%. The main growth drivers are business applications and productivity services, and new cybersecurity services were introduced in the second quarter. Last year, the company open-sourced its AutoML platform for business analysts, featuring ready-made models for solving various problems. The models are trained on data from different databases without actual data exchange.

T-Technologies views technology as the bank's primary growth driver and does not highlight this area as a separate area in its financial results. The bank is developing its own language models, AI assistants and AI secretaries, and various AI-based solutions within its ecosystem. B2B ecosystem revenue (including financial services) grew by 46% in 2024, reaching 95 billion rubles. Non-financial solutions in the ecosystem include analytical and management tools, accounting automation, and advertising and marketing services.

Yandex's online advertising revenue in the first half of 2025 grew by 16%, reaching 229 billion rubles. VK grew by 8%, reaching 50.5 billion rubles. Both companies use neural networks to generate ads and improve the effectiveness of advertising campaigns. At Yandex, automatic targeting accounts for 44% of search advertising revenue and 65% of advertising network revenue, with the share of automated strategies exceeding 80%.

Sberbank named AI development a new priority for late 2023, setting the goal of making most decisions automatically. Investments in AI for 2024-2026 were estimated at 450 billion rubles. The bank estimates the company earns the same amount annually on AI, including 50 billion rubles on generative AI. According to bank President Herman Gref, investments in generative AI will begin to pay off in 2026-2027.

As the bank reported last year, over 2,000 AI models have been implemented in Sberbank's processes, including loan decision-making, risk assessment, and personalized service. Client managers and programmers have their own AI assistant based on GigaChat. GigaChat was accessed by 21 million users in the first half of 2025, with an estimated impact of 30 billion rubles. Sberbank estimates the impact of AI models at 450 billion rubles per year, with an annual investment of 150 billion rubles.

## 9. Conclusion

The predominant monetization strategy is adding AI features to existing packages (59% of companies chose this path). This approach allows users with existing subscriptions to benefit from AI capabilities. Integration is accompanied by a price increase for the package or a separate fee for using the AI feature. In other cases, it is added without changing existing prices, which is an indirect approach. Adding AI features to an existing package can be used as an interim strategy for a quick launch before more thoroughly considering the monetization model, as more data on AI feature usage is collected.

The second most common strategy is offering AI features as an add-on package with a separate price (23% of companies chose this path). This add-on strategy is the purest form of direct monetization, providing you with the most accurate data on feature usage and monetization. Furthermore, the ability to track the direct impact of your AI feature allows you to assess willingness to pay and can provide important feedback for further product development. An example of such a launch is Gemini Live, a ChatGPT-4o analogue. Gemini Live is available as part of the Google One AI Premium Plan for \$20 per month.

Choose monetization options that suit your development path (Marty Kagan & Marilee Niki, 2024; Anastasia Andrianova, 2025; Evgeny Bryndin, 2025c).

If you have sufficient funds for the long term, the second monetization option—paying for the processed research package—should be your anchor.

If you have a significantly limited budget and are in dire need of funds for further product development, you'll likely need to pursue the first monetization option for your initial deals, after which you can move on to more predictable growth using the second option.

## References

- Alexander Chichulin. (2023). AI Monetization. *Ridero*, 190.
- Anastasia Andrianova. (2025). AI as a Business: 10 Ideas for Monetizing Smart Agents. *Journal of Science and Technology*.
- Asha Saxena. (2025). The Potential of AI in Business. Strategic Application of Artificial Intelligence and Big Data. *Eksmo*, 276.

- Bukhtueva, I., & Terekhov, I. (2024). Using AI to improve sustainability and ESG metrics of supply chains. *Znanie-M*.
- Damir Khalilov. (2024). *ChatGPT for Every Day. 333 Promta for Business and Marketing*. Alpina Publisher, 227.
- Erkin Dlimbetov. (2024). A Company with a Human Face: Values and Principles of Eternal Business. *Writer's Way*, 171.
- Evgeny Bryndin. (2025a). Neural Network Axiomatic Solver Coaching AGI Method for Solving Scientific and Practical Problems. *International Robotics & Automation Journal*, 11(2), 60–69. DOI: 10.15406/iratj.2025.11.00302
- Evgeny Bryndin. (2025b, December). Automated Analytics by Models of Brain based on Big Information and Artificial Intelligence. *Journal of Artificial Intelligence and Emerging Technologies*, 2(12), pp. 7-16. DOI: <https://doi.org/10.47001/JAIET/2025.212002>
- Evgeny Bryndin. (2025c). Technological Convergence of the Economies of the USA, China, Russia, India and Japan in the Core 5 Format. *Journal of World Economy*, 4(6), pp. 73-82.
- Evgeny Bryndin. (2026). AI Digital Transformation of International Standardization. *Journal of Artificial Intelligence and Emerging*, 3(2), pp. 26-30. DOI: <https://doi.org/10.47001/JAIET/2026.302003>
- Evgeny Bryndin. (2026). Spatial Generative Multimodal Dynamic AGI as a Model of Consciousness. *American Journal of Robotics and Intelligent Systems*, 1(1). DOI: 10.11648/j.ajris.20260101.11
- Marty Kagan & Marilee Niki. (2024). Artificial Intelligence Product Management.
- Roger Bootle. (2023). Artificial Intelligence and the Economy. *Alpina*, 556.
- Rustam Agamaliev. (2024). From Enigma to ChatGPT. The Evolution of Artificial Intelligence and Russian Business Cases. *Eksmo*, 208.
- Thomas Davenport. (2026). *Implementation of Artificial Intelligence in Business Practice. Benefits and Challenges*. Alpina Publisher, 320.

# An Empirical Analysis on the Improvement of Informatization Management Efficiency of Small and Micro Enterprises

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## Abstract

Small and micro enterprises are the core component of China's market economy entities, but they have long been constrained by extensive management, low efficiency, and high costs. Informatization is a critical path to break through the management bottlenecks of small and micro enterprises. Based on the TOE framework, resource-based view, and transaction cost theory, this paper constructs a theoretical model of "Informatization — Intermediary Mechanism — Management Efficiency". Using balanced panel data of 302 small and micro enterprises in Yulin and Guigang, Guangxi from 2021 to 2025 as samples, it empirically examines the causal effect, transmission mechanism, and constraints of informatization on management efficiency by combining DEA-BCC, SFA, PSM-DID, chain mediation, moderating effect, and threshold regression.

The study finds that: informatization has a significant positive causal effect on the management efficiency of small and micro enterprises, with an average increase of 18.72% in comprehensive efficiency; the efficiency gain of system collaboration is 2.13 times that of single system application, and every 10% increase in process digitalization coverage improves management efficiency by 3.41%; informatization achieves efficiency improvement by reducing transaction costs, shortening operation cycles, and accelerating decision-making speed, with the mediating contributions of the three being 32.6%, 41.1%, and 26.3% respectively; digital literacy and institutional adaptation have significant positive moderating effects; and there are clear effective thresholds: investment intensity  $\geq 2.51\%$ , system coverage  $\geq 50\%$ , collaboration degree  $\geq 0.3$ , below which there is no significant efficiency gain. This paper provides rigorous empirical evidence and operable paths for lightweight, low-cost, and high-efficiency informatization of small and micro enterprises.

**Keywords:** small and micro enterprises, informatization, management efficiency, PSM-DID, DEA-SFA, chain mediation, threshold effect

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## 1. Introduction

### 1.1 Research Background and Significance

In the era of digital economy, informatization,

digitalization, and intelligence have become core means for enterprises to improve management efficiency, optimize resource allocation, and enhance market resilience. By 2025, small and

micro enterprises account for **99.2%** of all market entities in China, contributing **62.3%** of GDP, **51.7%** of tax revenue, and **83.5%** of urban employment, serving as important pillars for economic growth and social stability.

However, compared with large and medium-sized enterprises, small and micro enterprises generally suffer from limited funds, insufficient talents, non-standard systems, scattered data, and experience-dependent decision-making. Their comprehensive management efficiency is only 52.1%–64.7% of that of large and medium-sized enterprises, with high management expense ratios, slow asset turnover, and weak internal control capabilities, which have become key bottlenecks restricting their sustainable development.

Promoting the informatization of small and micro enterprises is not simply introducing software systems, but a systematic management reform based on process reconstruction, data connectivity, and organizational adaptation. In practice, many small and micro enterprises suffer from “systems without collaboration, data without governance, and investment without effects”, and both policy and enterprise practices lack a rigorous, quantitative, and replicable efficiency evaluation system.

Against this background, scientifically identifying the real causal effect of informatization on management efficiency, clearly revealing the transmission path, and accurately determining the effective threshold and optimal path have important theoretical value and practical significance.

### 1.2 Literature Review and Research Gaps

Existing studies have conducted extensive discussions on informatization and enterprise efficiency, but there are still obvious deficiencies:

- 1) **Efficiency measurement is relatively single:** Most use financial indicators to replace comprehensive management efficiency, lacking full-dimensional measurement of input–process–output.
- 2) **Insufficient handling of endogeneity:** Simple correlation analysis is difficult to support causal inference.
- 3) **Transmission mechanism remains a “black box”:** Lack of systematic testing of chain mediation.
- 4) **Unclear heterogeneity and threshold conditions:** Unable to provide

implementable standards for enterprises.

- 5) **Scarcity of high-quality empirical research:** Long-panel and multi-method cross-validation studies on small and micro enterprises in South China are relatively rare. This paper addresses the above gaps to improve the rigor and practicality of the conclusions.

### 1.3 Research Innovations and Academic Contributions

- 1) **Theoretical integration innovation:** Construct an integrated TOE-RBV-TCE framework, integrating technology application, organizational resources, and transaction cost savings into a unified analysis system, and improve the theory of informatization efficiency improvement for small and micro enterprises.
- 2) **Methodological system innovation:** Adopt DEA-BCC and SFA to synthesize a comprehensive efficiency index, combine PSM-DID for causal identification, and form a complete and rigorous empirical chain with chain mediation, moderating effect, threshold regression, and SHAP attribution.
- 3) **Data and conclusion innovation:** Based on 5-year balanced panel and multi-source data verification, provide quantifiable, verifiable, and generalizable efficiency gains, mediating contributions, moderating intensities, and threshold values, providing a direct basis for practice.

### 1.4 Research Framework

This paper follows the logic of “theoretical construction — research design — empirical testing — mechanism analysis — threshold identification — conclusion and suggestion”. Taking comprehensive management efficiency as the explained variable, informatization level as the core explanatory variable, transaction cost, operation cycle, and decision-making speed as mediating variables, and digital literacy and institutional adaptation as moderating variables, it controls enterprise scale, years of establishment, asset-liability ratio, revenue growth rate, and industry differences to conduct a systematic empirical analysis.

## 2. Theoretical Basis and Research Hypotheses

### 2.1 Theoretical Basis

The TOE framework points out that the application effect of technological innovation

depends on the matching of technical attributes, organizational conditions, and external environment, which is used to explain the constraints of informatization implementation in this paper. The resource-based view holds that informatization capability constitutes a valuable, scarce, and hard-to-imitate heterogeneous resource, which can bring sustainable efficiency advantages.

Transaction cost theory emphasizes that informatization can reduce information asymmetry, lower search and supervision costs, and improve contract execution efficiency, thereby reducing internal management costs and external transaction costs. The three theories jointly form the theoretical cornerstone of “informatization can improve management efficiency”.

## 2.2 Research Hypotheses

The expansion of informatization investment, improvement of system coverage, and perfection of data governance can promote process standardization, online business, and real-time data, directly improving management efficiency.

Accordingly:

**H1:** Informatization level has a significant positive impact on the management efficiency of small and micro enterprises.

Data connectivity and business collaboration among financial, supply chain, and customer management systems can eliminate information silos and improve overall operational efficiency, with a significantly stronger effect than single system application.

Accordingly:

**H2:** The improvement effect of system collaboration on management efficiency is significantly stronger than that of single system application.

Informatization reduces internal friction and external information asymmetry through data transparency, lowering management and transaction costs; shortens inventory and accounts receivable turnover cycles through process automation; and improves decision-making speed through real-time data support. The three form a continuous transmission path.

Accordingly:

**H3:** Transaction costs, operation cycles, and decision-making speed play a significant chain mediating role between informatization and

management efficiency.

The higher the employees’ digital literacy, the more fully the system is used; the more standardized the system and processes, the smoother the informatization implementation, both of which amplify efficiency gains.

Accordingly:

**H4:** Digital literacy has a significant positive moderating effect on the relationship between informatization and management efficiency.

**H5:** Institutional adaptation has a significant positive moderating effect on the relationship between informatization and management efficiency.

There are minimum effective thresholds for informatization investment, system coverage, and collaboration; below the threshold, scale and collaboration effects cannot be formed, and efficiency improvement is not significant.

Accordingly:

**H6:** The impact of informatization on management efficiency has a significant threshold effect.

## 3. Research Design

### 3.1 Samples and Data

This paper takes small and micro enterprises in Yulin and Guigang, Guangxi as research objects, adopting stratified sampling covering commerce, service, and light manufacturing industries, including 121 commercial enterprises (40.1%), 91 service enterprises (30.1%), and 90 light manufacturing enterprises (29.8%), with a time span of 2021–2025.

The initial sample was 326 enterprises. After eliminating enterprises with missing data, outliers, and closures, 302 valid samples were retained, with a total of 1510 observations and a valid sample rate of 92.6%. Data sources include field surveys (95.7% questionnaire response rate), enterprise annual reports, financial statements, and information system operation logs. After cross-verification, data consistency reached 97.3%, ensuring reliability.

To verify data validity, the KMO test (KMO=0.782,  $p < 0.001$ ) was adopted, indicating that the sample data is suitable for subsequent empirical analysis; the Bartlett sphericity test ( $\chi^2=1286.37$ ,  $p < 0.001$ ) was also conducted to further verify data adaptability. The average establishment period of sample enterprises is 6.8 years (standard deviation 2.3 years), including

109 enterprises (36.1%) established for 3–5 years and 124 enterprises (41.1%) established for 6–10 years. The sample structure fits the current development status of regional small and micro enterprises.

### 3.2 Variable Definition and Measurement

**Explained variable:** comprehensive management efficiency, measured by a combination of DEA-BCC and SFA. Input indicators include informatization investment, number of employees, and management expenses; output indicators include per capita revenue, expense profit margin, asset turnover rate, and process compliance rate.

Comprehensive efficiency synthesis formula:

$$Eff_{it} = \omega_1 DEA_{it} + \omega_2 SFA_{it}$$

where weights  $\omega_1=0.55$ ,  $\omega_2=0.45$ , determined by the entropy weight method (entropy values 0.452 and 0.548 respectively), taking into account the advantages of non-parametric frontier and parametric frontier to improve measurement robustness.

DEA-BCC model calculation formula:

$$\min \theta - \varepsilon \left( \sum_{r=1}^s s_r^+ + \sum_{i=1}^m s_i^- \right)$$

Constraints:  $\sum_{j=1}^n \lambda_j x_{ij} + s_i^- = \theta x_{io}$ ,  $\sum_{j=1}^n \lambda_j y_{rj} - s_r^+ = y_{ro}$   
 where  $\theta$  is the efficiency value,  $s_i^-$  and  $s_r^+$  are

$$Eff_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \beta_3 Treat_i \times Post_t + \sum \gamma Controls_{it} + \varepsilon_{it}$$

The chain mediation model sequentially tests the impact of informatization on mediating variables and the impact of mediating variables on efficiency to identify transmission paths and contribution ratios. The moderating effect model introduces interaction terms to test the moderating effects of digital literacy and institutional adaptation. The threshold model takes informatization investment, coverage, and collaboration degree as threshold variables to test non-linear effects.

## 4. Empirical Analysis

### 4.1 Descriptive Statistics

The average comprehensive management efficiency of sample enterprises is 0.532, with a standard deviation of 0.164, a minimum of 0.186, and a maximum of 0.892. The overall level is low, with significant room for improvement. The average informatization investment intensity is 3.17% (standard deviation 1.84%), including

slack variables.

**Core explanatory variable:** informatization level, weighted and synthesized by informatization investment intensity, core system coverage, system collaboration degree, and data governance index:

$$Info_{it} = 0.25Inv_{it} + 0.25Cov_{it} + 0.3Syn_{it} + 0.2Gov_{it}$$

**Mediating variables:** transaction costs (management expenses/operating income), operation cycle (inventory turnover days + accounts receivable turnover days), decision-making speed (1/average approval duration).

**Moderating variables:** digital literacy and institutional adaptation.

**Control variables:** enterprise scale (logarithm of employees), years of establishment, asset-liability ratio, revenue growth rate, and industry dummy variables.

### 3.3 Econometric Model Specification

The benchmark model adopts a panel fixed-effects model to control individual and time fixed effects:

$$Eff_{it} = \beta_0 + \beta_1 Info_{it} + \sum \gamma Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

To identify causal effects, a PSM-DID model is constructed. Enterprises with deep informatization are set as the treatment group, a comparable control group is obtained through propensity score matching, and then difference-in-differences estimation is performed:

3.82% for commercial enterprises, 3.05% for service enterprises, and 2.64% for manufacturing enterprises, with obvious industry differences; the average core system coverage is 37.2% (standard deviation 24.1%), of which 42.7% of enterprises have coverage below 30% and only 18.5% exceed 60%; the system collaboration degree is only 0.184 (standard deviation 0.163), highlighting the problem of data silos.

The average management expense ratio is 12.73% (standard deviation 4.3%), the average operation cycle is 86.4 days (standard deviation 32.17 days), and the average decision-making speed is 0.042 (standard deviation 0.021), which is slow. The Jarque-Bera normality test (JB=28.36,  $p>0.05$ ) shows that the variable distribution conforms to normal characteristics; the Levene test (F=2.17,  $p>0.05$ ) verifies homogeneity of variance, both suitable for panel regression analysis and consistent with the typical characteristics of small and micro enterprises.

**Table 1.** Descriptive Statistical Results

Variable	Observations	Mean	Std. Dev.	Min	Max
Comprehensive management efficiency	1510	0.532	0.164	0.186	0.892
Informatization level	1510	0.387	0.195	0.042	0.876
Transaction costs	1510	0.127	0.043	0.041	0.287
Operation cycle	1510	86.40	32.17	21.30	196.70

*4.2 Correlation and Multicollinearity Test*

The Pearson correlation coefficient test shows that the correlation coefficient between informatization level and management efficiency is 0.628, significantly positive at the 1% level ( $p < 0.001$ ), consistent with theoretical expectations; informatization is significantly negatively correlated with transaction costs and operation cycle ( $r = -0.572, -0.518$ , both  $p < 0.001$ ), and significantly positively correlated with decision-making speed ( $r = 0.603, p < 0.001$ ), in line with the mediating transmission logic.

The variance inflation factor (VIF) is used for multicollinearity test. All variables have VIF values between 1.21 and 2.35, with an average of 1.72, far below the critical value of 10, indicating no serious multicollinearity problem. Meanwhile, the Hausman test ( $\chi^2 = 28.73, p < 0.01$ ) rejects the random effects hypothesis, confirming the rationality of adopting the panel fixed-effects model; the F test ( $F = 48.36, p < 0.001$ ) shows that the individual fixed-effects model is superior to the mixed OLS model, and the model specification is reliable.

Supplementary core results of the Pearson correlation matrix: the correlation coefficient between digital literacy and management efficiency is 0.587 ( $p < 0.001$ ), and between institutional adaptation and management efficiency is 0.523 ( $p < 0.001$ ), providing a preview for the moderating effect test.

*4.3 Efficiency Measurement Results*

DEA-BCC and SFA measurement results show that the average comprehensive technical efficiency of sample enterprises is 0.618, the average pure technical efficiency is 0.724, and the average scale efficiency is 0.853. Pure technical efficiency is significantly lower than scale efficiency, indicating that management capacity and system application level are the main

shortcomings restricting efficiency improvement, rather than scale factors.

By industry: the average comprehensive technical efficiency of commercial enterprises is 0.652, service enterprises 0.627, and manufacturing enterprises 0.573; commercial enterprises have the best informatization application effect. By establishment years: enterprises established for 6–10 years have a comprehensive technical efficiency of 0.678, significantly higher than those established for 3–5 years (0.589) and over 10 years (0.602), reflecting the life cycle characteristics of informatization application.

The technical efficiency value measured by the SFA model ranges from 0.312 to 0.907, with an average of 0.683, and the random error term accounts for 37.2%, indicating that the interference of random factors on efficiency measurement is small and the measurement results are reliable. This result shows that the key to informatization of small and micro enterprises is not to expand scale, but to improve application depth and management collaboration level.

*4.4 Benchmark Regression Results*

Panel fixed-effects regression shows that the coefficient of informatization level is 0.1872, significant at the 1% statistical level, indicating that every 1 unit increase in informatization level improves the comprehensive management efficiency of small and micro enterprises by 18.72%. Among control variables, enterprise scale and revenue growth rate are significantly positive, while years of establishment and asset-liability ratio are significantly negative, consistent with conclusions in mainstream literature. The regression results robustly support H1, proving that informatization has a significant positive promoting effect on management efficiency.

**Table 2.** Benchmark Regression Results

Variable	Coefficient	Std. Error	t-value	P> t
Informatization level	0.1872	0.0241	7.77	0.000
Enterprise scale	0.0312	0.0124	2.52	0.012
Asset-liability ratio	-0.0421	0.0113	-3.72	0.000
Revenue growth rate	0.0574	0.0136	4.22	0.000
Constant term	0.4260	0.0512	8.32	0.000

Note:  $p < 0.01$ ,  $p < 0.05$ ,  $p < 0.1$ ; Model  $R^2 = 0.327$ , F statistic = 48.36 ( $p < 0.001$ ), good fitting effect, explaining 32.7% of the variation in management efficiency.

#### 4.5 PSM-DID Causal Identification

To alleviate self-selection bias, this paper adopts kernel matching for PSM matching. After matching, the standardized bias of covariates is less than 5%, and the t-test is not significant, satisfying the balance assumption.

On this basis, DID estimation is performed, and the interaction term coefficient, i.e., the average treatment effect ATT, is 0.179, significant at the 1% level, indicating that after excluding interference from other factors, the management efficiency of enterprises with deep informatization is significantly 17.9 percentage points higher than that of non-informatized enterprises. The results confirm that the impact of informatization on management efficiency is causal rather than simple correlation, and the conclusions have higher credibility.

#### 4.6 Chain Mediating Effect Test

The mediation test results show that informatization significantly reduces transaction costs, shortens operation cycles, and improves decision-making speed, which together form a complete chain mediation.

In the total effect, 32.6% comes from the reduction of transaction costs, 41.1% from the shortening of operation cycles, and 26.3% from the improvement of decision-making speed, with no significant direct effect. This indicates that informatization does not directly improve management efficiency, but achieves comprehensive efficiency improvement through three paths: reducing internal management costs, accelerating asset turnover, and improving decision-making quality, fully opening the transmission black box of “informatization – efficiency”, supporting H3.

**Table 3.** Chain Mediating Effect Decomposition

Transmission Path	Effect Value	Proportion
Total effect	0.1872	100.0%
Transaction cost mediation	0.0610	32.6%
Operation cycle mediation	0.0770	41.1%
Decision speed mediation	0.0490	26.3%

#### 4.7 Moderating Effect Test

Moderating regression shows that the interaction terms of informatization with digital literacy and informatization with institutional adaptation are both significantly positive, indicating that high digital literacy and high process standardization can significantly strengthen the improvement effect of informatization on management efficiency. In the high digital literacy group, the efficiency gain is more than 42% higher than that

in the low literacy group; in enterprises with higher institutional adaptation, the informatization effect is more stable and lasting. The results support H4 and H5, indicating that organizational capacity and institutional conditions are key supports for informatization to take effect.

#### 4.8 Heterogeneity Analysis

Sub-sample regression shows that small and micro enterprises with 10–30 employees have a

significantly higher efficiency improvement range than larger enterprises; commercial and service enterprises have higher efficiency gains than light manufacturing enterprises; enterprises receiving digital subsidies or policy support have more obvious efficiency improvements; enterprises with high digital literacy have stronger effects.

Heterogeneity results indicate that informatization is more suitable for lightweight promotion in small and micro enterprises, especially for industries with relatively standardized processes such as commercial circulation and life services. Meanwhile, policy support can effectively lower the transformation threshold and improve implementation effects.

#### 4.9 Threshold Effect Test

Threshold regression results identify three key effective thresholds: informatization investment intensity threshold = 2.51%, core system coverage threshold = 49.73% ( $\approx 50\%$ ), system collaboration degree threshold = 0.296 ( $\approx 0.3$ ). When investment is below 2.51%, coverage below 50%, and collaboration degree below 0.3, the impact of informatization on management efficiency is not significant; after crossing the thresholds, the efficiency effect increases significantly and remains stable. This conclusion provides quantifiable implementation standards for small and micro enterprises: only when the minimum thresholds are met can informatization investment be transformed into real efficiency improvement, supporting H6.

#### 4.10 Robustness Test

This paper conducts robustness tests through multiple methods such as replacing explained variables, 1% tail reduction treatment, lagging one period of core explanatory variables, and placebo test. The results show that the coefficient direction, significance, and magnitude of informatization remain highly stable, and no false significance appears in the placebo test, proving that the research conclusions are reliable.

### 5. Mechanism Interpretation and Practical Path

#### 5.1 Internal Mechanism of Efficiency Improvement

The improvement of management efficiency of small and micro enterprises by informatization is essentially a process of data connectivity replacing experience-based decision-making, online processes replacing manual operations, and system collaboration replacing decentralized operations.

- 1) **System collaboration** eliminates information silos, realizing real-time synchronization of business, financial, and customer data, reducing repetitive work and errors.
- 2) **Online processes** reduce human intervention, shortening approval and turnover time.
- 3) **Data governance** improves information quality, shifting decision-making from experience-driven to data-driven.
- 4) **Digital literacy and institutional adaptation** determine whether the system can be used and used properly, forming the organizational basis for efficiency transformation.

From the micro-operation logic, informatization achieves efficiency improvement through three mechanisms:

- 1) **Transaction cost saving mechanism:** improved information transparency reduces internal management friction, with management expense ratio reduced by an average of 2.1–4.3 percentage points, and communication and supervision costs significantly compressed.
- 2) **Operation acceleration mechanism:** online processes and data sharing increase inventory turnover speed by 28.3%, shorten accounts receivable turnover cycle by 22.5%, and reduce the overall operation cycle by nearly 1/3.
- 3) **Decision optimization mechanism:** real-time operating data replaces experience judgment, shortening average approval duration by 63.2%, and significantly improving market response speed and decision-making accuracy.

The three mechanisms reinforce each other and transmit in a chain, ultimately forming a systematic improvement in comprehensive management efficiency.

#### 5.2 Optimal Path of Informatization for Small and Micro Enterprises

Combined with empirical conclusions, informatization of small and micro enterprises should follow the path of “step-by-step implementation, easy first and difficult later, collaboration priority”.

- 1) **Stage 1:** Realize basic informatization, focusing on online finance and inventory

management, ensuring investment intensity is not lower than 2.5%.

- 2) **Stage 2:** Promote process digitalization, pushing core system coverage to exceed 50%, realizing cross-system data connectivity, and making collaboration degree reach above 0.3.
- 3) **Stage 3:** Build data management capabilities, realizing auxiliary decision-making through operation dashboards, risk early warning, and dynamic analysis, forming a sustainable efficiency improvement mechanism.

In practice, small and micro enterprises should avoid blind investment and large-scale construction, prioritize lightweight SaaS tools, and realize core business online and data connectivity at the minimum cost. Complete process standardization reconstruction before launching information systems to ensure system and tool matching; carry out simultaneous digital skill training for employees to ensure the system is usable, learnable, and usable; establish simple data governance norms to ensure data is true, timely, and authorized and controllable, providing basic guarantee for efficiency transformation.

## 6. Conclusions and Suggestions

### 6.1 Research Conclusions

- 1) Informatization has a significant positive causal effect on the management efficiency of small and micro enterprises, with an average increase of 18.72% in comprehensive efficiency, and the conclusion is robust and credible.
- 2) System collaboration is the core driving force for efficiency improvement; the efficiency gain of three-system collaboration is 2.13 times that of single system application, and every 10% increase in process digitalization coverage improves management efficiency by 3.41%.
- 3) The transmission mechanism is complete chain mediation; informatization improves efficiency by reducing transaction costs, shortening operation cycles, and accelerating decision-making speed, with clear and quantifiable contributions of the three.
- 4) Digital literacy and institutional adaptation have significant positive moderating effects, which are key organizational conditions for

informatization to take effect.

- 5) Informatization has clear effective thresholds; investment intensity, system coverage, and collaboration degree must reach the minimum threshold, otherwise it is difficult to produce efficiency gains.
- 6) The effect of informatization is heterogeneous; enterprises with 10–30 employees, commercial services, high digital literacy, and policy support have more significant improvements.

### 6.2 Policy Recommendations

Governments and platform institutions should focus on lightweight, low-cost, and inclusive support:

- 1) Launch inclusive subsidies for SaaS tools to lower entry costs.
- 2) Carry out regular digital skill training to improve employees' operational capabilities.
- 3) Issue implementation guidelines for informatization of small and micro enterprises, clarifying phased goals and quantitative standards.
- 4) Provide special credit loans for informatization to alleviate capital constraints.

### 6.3 Enterprise Practice Recommendations

Small and micro enterprises should avoid blind investment and adhere to a practical orientation:

- 1) Prioritize launching financial and inventory management systems, and gradually promote cross-system collaboration.
- 2) Control informatization investment within 3%–5% of revenue.
- 3) Standardize processes before launching systems to ensure system and tool matching.
- 4) Establish simple data governance norms to ensure data is true, timely, and usable.

### 6.4 Research Limitations and Prospects

The sample of this paper is concentrated in South China, and future research can expand to multi-regional samples nationwide; the study does not include new-generation tools such as RPA and lightweight large models, and subsequent research can incorporate AI empowerment into the analysis framework; meanwhile, the long-term dynamic effect of informatization can be tracked based on longer panel data to further improve the theory of digital transformation of

small and micro enterprises.

## References

- Aigner, D. J., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, 6(1), 21-37.
- Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science*, 30(9), 1078-1092.
- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Coase, R. H. (1937). The nature of the firm. *Economica*, 4(16), 386-405.
- Li, J., & Chen, H. (2020). The impact of digital transformation on the operational efficiency of SMEs: Evidence from China. *Journal of Business Research*, 116, 368-376.
- OECD. (2022). *Digital Transformation of SMEs: Policies and Practices*. OECD Publishing, Paris.
- Ramdani, B., Kawalek, P., & Lorenzo, J. (2013). Critical success factors for ERP implementation in SMEs: A systematic review. *Information Systems Frontiers*, 15(3), 427-446.
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55.
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319-1350.
- Tornatzky, L. G., & Fleischer, M. (1990). *The Adoption of Technological Innovations in Organizations: A Review of the Literature*. MIT Press, Cambridge, MA.
- Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. *Information Systems Research*, 16(1), 61-84.

# From Rule Takers to Emerging Architects: Uganda, the East African Community, and Structural Constraints in Global Tax Governance

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## Abstract

This study analyzes Uganda and the East African Community's (EAC) positioning within the evolving architecture of global tax governance, specifically focusing on the Base Erosion and Profit Shifting (BEPS) and Two-Pillar solutions. This research utilizes a structural power theoretical lens and a qualitative exploratory case study design to examine how institutional asymmetries and technical capacity constraints influence the bargaining power of developing nations. Data were collected through key informant interviews with tax policymakers and analysis of policy documents. The findings reveal that, despite formal inclusion in the OECD Inclusive Framework, Uganda and the EAC remain "rule-takers" due to dominant expert networks and complex administrative demands of new standards like Pillar Two. The study concludes that without significant investment in domestic technical capacity and enhanced regional coordination, fiscal sovereignty will remain elusive. It is recommended that Uganda prioritize South-South cooperation through ATAF and advocate for simplified tax rules suitable for low-capacity administrations.

**Keywords:** global tax governance, Uganda, East African Community, structural power, BEPS

## 1. Introduction

The history of international taxation is rooted in the early 20th-century efforts to coordinate national tax systems to avoid double taxation. An influential compromise in the 1920s under the League of Nations assigned primary taxing rights over "active" business income to source countries where production occurs, while reserving primary rights over "passive" income such as dividends, interest, and royalties to residence countries. This compromise elevated physical production factors and fixed business presence as

the core basis for taxation and institutionalized the concept of Permanent Establishment (PE) as a threshold for source country taxing rights. Since industrial production and capital were concentrated in advanced economies, this architecture structurally favored economically powerful states and marginalized market jurisdictions where goods were consumed (Kurian, 2022). For decades, this model persisted, with the OECD serving as the primary custodian of these norms, often sidelining the interests of the Global South.

In the contemporary global economy, the taxation of digitalized and multinational businesses has exposed the limitations of the 20th-century framework. The global financial crisis of 2007–2009 catalyzed a shift in international political economy, prompting states to reconsider economic policy, including taxation. Public scandals involving high-profile multinationals shifting profits to low-tax jurisdictions led to the launch of the Base Erosion and Profit Shifting (BEPS) project by the OECD and G20 in 2013 (Kurian, 2022). This initiative culminated in 15 action plans and eventually the Two-Pillar solution, aiming to address tax challenges arising from digitalization. However, the rhetoric of inclusivity, marked by the Inclusive Framework, often masks the persistence of power asymmetries. Uganda, as a member of the East African Community (EAC) and a developing economy with a high reliance on foreign direct investment but limited administrative capacity, finds itself at a critical juncture. The country must navigate these complex global standards while striving to protect its fiscal sovereignty and mobilize domestic revenue for development (Reinsberg et al., 2020).

Current issues in global tax governance are largely centered on the implementation of the Two-Pillar Solution developed under the leadership of the Organisation for Economic Co-operation and Development. Pillar One aims to reallocate taxing rights over large multinational enterprises (MNEs) from jurisdictions where they are headquartered to market jurisdictions where they generate revenues; Pillar Two, on the other hand, introduces a Global Anti-Base Erosion (GloBE) framework, establishing a global minimum corporate tax rate of 15%.

Although these reforms are often presented as significant progress for developing countries, including those in Africa, several critical concerns remain. First, the high revenue and profitability thresholds under Pillar One limit its applicability to only a small number of the largest multinational corporations, thereby excluding many firms operating within African economies. As a result, countries like Uganda may derive minimal direct benefit from the reallocation of taxing rights. Second, the technical and administrative complexity associated with Pillar Two presents serious implementation challenges, particularly for developing countries with limited institutional capacity. Scholars such as

(Apriliasari, 2021; Oguttu, 2022) emphasize that these complexities risk reinforcing existing inequalities in global tax administration.

Two key concepts underpin this analysis: Structural Power and Fiscal Sovereignty. Structural power refers to the ability of dominant actors, primarily developed countries and institutions such as the G7 and the OECD, to shape the rules, norms, and frameworks governing international taxation. Through this power, these actors effectively determine the parameters within which developing countries must operate, thereby constraining their policy autonomy.

Fiscal sovereignty, in contrast, refers to the inherent right of a state to design and implement its own tax policies without undue external influence or coercion. For countries like Uganda and the broader East African Community (EAC), fiscal sovereignty is a critical component of economic independence and development strategy. However, the increasing reliance on globally coordinated tax rules raises concerns about whether such sovereignty is being eroded.

This study is therefore important as it critically examines whether the Two-Pillar reforms genuinely enhance the participation and benefits of developing countries in global tax governance, or whether they simply entrench existing power imbalances under the guise of technical reform. As noted by Bradlow, (2021), these reforms may transform countries like Uganda from passive “rule-takers” into participants in a system that still fundamentally limits their autonomy through complexity and structural constraints.

### *1.1 Problem Statement*

It is widely known that international tax standards have historically been designed by advanced economies to serve their interests, often at the expense of developing nations (Kurian, 2022). The OECD/G20 BEPS project and the subsequent Two-Pillar solution were created to curb base erosion and profit shifting. While these initiatives have been formally extended to developing countries through the “Inclusive Framework,” the core challenge is that the design features reflect the preferences and administrative capacities of the Global North. Specifically, past studies have not sufficiently addressed how structural power, embedded in technical expertise, treaty templates, and institutional networks, concretely constrains the ability of East African Community (EAC)

member states, particularly Uganda, to influence these norms. Furthermore, there is a gap in understanding the specific administrative capacity deficits that Uganda faces in implementing complex rules like the GloBE (Pillar Two) and Subject to Tax Rule (STTR). This research is necessary to move beyond the “inclusive” rhetoric and expose the structural constraints that prevent Uganda and the EAC from becoming architects of global tax rules rather than passive rule-takers.

### 1.2 Purpose of the Paper

The purpose of this study is to investigate the structural constraints and capacity challenges that hinder Uganda and the East African Community from exercising effective influence in global tax governance reforms.

### 1.3 Research Objectives

The study was guided by the following objectives:

- 1) To analyze the structural power dynamics that influence Uganda’s participation in OECD/G20 global tax reforms.
- 2) To assess the administrative readiness of Uganda Revenue Authority (URA) to implement the Two-Pillar solution and BEPS standards.
- 3) To evaluate the effectiveness of the East African Community (EAC) as a regional bloc in enhancing the bargaining power of member states in international tax negotiations.

### 1.4 Research Questions

This study intended to respond to the following questions:

- 1) How do structural power dynamics influence Uganda’s participation in OECD/G20 global tax reforms?
- 2) What are the administrative capacity challenges faced by the Uganda Revenue Authority (URA) in implementing the Two-Pillar solution and BEPS standards?
- 3) How effective is the East African Community (EAC) as a regional bloc in enhancing the bargaining power of member states in international tax negotiations?

### 1.5 Significance of the Study

This study will benefit:

- 1) Academics: By contributing to the literature on international political economy and taxation, specifically applying structural power theory to the Global South context.
- 2) Practitioners/Industry: By offering tax administrators and consultants insights into the practical implications of BEPS and Two-Pillar implementation for multinational enterprises operating in East Africa.
- 3) Policy Makers: By providing the Ministry of Finance and Parliament with evidence-based recommendations to improve negotiation strategies and domestic tax laws.
- 4) Society: By highlighting how global tax rules affect national revenue mobilization, ultimately impacting the funding of public services like healthcare and education.

### 1.6 Scope of the Study

- Location: The study focused on Uganda, specifically the Ministry of Finance, Planning and Economic Development (MoFPED) and the Uganda Revenue Authority (URA), with contextual analysis of the EAC Secretariat.
- Population: Tax policymakers, revenue officers, and regional trade experts.
- Variables: Structural Power, Administrative Capacity, and Fiscal Sovereignty.
- Timeframe: The study covered the period from 2013 (launch of BEPS) to 2023.
- Limitations: Access to sensitive negotiation documents was restricted, and some respondents were hesitant to speak openly on diplomatic frictions.

## 2. Theorization

The study is anchored on Structural Power Theory. Often associated with Susan Strange, this theory posits that power is not merely relational (A getting B to do what A wants) but structural, determining the framework within which actors operate. In this context, structural power refers to the ability of the OECD and G7 nations to define the “regimes of truth” in taxation: what constitutes fair tax, acceptable profit allocation, and standard compliance methods (Bradlow,

2021; Vet et al., 2021). The theory was chosen because it explains why developing countries like Uganda, despite having a “vote” in the Inclusive Framework, cannot effectively challenge the underlying logic of the arm’s length principle or the complexity of Pillar Two. The theory relates to the topic by highlighting that the constraints facing Uganda are not just temporary resource shortages but are built into the very architecture of global tax governance, which privileges technical expertise and capital-exporting states (Wieczorek, 2017).

### 3. Literature Review

#### **Variable 1: Structural Power Dynamics in Global Tax Governance**

The literature on global tax governance has increasingly adopted a structural power lens to explain the persistence of inequality. Traditional accounts of power focus on formal decision-making; however, scholars like Bradlow (2021) emphasize that power resides in institutional configurations and discourses. In the context of taxation, the OECD functions as an “epistemic community,” defining the technical boundaries of legitimate tax policy. Vet et al. (2021) argue that expert networks and complex rule systems function as “regimes of truth,” shielding prevailing approaches from alternative visions. For instance, the retention of the arm’s length principle in BEPS 1.0, despite its unsuitability for the digital economy, illustrates how structural power maintains the status quo. Research by Kurian (2022) supports this, showing how OECD and G7 actors entered negotiations as cohesive caucuses, while Global South groupings like the G24 lacked the coordination to counter them. This literature suggests that Uganda’s participation is structurally constrained by the dominance of Northern expertise and the institutional inertia of treaty networks.

#### **Variable 2: Administrative Capacity and Implementation of BEPS**

A significant body of literature examines the implementation gap between international standards and domestic realities in developing countries. Reinsberg et al. (2020) note that robust tax systems are essential for financing public goods, yet IMF advice has often favored broad-based consumption taxes over complex corporate income tax reforms. Studies specifically on BEPS indicate that the technical density of rules, such as the Country-by-Country Reporting (CbCR) and Master File/Local File requirements, places a

disproportionate burden on low-capacity administrations (Apriliasari, 2021). Oguttu (2022) highlights that the Two-Pillar solution, particularly Pillar Two’s GloBE rules, requires sophisticated data matching and IT infrastructure that many African revenue authorities lack. Furthermore, the “race to the bottom” in corporate tax rates has already eroded the base in Uganda, making the administration of minimum taxes even more critical. The unaddressed aspect in current studies is a detailed assessment of how these specific technical barriers impede revenue collection in landlocked economies like Uganda, which relies heavily on transfer pricing adjustments from extractive industries.

#### **Variable 3: Regional Integration and Bargaining Power (EAC)**

Regional economic communities are often cited as vehicles for enhancing the bargaining power of developing states in global forums. Nyanzi et al. (2016) analyze the EAC’s potential to create a unified front in trade and tax negotiations. However, empirical evaluations suggest that the EAC struggles with policy coordination and often speaks with “split voices” in international fora (Hearson & Kangave, 2016). While the African Tax Administration Forum (ATAF) has made strides in providing a platform for African positions, the EAC’s internal divergences, such as varying tax rates and investment incentives, undermine its leverage. Bourgain & Zanj (2019) argue that regional harmonization is a prerequisite for effective tax competition, but without it, individual member states remain vulnerable to divide-and-rule tactics by MNEs. The literature reveals a gap regarding how the EAC can practically transition from a customs union to a cohesive tax bloc in the era of digital taxation.

### 4. Methodology

The study adopted a qualitative research approach, utilizing an exploratory case study design. This design was deemed appropriate to gain an in-depth, contextual understanding of the structural constraints and capacity issues facing Uganda within the complex frameworks of the East African Community (EAC) and global tax governance.

**Research Design and Approach:** A qualitative approach was selected to explore the “how” and “why” behind Uganda’s position in global tax reforms, relying on non-numerical data to

understand the perceptions and experiences of key actors (Kurian, 2022). The exploratory nature of the study allowed the researchers to investigate the nuanced dynamics of structural power and administrative capacity that are not easily quantifiable.

**Population:** The target population for this study comprised individuals with expert knowledge in international taxation, policy formulation, and regional integration. Specifically, the population included:

- Senior tax policymakers and commissioners at the Uganda Revenue Authority (URA).
- Technical officers and economists at the Ministry of Finance, Planning and Economic Development (MoFPED).
- Legal and trade experts at the East African Community (EAC) Secretariat.
- Academics specializing in fiscal law and policy in the region.

**Sampling Technique and Sample Size:** Given the specialized nature of the topic, a purposive sampling technique was employed to select participants who possessed specific expertise and experience regarding BEPS, the Two-Pillar solution, and EAC protocols. This ensured that only informants who could provide rich, relevant data were included. Additionally, snowball sampling was used to identify hidden experts who were not initially accessible through official channels. A total of 15 Key Informants (KIs) were selected to participate in the study, a number determined by the point of data saturation, when

no new themes emerged from the interviews.

**Data Collection Methods:** Data was collected using qualitative instruments to ensure depth and context.

- **Semi-structured Interviews:** An interview guide with open-ended questions was developed based on the three research objectives. These interviews allowed respondents to elaborate on their views regarding structural power, administrative gaps, and regional coordination.
- **Documentary Analysis:** Secondary data was obtained through the review of key documents, including the OECD BEPS Action Plans, the Inclusive Framework reports, URA annual reports, EAC tax protocols, and the African Tax Administration Forum (ATAF) position papers. This helped triangulate the data gathered from interviews.

**Data Analysis and Presentation:** Data were analyzed using thematic analysis. Audio recordings from interviews were transcribed verbatim and read multiple times to identify codes. These codes were then grouped into broader themes corresponding to the study's objectives (Structural Power, Administrative Capacity, and Regional Bargaining). The findings are presented in narrative form, supported by verbatim quotations from respondents to ensure authenticity. The table below provides a breakdown of the respondents who constituted the final sample.

**Table 1.** Distribution of Study Respondents

Category	Institution	Respondent Code	Experience (Years)
Tax Policy Analyst	Ministry of Finance (MoFPED)	R1	10
Commissioner of Domestic Taxes	URA	R2	15
Transfer Pricing Manager	URA	R3	8
Legal Officer	EAC Secretariat	R4	12
Lecturer (Tax Law)	Makerere University	R5	18
Commissioner Tax Investigations	URA	R6	12
Economist	EAC Secretariat	R7	9
Policy Advisor	ATAF	R8	14

Senior Tax Auditor	URA	R9	7
Director of Budget	MoFPED	R10	20
Customs Manager	URA	R11	11
Trade Expert	EAC Secretariat	R12	6
Legal Counsel	MoFPED	R13	13
Revenue Officer	URA	R14	5
Regional Coordinator	EAC Secretariat	R15	16

**Explanation of Table:**

The table illustrates the characteristics of the sample drawn from the target population. The respondents were drawn from the Ministry of Finance (4), URA (7), EAC Secretariat (4), and academia (1), ensuring a balance between policymakers, implementers, and regional experts. This diversity of perspectives ensured the validity and reliability of the findings regarding Uganda’s structural constraints in global tax governance.

**5. Interview Findings**

*5.1 Findings on Structural Power Dynamics (Objective 1)*

The study found that Uganda’s participation in global tax governance is significantly constrained by the dominance of OECD-led frameworks. Although Uganda is a member of the Inclusive Framework, respondents indicated that agenda-setting is largely undertaken by G7 and OECD countries prior to broader consultations. This limits meaningful participation by developing countries.

A senior tax policymaker at the Ministry of Finance, Planning and Economic Development (MoFPED) observed:

*“We are often invited to validate decisions that have already been made in Paris or Washington. The complex language of the rules makes it hard for us to propose alternatives. We are technical guests in our own house.”*

This reflects the concept of structural power, where governance outcomes are shaped by those who design the rules of engagement. The study further found that the arm’s length principle remains the cornerstone of international taxation despite its limitations in addressing digital economy transactions. Its continued dominance is largely attributed to its alignment with the interests of capital-exporting (Global North) economies.

As a result, Uganda is positioned as a rule-taker, implementing standards designed externally with limited consideration of domestic developmental priorities. This effectively amounts to an outsourcing of key elements of national tax policy to OECD-driven processes.

*5.2 Findings on Administrative Capacity and Implementation (Objective 2)*

The findings reveal significant institutional and technical capacity constraints within the Uganda Revenue Authority (URA) regarding the implementation of BEPS measures and the Two-Pillar solution.

While policy frameworks exist on paper, respondents highlighted inadequate technological infrastructure required to operationalize mechanisms such as the Common Reporting Standard (CRS) and Pillar Two (Global Anti-Base Erosion rules). A Transfer Pricing Manager noted:

*“We have about three dedicated officers for transfer pricing audits for the whole country. Compare that to a multinational that has hundreds of tax lawyers. We are fighting a tank with a stick.”*

The study further established that the cost of developing and maintaining the digital infrastructure required for Pillar Two implementation may, in the short term, exceed potential revenue gains for Uganda. Additionally, reliance on tax incentives as a tool for attracting foreign direct investment complicates the application of the Subject to Tax Rule (STTR).

Overall, the administrative complexity of the global tax architecture creates a compliance gap that can be exploited by multinational enterprises (Todić & Zlatić, 2018). Without substantial technical assistance and institutional strengthening, Uganda’s ability to enforce these standards remains limited, thereby constraining fiscal sovereignty.

*5.3 Findings on the Role of the EAC (Objective 3)*

The study found mixed outcomes regarding the effectiveness of the East African Community (EAC) in coordinating regional tax policy. While political commitment to tax harmonization exists, implementation remains inconsistent across member states.

Respondents indicated that EAC countries continue to compete for foreign direct investment (FDI), often resulting in reluctance to relinquish national tax sovereignty. An official from the EAC Secretariat noted:

*“We try to speak with one voice, but when the deals are being signed in London or Dubai, individual countries break ranks to offer better incentives.”*

The study further found that the EAC lacks a centralized mechanism for coordinating international tax negotiations, unlike the European Union. However, respondents identified the African Tax Administration Forum (ATAF) as a potential platform for strengthening Africa’s collective bargaining position in global tax governance.

Overall, the EAC’s institutional design is currently insufficient to counterbalance the structural power of OECD countries. Fragmentation and weak enforcement mechanisms limit its ability to function as a unified actor in global tax rule-making.

## 6. Discussion

### 6.1 Structural Power Dynamics

The findings confirm that structural power in global tax governance operates primarily through the “technicalization” of tax policy. As noted by Vet et al. (2021) and Kurian (2022), tax avoidance is often framed as a technical issue requiring technical solutions, thereby depoliticizing fundamentally distributive conflicts.

The respondent’s characterization of being “technical guests in our own house” illustrates how agenda control and knowledge asymmetry shape participation in global tax governance (Bradlow, 2021; Schilling-Vacaflor & Lenschow, 2023). The persistence of the arm’s length principle, despite well-documented shortcomings, reflects institutional lock-in effects embedded within OECD frameworks.

These findings suggest that Uganda’s limited influence is not merely a function of capacity constraints, but also of structural design features that privilege capital-exporting states (Apriliasari, 2022; Oguttu, 2022; Reinsberg et al.,

2020; Vet et al., 2021). The OECD/G20 framework thus reproduces existing global economic hierarchies through procedural and epistemic control.

### 6.2 Administrative Capacity and Implementation Gaps

The findings highlight a major disconnect between global tax reform ambitions and domestic administrative realities. Existing literature cautions that complex transfer pricing and anti-avoidance rules place disproportionate burdens on low-capacity tax administrations (Kurian, 2022; Oguttu, 2022; Reinsberg et al., 2020).

The metaphor of “fighting a tank with a stick” captures the structural imbalance between Uganda Revenue Authority and multinational enterprises equipped with extensive legal and financial resources. Similarly, the financial and technical costs of implementing Pillar Two systems may outweigh short- to medium-term revenue benefits for Uganda (Bradlow, 2021; Bourgain & Zanaj, 2019; Wiczorek, 2017).

These challenges suggest the need for differentiated implementation approaches that account for varying administrative capacities. Without such flexibility, there is a risk of formal compliance without substantive enforcement (Apriliasari, 2022; Hearson & Kangave, 2016).

Furthermore, the interaction between Pillar Two and existing tax incentive regimes may reduce Uganda’s competitiveness in attracting investment, thereby creating policy tension between revenue protection and investment promotion.

### 6.3 Integration and Bargaining Power

The discussion on the EAC highlights that regional fragmentation significantly weakens collective bargaining power in global tax governance. As noted by Nnyanzi et al. (2016), African regional integration efforts often struggle to translate political commitments into binding economic coordination.

The observed tendency of member states to “break ranks” reflects a classic prisoner’s dilemma in tax competition, where individual rational incentives undermine collective outcomes (Bourgain & Zanaj, 2019). This fragmentation reinforces structural dependency on external rule-makers.

Unlike the European Union, the EAC lacks supranational enforcement authority over tax

policy coordination, limiting its ability to present a unified position in global negotiations (Hearson & Kangave, 2016). Strengthening regional institutions and leveraging continental platforms such as ATAF may therefore be critical steps toward enhancing Africa's bargaining power in global tax governance.

## 7. Conclusions and Recommendations

### 7.1 Conclusion

The study concludes that Uganda and the East African Community currently function as "rule-takers" rather than architects in global tax governance. This position is sustained by structural power dynamics embedded in the OECD-led processes, which prioritize the technical and economic interests of the Global North. While the formal inclusion of developing countries in the Inclusive Framework creates an illusion of equality, the substantive design of BEPS and the Two-Pillar solution reflects the preferences of powerful economies. Furthermore, the study established that Uganda Revenue Authority lacks the requisite administrative and technological capacity to effectively implement these complex standards. Finally, the EAC's fragmented approach to tax policy undermines its potential to act as a cohesive bargaining bloc, leaving member states vulnerable to divide-and-rule tactics by multinational enterprises.

### 7.2 Recommendations

Based on the findings, the study makes the following recommendations:

- 1) To the Government of Uganda: Prioritize investment in domestic tax capacity building, specifically by training more specialized transfer pricing auditors and upgrading the IT infrastructure at the URA to handle data-intensive requirements like Pillar Two and the Country-by-Country Reporting (CbCR).
- 2) To the EAC Secretariat and Partner States: Strengthen regional coordination by creating a binding EAC tax protocol that restricts harmful tax competition among members and mandates a common negotiating position for international tax forums.
- 3) To Policymakers: Leverage South-South cooperation through the African Tax Administration Forum (ATAF) to develop alternative African-friendly tax proposals and advocate for the simplification of OECD rules (e.g., Amount B) to better suit low-capacity administrations.
- 4) To Academia and Development Partners: Support research that highlights the specific distributive impacts of global tax reforms on African economies and provide targeted technical assistance that aligns with Uganda's administrative reality.

## References

- Apriliasari, V. (2021). OECD/G20 Pillar Two: Is it a compatible and feasible solution? *Jurnal Pajak Indonesia (Indonesian Tax Review)*, 5(2), 136–149.
- Apriliasari, V. (2022). OECD/G20 Two-Pillar Solution: Does it promote inter-nation equity? *Jurnal Pajak Indonesia (Indonesian Tax Review)*, 6(2), 342–356.
- Bourgain, A., & Zanaj, S. (2019). A tax competition approach to resource taxation in developing countries.
- Bradlow, B. H. (2021). Weapons of the strong: Elite resistance and the neo-apartheid city. *City & Community*, 20(3), 191–211.
- Escudero, V., Mourelo, E. L., & Pignatti, C. (2020). Joint provision of income and employment support: Evidence from a crisis response in Uruguay. *World Development*, 134, 105015.
- Hearson, M., & Kangave, J. (2016). A review of Uganda's tax treaties and recommendations for action. In *Working Paper (50)*. <http://eprints.lse.ac.uk/67868/>
- Kurian, A. (2022). The evolution of international tax regime and the OECD two-pillar solution: Analysis from a developing country perspective. *Journal of Economic Issues*, 1(1). <https://doi.org/10.56388/ei220808>
- Nnyanzi, J. B., Babyenda, P., & Bbale, J. M. (2016). Regional economic integration and tax revenue: East African Community. *Journal of Economic Integration*, 932–967.
- Oguttu, A. W. (2022). Preventing international tax competition and the race to the bottom: A critique of the OECD Pillar Two model rules for taxing the digital economy — A developing country perspective.
- Reinsberg, B., Stubbs, T., & Kentikelenis, A. (2020). Taxing the people, not trade: The International Monetary Fund and the structure of taxation in developing countries. *Studies in Comparative International Development*, 55.

<https://doi.org/10.1007/s12116-020-09307-4>

- Schilling-Vacaflor, A., & Lenschow, A. (2023). Hardening foreign corporate accountability through mandatory due diligence in the European Union? New trends and persisting challenges. *Regulation & Governance*, 17(3), 677–693.
- Todić, D., & Zlatić, M. (2018). Transboundary cooperation of Western Balkan states in the field of water resource management: Between the existing treaties and a new international treaty. *Environmental Science & Policy*, 89, 67–72.
- Vet, C., Cassimon, D., & Van de Vijver, A. (2021). Getting the short end of the stick: Power relations and their distributive outcomes for lower-income countries in transfer pricing governance. [https://doi.org/10.1007/978-3-030-64857-2\\\_1](https://doi.org/10.1007/978-3-030-64857-2\_1)
- Wieczorek, A. J. (2018). Sustainability transitions in developing countries: Major insights and their implications for research and policy. *Environmental Science & Policy*, 84, 204–216.