



ARTICLE TYPE

The link between CEO's financial literacy and technological innovation of cooperative unions

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Abstract

The primary objective of this research was to explore the relationship between the financial literacy of CEOs and the technological innovation within cooperative unions located in the Bench Sheko and Sheka zones. An explanatory research design, complemented by a descriptive survey methodology, was employed for this study. Questionnaires were disseminated to all seven cooperative unions in the Bench Sheko and Sheka zones. The research identified the financial literacy of CEOs as the independent variable, which was assessed through their financial behavior, knowledge, and skills. Conversely, the technological innovation of the cooperative unions served as the dependent variable. The findings indicated that the financial behavior of CEOs positively and significantly influences the technological innovation of these unions in the specified zones. Additionally, the research revealed that the financial knowledge of CEOs also has a significant and positive impact on the technological innovation of the cooperative unions in the Bench Sheko and Sheka zones. Lastly, it was determined that the financial skills of CEOs significantly and positively affect the technological innovation of the cooperative unions in these areas. Consequently, it is recommended that cooperative unions implement training programs for CEOs through university education and specialized initiatives, as such training is essential for enhancing decision-making processes and fostering innovation within the unions. Furthermore, the university in the study region should consistently organize financial literacy competitions, courses, and related events to advance the financial education of CEOs.

Keywords: Cooperative unions, CEOs, financial behavior and financial skill.

Introduction

The responsibilities of Chief Executive Officers (CEOs) within organizations have evolved considerably in the context of today's globalized and technologically sophisticated business landscape. Presently, CEOs are at the forefront of intricate financial decision-making processes, extending beyond their conventional leadership roles (Canals, 2020). The financial literacy of CEOs is recognized as a vital element that influences the success of organizations and their ability to navigate the complexities of modern financial landscapes (Atkinson and Messy, 2012). Financial literacy is one of the essential knowledge assets that enhance both individual and

organizational capabilities, skills, and expertise in utilizing technology. Additionally, financial literacy and technological literacy frequently reinforce each other at both individual and organizational levels. Consequently, the integration of technological and financial literacy is crucial for enhancing organizational performance. Furthermore, there has been insufficient emphasis on the intersection of specific knowledge resources such as technological literacy and financial literacy, and this area remains under-researched regarding their mutual impact on the performance of small and medium-sized enterprises (SMEs) (Mabula, J.B.; Dong, H., 2018).

Technological advancements have been associated with the competitiveness of firms, sustainable growth, and overall business success, among other vital factors (Chatzoglou and Chatzoudes, 2018; Martínez-Alonso *et al.*, 2022; Razavi *et al.*, 2016; Santana *et al.*, 2015). Recent research in the domain of technological innovation has primarily concentrated on aspects such as research and development (R&D), the management of technological innovation, various models of technological innovation, and the effects of technological innovation (Akbari *et al.*, 2020). Prior studies have acknowledged the necessity for investigating the technological innovation behaviors of small and medium-

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sized enterprises (SMEs), as their innovative capabilities, speed, and frequency of innovations are crucial in a global landscape characterized by complexity and constant change (Hilmersson and Hilmersson, 2021). Existing literature has underscored the significance of technological innovation for the competitiveness and sustainability of SMEs in the marketplace (Sharif and Huang, 2012). Notably, for SMEs that frequently face resource limitations (Musteen *et al.*, 2010), technological innovation serves as a significant catalyst for promoting environmental sustainability practices (Ramírez-Orellana *et al.*, 2022), facilitating entry into new markets and ultimately enhancing performance (García-Lopera *et al.*, 2022) and growth (Donbesuur *et al.*, 2020) of SMEs. Nevertheless, much of the existing literature has given limited focus to the role of technological innovation within SMEs (Akbari *et al.*, 2020; Arsawan *et al.*, 2022).

Recently, there has been a notable increase in the interest surrounding financial literacy among small and medium-sized enterprises (SMEs) (Molina-García *et al.*, 2020). This interest is driven by the understanding that financial literacy can alleviate financial constraints (Nkundabanyanga *et al.*, 2014), enhance organizational performance (Eniola and Entebang, 2017), and provide advantages in recognizing opportunities (Anwar *et al.*, 2020), managing corporate risk (Kulathunga *et al.*, 2020; Ye and Kulathunga, 2019), and fostering entrepreneurship (Riepe *et al.*, 2022). Consequently, within the context of SMEs' innovation capacity, this study emphasizes the significance of Chief Executive Officers' financial literacy (CFL), which is increasingly acknowledged as a critical factor. CFL encompasses financial knowledge about resources, markets, risks, and management, as well as legal and tax considerations related to financial issues (Koropp *et al.*, 2013).

Research on the influence of financial literacy among managers on the innovation capabilities of small and medium-sized enterprises (SMEs) is scarce (Hutahayan, 2021; Liu *et al.*, 2021; Tian *et al.*, 2020). Existing literature indicates that the financial literacy of CEOs has both a direct and indirect effect (by easing financial limitations) on technological innovation within SMEs (García-Pérez-de-Lema *et al.*, 2021). This study, grounded in upper-echelon theory, highlights how the unique traits of CEOs, particularly their financial literacy, positively influence firm innovation by improving the management of expenses and income, as well as facilitating long-term planning. Additionally, the findings suggest that CEOs with strong financial acumen can mitigate financial constraints by securing greater access to available financing, thereby significantly increasing the firm's potential to engage in technological innovation.

Wasif Anis *et al.* (2021) examined the impact of financial literacy and demographic factors on investor preferences for cash dividends. The study's results indicate that financial literacy significantly enhances investor preference for cash dividends, while demographic factors such as gender and age do not influence these preferences. Additionally, the

research did not establish a connection between financial literacy and technological innovation, and it was conducted in a developed country. Furthermore, Antonio Durendez *et al.* (2023) explored the effect of a CEO's financial literacy on the technological innovation of SMEs, highlighting the mediating roles of management control systems and risk-taking. Their findings revealed that both management control systems and managers' risk attitudes fully mediate the relationship between financial literacy and innovation, with the study also being limited to developed nations and focusing solely on SMEs. In a similar vein, Ayalew Ali and Cheirnet Demissie (2025) investigated the influence of financial literacy on the performance of medium-scale enterprises in the Bench Sheko zone, concluding that financial literacy has a significant positive impact on their performance. However, this study did not establish a relationship between CEOs' financial literacy and the technological innovation of cooperative unions, and its findings were restricted to medium-scale enterprises.

Despite the current body of research on financial literacy, there is still a significant gap in comprehensive studies examining its influence on the technological innovation of cooperative unions in Southwest Ethiopia. Therefore, this study seeks to evaluate the relationship between the financial literacy of CEOs and the technological innovation within cooperative unions located in the Bench Sheko and Sheka zones, thereby addressing the identified research gap with the following objectives:

- To assess the effect of CEOs' financial behavior on the technological innovation of cooperative unions in the Bench Sheko and Sheka zones.
- To determine the effect of CEOs' financial knowledge on the technological innovation of cooperative unions in the Bench Sheko and Sheka zones.
- To examine the effect of CEOs' financial skills on the technological innovation of cooperative unions in the Bench Sheko and Sheka zones.

Literature review

Resource-based theory

The theory of resources emphasizes that a CEO's financial literacy, knowledge, and skills are essential strategic assets. This type of literacy significantly impacts a company's strategic choices, financial management, and overall effectiveness. CEOs with strong financial expertise are more capable of recognizing opportunities, efficiently managing risks, and effectively allocating resources, which enhances the company's success (Brigham and Daves, 2019). Furthermore, these financially knowledgeable CEOs excel at promoting innovation within their firms. They are equipped to make well-informed decisions about investing in new technologies and managing the risks linked to innovation-driven projects (Hitt *et al.*, 2014).

The concept of financial literacy

Financial literacy encompasses the acquisition of essential skills, knowledge, and behaviors required for making informed financial decisions (Dewi *et al.*, 2020). It empowers individuals to navigate the complex landscape of personal finance with confidence, leading to decisions that foster financial success (Holzmann *et al.*, 2013). This literacy, which includes financial behaviors, knowledge, and skills, transcends basic needs and serves as a strategic advantage as outlined by Resource-Based Theory (RBT). According to RBT, a company's internal resources, particularly the financial expertise and skills of its Chief Executive Officers (CEOs), are vital for achieving and sustaining a competitive advantage (Barney, 1991).

Financial literacy is essential for individuals to avoid financial difficulties, as noted by Arianti BF (2018). It enables employees to develop sound financial habits and effectively navigate financial challenges, according to Ismail S *et al.* (2017). Lusardi and Mitchell Miller BG (2001) define financial literacy as the understanding of financial concepts and risks, along with the skills, motivation, and confidence to apply this knowledge in making informed decisions across various financial situations, thereby enhancing the financial well-being of both individuals and society and facilitating participation in economic activities. The ability to grasp basic financial principles and manage daily financial transactions is crucial. Consequently, individuals should be equipped with enhanced financial knowledge and attitudes to make prudent financial decisions. Financial knowledge plays a critical role in financial literacy, as highlighted by Pavković AA (2018) and Potrich ACG, Vieira KM, Kirch G (2018). Those lacking sufficient financial knowledge may struggle with financial management, as indicated by Ahmad NW, Mawar MY, and Ripain N (2016). Financial literacy has been assessed through fundamental questions regarding financial knowledge, including topics such as inflation, interest calculations, risk and return, diversification, and market operations, as discussed by Hanson TA, Olson PM (2018), and Miller BG (2001). Individuals with advanced cognitive skills tend to exhibit a higher level of financial literacy. Cognitive abilities are significantly correlated with numerical skills and financial behaviors, as noted by Hastings JS (2013). While financial knowledge is crucial, it alone is not sufficient to ensure responsible financial behavior, as managing finances encompasses more than just financial literacy.

Empirical literature review and hypothesis development

CEO's financial literacy and technological innovation

Gyori *et al.* (2019) examined particular elements of innovation activities within small and medium-sized enterprises (SMEs), focusing on the role of entrepreneurial financial culture and the socio-economic environment. Their research indicated

that hiring a full-time financial expert significantly enhances the execution of both ongoing and planned innovations in SMEs. Hutahayan (2021) investigated how SMEs adapt and enhance their business competencies, innovations, and overall performance through market orientation, learning behaviors, and financial literacy. The results affirmed the beneficial impact of CEOs on innovation within firms. Hasan *et al.* (2021) illustrated that CEOs facilitate the adoption of cutting-edge financial instruments as alternative financing options (FinTech), leveraging technological advancements.

Research has examined the connection between the financial literacy of CEOs and technological innovation (García-Pérez-de-Lema *et al.*, 2021; Liu *et al.*, 2021; Tian *et al.*, 2020). Liu *et al.* (2021) investigated how the financial literacy of CEOs affects innovation in small and medium-sized enterprises (SMEs) through a comprehensive survey of Chinese SMEs conducted in 2015 and 2017. Their findings indicated a positive correlation between an entrepreneur's financial literacy and engagement in innovation, with risk tolerance serving as a mediating factor in the relationship between financial literacy and innovation (Liu *et al.*, 2021). In a different study, Tian *et al.* (2020) explored the link between CEOs' financial literacy and firm innovation using data from surveys of Chinese SMEs in 2019. They established that corporate financial literacy significantly boosts research and development investments by mitigating financial constraints and enhancing risk management. Lastly, García-Pérez-de-Lema *et al.* (2021) investigated the impact of CEOs' financial literacy on technological innovation within firms, focusing on the mediating effect of reduced financial constraints in SMEs based on a sample of Spanish SMEs from 2016 to 2017. Their results indicated that by easing financial constraints, the financial literacy of CEOs has both a direct and indirect influence on a firm's technological innovation.

The influence of a CEO's financial literacy is especially pronounced in Zimbabwe's SME sector, where effective and knowledgeable leadership can dictate whether a business remains stagnant or achieves growth (Mutengezanwa, 2018). Consequently, CEO financial literacy is essential for the adoption and successful implementation of technological innovations (Manhiwa *et al.*, 2016; Mashizha *et al.*, 2019). The complex nature of Zimbabwe's economic landscape, coupled with the rapid pace of technological advancements, underscores the increasing significance of financial expertise among CEOs. This expertise is vital for promoting innovation and ensuring the sustainability of SMEs in the region. A CEO's financial behavior encompasses their attitudes and actions regarding financial management. In Zimbabwe, where economic conditions are often challenging, the strategic financial practices of CEOs are crucial in fostering an environment conducive to innovation (Nleya and Chummun, 2022).

Chief Executive Officers who demonstrate prudent financial management are likely to create stability within

their organizations, which in turn enhances the focus on and distribution of resources for technological innovation. This relationship suggests that exercising fiscal prudence and taking calculated financial risks may be vital for promoting innovation in small and medium-sized enterprises (Mashizha *et al.*, 2019; Mutengezanwa, 2018). Additionally, a CEO’s financial expertise, encompassing an understanding of financial markets, investment opportunities, and economic trends, is another critical factor. A CEO’s deep comprehension of financial issues can be advantageous in navigating Zimbabwe’s complex economic landscape. It aids in identifying and seizing opportunities for technological advancement while aligning financial strategies with innovative projects (Weill and Broadbent, 1998). Moreover, the financial competencies of a CEO, which entail the practical application of financial knowledge in decision-making, are essential for converting innovative ideas into viable technological solutions (Proctor, 2010). Strong financial skills enable CEOs to allocate resources effectively, manage risks associated with innovation, and skillfully handle the financial aspects of technology development and implementation. This expertise is particularly crucial in Zimbabwe, where resources are scarce, necessitating the optimization of every investment to foster technological progress (Teece, 2010).

• *H1*

CEOs’ financial behavior has a significant and positive effect on the technological innovation of cooperative unions in the Bench Sheko and Sheka zones.

• *H2*

CEOs’ financial knowledge has a significant and positive effect on the technological innovation of cooperative unions in the Bench Sheko and Sheka zones.

• *H3*

CEOs’ financial skill has a significant and positive effect on the technological innovation of cooperative unions in the Bench Sheko and Sheka zones.

Conceptual framework

Figure 1 illustrates the link between CEOs’ financial literacy and the technological innovation of cooperative unions in the Bench Sheko and Sheka zones. The study’s dependent variable is the technological innovation of cooperative unions. Conversely, the independent variable is the CEO’s financial literacy, evaluated through the CEO’s financial behavior, CEO’s financial knowledge, and CEO’s financial skill.

Research method

This study sought to explore the relationship between the financial literacy of CEOs and the technological innovation within cooperative unions located in the Bench Skeo and Sheka zones. To align with the research

objectives and the quantitative nature of the data, a quantitative methodology was utilized to determine the connection between the financial literacy of CEOs and the technological advancements of cooperative unions. An explanatory research design was adopted to analyze the causal relationships between these two variables. Data was gathered from all seven cooperative unions situated in the Bench Sheko and Sheka zones.

Model specifications and measurements of variables

Model specifications

The main aim of this research is to examine the relationship between the financial literacy of CEOs and technological innovation within cooperative unions. A multiple linear regression model was utilized to demonstrate and evaluate the connection between the dependent variable, which represents the technological innovation of cooperative unions, and the independent variable, the financial literacy of CEOs. This model is applied when the dependent variable is affected by two or more explanatory variables (Gujarat, 2004). Several factors related to CEOs’ financial literacy were identified to investigate their impact on the technological innovation of cooperative unions. The empirical framework for this study will be organized as follows:

$$Y = f(CEOsFB, CEOsFK, CEOsFS) \text{-----} 1$$

$$TI = \alpha + \beta_1 CEOsFB_i + \beta_2 CEOsFK_i + \beta_3 CEOsFS_i + \sum i \text{-----} 2$$

Where;

Technological innovation within cooperative unions is represented by TI; the financial behavior of chief executive officers is denoted as CEOs FB, their financial knowledge as CEOs FK, and their financial skill as CEOs FS, while $\sum i$ represents the error term in the equation.

Measurement of variables

The study employed a linear regression model to elucidate the relationship between the financial literacy of CEOs and technological innovation. In this context, technological innovation was treated as the dependent variable, while the independent variables included the financial behavior

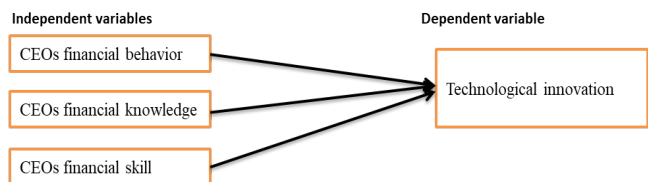


Figure 1: Conceptual framework

Source: Researcher’s design (2025)

of CEOs (CEOs FB), their financial knowledge (CEOs FK), and their financial skills (CEOs FS). These variables were selected due to their direct relevance to the research objectives, as well as their status as clear metrics that are associated with established theories.

Dependent variable

Technological innovation

Technological innovation refers to the process of developing new or significantly enhancing existing products, processes, or services through the use of technology, with the ultimate goal of increasing business value and enhancing market competitiveness. It is crucial for addressing societal needs, achieving objectives, and resolving challenges faced by users, thereby facilitating corporate, industrial, economic, and social transformations that provide competitive advantages to both firms and nations while also contributing to overall human advancement (Arthur, 2009; Coccia, 2019a; Dosi, 1988; Sahal, 1981). The assessment of technological innovation was conducted using a three-item scale adapted from Madrid-Guijarro *et al.* (2021), which evaluates the CEO's technological innovation in comparison to other companies within the same industry, utilizing a 5-point Likert scale.

Independent variables

CEOs financial behavior

The financial behavior of a CEO includes their decisions and actions related to a company's finances, such as investment

strategies, debt management, and profit projections. This behavior can be characterized as any human conduct pertinent to financial management, as noted by Xiao, J. (2008). Saurabh, K. and Nandan, T. (2008) further elaborated that financial behavior pertains to the management of one's income and financial circumstances, reflecting an individual's approach to daily financial issues. Essentially, financial behavior signifies an individual's capability to effectively manage their finances to achieve success in life. The concept of CEO financial behavior was derived from the work of Atkinson and Messy (2012) and assessed using a 5-point Likert scale.

CEOs financial knowledge

Financial knowledge constitutes a component of financial literacy, which denotes a fundamental comprehension of financial principles, as noted by S. J. Huston (2010). Prior studies have indicated that financial knowledge serves as a predictor of financial well-being, as articulated by Archuleta *et al.* (2013) and Norvilitis and MacLean (2010) in the work of Saurabh and Nandan K. Saurabh and T. Nandan (2018). However, Saurabh and Nandan, referencing Mugenda *et al.* (1990), found a persistent negative correlation between financial knowledge and financial satisfaction. The financial knowledge of CEOs was derived from Jennah (2022) and assessed using a 5-point Likert scale.

CEOs financial skills

The CEO's financial skills encompass the ability to understand and apply financial concepts, analyze financial data, make

Table 1: Variables and their measurement

<i>Variables</i>	<i>Symbol</i>	<i>Measurement</i>
Dependent variable (Technological innovation)	TE	- Cooperative unions introduced new products or services. - Cooperative unions are pioneering nature when introducing new products or services. - Cooperative unions' speed of response to the introduction of new products or services is better than other business. - Cooperative unions made modifications in the processes. - Cooperative unions are pioneering nature when it comes to introducing new processes. - Cooperative unions' speed of response to the introduction of new processes is better than other business.
Independent variables (CEOs financial literacy)		
CEOs financial behavior	CEOs FB	- CEOs keep a close watch on personal and enterprise financial affairs - CEOs set long-term enterprise goals and strive hard to achieve them - CEOs actively save or buy investments for the enterprise. - CEOs carefully consider all enterprise purchases before making them
CEOs financial knowledge	CEOs FK	- CEOs knowledge on the financial statement preparation - CEOs knowledge on financial statement analysis - CEOs knowledge about alternative financial sources - CEOs knowledge on the financial assets to invest in
CEOs financial skill	CEOs FS	- CEOs ability to prepare a personal budget - CEOs accurately determine benefits and costs from financial dealings - CEOs evaluate different financial products and services.

Source: Own design, 2025

sound financial decisions, and oversee the financial performance of a company. CEO's financial skill was measured using a 5-point Likert scale. The study variables are summarized in Table 1.

Results and Discussions

Descriptive statistics

Table 2 presented indicates that the average score for technological innovation among cooperative unions is 2.142857, accompanied by a standard deviation of 1.069045. The range of technological innovation scores for these unions spans from a minimum of 1 to a maximum of 4. Furthermore, the average score for the financial behavior of CEOs within cooperative unions is 1.857143, with a standard deviation of 0.6900656, and the scores range from 1 to 3 in the Bench Sheko and Sheka zones. Additionally, the average score for the financial knowledge of CEOs in cooperative unions is 1.571429, with a standard deviation of 0.5345225, and the scores range from 1 to 2 in the same zones. Lastly, the average score for the financial skills of CEOs in cooperative unions is 1.857143, with a standard deviation of 0.3779645, and the scores also range from 1 to 2 in the Bench Sheko and Sheka zones.

Correlation matrix

Table 3 illustrates a positive correlation among the financial behavior, financial knowledge, and financial skills of CEOs, with coefficients of 0.4196, 0.1667, and 0.4714, respectively.

Regression analysis

Table 4 illustrates that the financial behavior of CEOs has a significant and positive impact on the technological innovation of cooperative unions, with a coefficient of

0.625 and a *p-value* of 0.0456. This indicates that holding other explanatory variables constant, a 1% increase in the financial behavior of CEOs results in a 62.5% enhancement in the technological innovation of cooperative unions. The positive correlation between CEOs' financial behavior and technological innovation suggests that CEOs exhibiting higher levels of financial behavior are more inclined to adopt innovative technologies. Furthermore, CEOs who practice prudent financial behavior positively influence their cooperative unions' technological innovation by creating an environment that prioritizes research and development, risk management, long-term planning, and effective resource allocation. These findings align with the research conducted by Suardhika *et al.* (2018), Mutengezanwa (2018), and Mashizha *et al.* (2019).

The research indicated that the financial acumen of CEOs has a substantial and beneficial impact on the technological innovation of cooperative unions, evidenced by a coefficient of 0.2083 and a *p-value* of 0.00849. This suggests that holding other explanatory variables constant, a 1% increase in the financial knowledge of CEOs leads to a 20.83% enhancement in the technological innovation of cooperative unions. The positive correlation between the financial expertise of CEOs and technological innovation arises from the fact that such knowledge significantly bolsters the capacity of cooperative unions to innovate technologically by fostering informed decision-making, efficient budgeting, risk management, and a culture that encourages continuous development and adaptability to market fluctuations. These findings align with the studies conducted by Suardhika *et al.* (2018), Mutengezanwa (2018), and Mashizha *et al.* (2019).

The research concluded that the financial expertise of CEOs has a significant and positive impact on the technological innovation of cooperative unions, with a coefficient of 0.125 and a *p-value* of 0.0481. This indicates that holding other explanatory variables constant, a 1% increase in a CEO's financial skill leads to a 12.5% enhancement in the technological innovation of cooperative unions. The positive correlation between a CEO's financial acumen and the technological innovation of cooperative unions arises from the synergy between their financial skills and their approach to technological advancements, which can greatly influence a company's capacity to adapt, compete, and succeed in a rapidly evolving market landscape. This study's findings align with Henri (2006), who noted that CEOs equipped with financial skills (including financial planning, cost accounting, financial analysis, cash-flow management, risk analysis, and investment options) are better positioned to foster innovation. Furthermore, these findings are consistent with the research of Smith *et al.* (1994) and Talke *et al.* (2010), which suggests that the decision-making of top managers regarding innovation is often influenced by their education, financial background, experience, and values.

Table 2: Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
TI	7	2.142857	1.069045	1	4
CEOs FB	7	1.857143	0.6900656	1	3
CEOs FK	7	1.571429	0.5345225	1	2
CEOs FS	7	1.857143	0.3779645	1	2

Source: STATA 14 result

Table 3: Correlation matrix

	TI	CEOs FB	CEOs FK	CEOs FS
TI	1.0000			
CEOs FB	0.4196	1.0000		
CEOs FK	0.1667	-0.1936	1.0000	
CEOs FS	0.4714	-0.0913	-0.3536	1.0000

Source: STATA 14 result

Test of Classical Linear Regression Model Assumptions

The mean of the disturbances is zero

The traditional linear regression model is based on the premise that the error terms average to zero, indicating that the distribution of error terms should have an expected value of zero. An error term with a non-zero average will affect the estimated coefficients. The inclusion of a constant term in the regression equation ensures that this assumption is maintained, as noted by Brooks, C. (2008). Since the model in this analysis includes a constant term, the assumption is upheld.

Normality test

To determine an appropriate statistical test, it is crucial to assess the normality of the data. This study utilized the Shapiro-Wilk test to evaluate data normality. The null hypothesis for this test asserts that if the *p-value* is below 0.05, the distribution of the residuals is not normal. On the other hand, if the *p-value* is above 0.05, the distribution of the residuals is deemed normal, resulting in the rejection of the null hypothesis that the data are not normally distributed. In this case, the *p-value* for the model shown in Table 5 is 0.93733, which exceeds 0.05. Consequently, the

null hypothesis is rejected, suggesting that the residuals follow a normal distribution.

Multicollinearity test

Multicollinearity refers to a situation in which two or more explanatory variables within a multiple regression model demonstrate a strong linear correlation. The fundamental assumption concerning multicollinearity is that the explanatory variables ought to be uncorrelated with each other (Brooks, 2008). In this research, the degree of multicollinearity was assessed through the use of variance inflation factors (VIF). A VIF value below 10 indicates that multicollinearity is not a concern. In contrast, a VIF that surpasses this threshold suggests a potential issue, which complicates the evaluation of the influence of independent variables on the dependent variable (Gujarati, 2004). As shown in Table 6, the VIF for all variables remains well below 10, and the reciprocal of VIF is significantly above 0.1, thereby confirming that multicollinearity does not present a challenge in this analysis.

Heteroscedasticity test

The Breusch-Pagan test was utilized to assess this assumption. It evaluates the null hypothesis that the variance is constant. This hypothesis indicates that a *p-value* below 0.05 suggests a lack of constant variance or homoscedasticity; on the other hand, a *p-value* above 0.05 indicates the presence of constant variance or homoscedasticity. In this instance, the *p-value* is considered insignificant ($p > 0.05$), prompting the researcher to reject the null hypothesis. Therefore, Table 7 displays a probability value of 0.2756, indicating that heteroscedasticity is not a concern in this study.

Autocorrelation

This premise asserts that the errors are independent of each other in a linear manner (uncorrelated). As noted by Brooks (2008), the Durbin-Watson (DW) model comprises two essential critical values: an upper critical value (du) and a lower critical value (dl), along with an inconclusive intermediate range. This range represents the area where the null hypothesis of no autocorrelation cannot be definitively accepted or rejected. Consequently, the findings indicate a DW statistic of 1.897, which is closer to 2, suggesting no evidence of autocorrelation, as illustrated in Table 8.

Table 4: Regression result

TI	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
CEOs FB	0.625	0.7324332	-0.85	0.0456**	-2.955929 1.705929
CEOs FK	0.2083	1.006633	-0.21	0.00849***	-3.411889 2.995222
CEOs FS	0.125	1.402503	0.80	0.0481**	-3.33839 5.58839
cons	1.541667	4.092606	0.38	0.731	-11.48283 14.56616

Source: STATA 14 result

Table 5: Test for normality

Variable	Obs	W	V	z	Prob>z
residual_hat	7	0.97729	0.281	-1.533	0.93733

Source: STATA 14 result

Table 6: Test for multicollinearity

Variables	VIF	1/VIF
CEOs FK	1.21	0.823529
CEOs FS	1.18	0.848485
CEOs FB	1.07	0.933333
Mean VIF	1.15	

Source: STATA 14 result

Table 7: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1)	1.19
Prob > chi2	0.2756

Source: STATA 14 result

Table 8: Autocorrelation test

Durbin Watson test	Statistics = 1.897
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Conclusion

This study primarily investigates the relationship between the financial literacy of CEOs and the technological innovation of cooperative unions in the Bench Sheko and Sheka zones. To achieve this, data were gathered from cooperative unions operating in these areas, utilizing a five-point Likert scale for measurement. Descriptive and multiple regression analyses were performed to examine the connection between the financial literacy of CEOs and the technological innovation of the cooperative unions. The research identified the financial literacy of CEOs as the independent variable, which was assessed through their financial knowledge, behavior, and skills. Conversely, the technological innovation of the cooperative unions served as the dependent variable. The findings revealed that the financial behavior of CEOs has a significant and positive impact on the technological innovation of cooperative unions in the Bench Sheko and Sheka zones, as it cultivates an environment that prioritizes research and development, risk management, long-term vision, and efficient resource allocation. Additionally, the study indicated that the financial knowledge of CEOs also significantly and positively influences the technological innovation of these unions, as it encourages informed decision-making, effective budgeting, risk management, and a culture that fosters continuous development and adaptability to market changes. Lastly, the research concluded that the financial skills of CEOs have a significant and positive effect on the technological innovation of cooperative unions in the Bench Sheko and Sheka zones, as the synergy between their financial skills and approach to technological innovation can greatly enhance a company's capacity to adapt, compete, and succeed in a rapidly evolving market landscape.

Policy implications

The results of the study prompted the development of the following recommendations:

- Cooperative unions ought to offer training programs for CEOs through university education and specialized courses; as such, training is essential for enhancing decision-making processes and fostering innovation within the unions.
- Additionally, the university in the study area should consistently host financial literacy competitions, courses, and related events to advance the financial education of CEOs.
- Furthermore, the Bench Sheko zone, Sheka zones, and the cooperative office of the Southwest Ethiopian regional state should effectively utilize financial literacy to build resilience, enhance performance, and adeptly manage the challenges of the rapidly changing business landscape.
- Lastly, it is recommended that further research be

undertaken to explore additional variables that were not covered in this study.

This research presents several key contributions: first, it emphasizes the importance of strategic investments in leadership development programs specifically designed to meet the diverse needs of organizations of varying sizes. Second, the findings provide actionable insights for organizational leaders and human resource professionals aiming to maximize the benefits of financial literacy initiatives within their specific contexts. Third, this research offers significant insights that deepen the understanding of the impact of financial literacy on technological innovation, clarifying the mechanisms involved and recognizing the contextual factors that may affect these dynamics, thereby enriching the existing literature in this area. Lastly, the results furnish both practitioners and academics with a more nuanced perspective on the complex pathways through which financial literacy leads to measurable improvements within organizations.

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Conflict of interest

The authors declare that they have no conflict of interest.

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