

**Financial Literacy and the Financial Performance of SMEs in Oman: Examining the Mediating Role of Financial Behavior**Humaid Talib Rashid Al Musheifri^{1*}, Baharudin Kadir¹, Zaharuzaman Jamaluddin¹¹Faculty of Business & Accountancy, Universiti Selangor (UNISEL), Shah Alam Campus Seksyen 7,
40000 Shah Alam, Selangor, Malaysia**Article Information****ABSTRACT****Article Type: Research Article****Dates:****Received:** June 17, 2026**Revised:** August 12, 2026**Accepted:** August 25, 2026**Available online:** September 2026**Copyright:**

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Humaid Talib Rashid Al Musheifri



almusheifri10@hotmail.com

Financial literacy is associated with small and medium-sized enterprise (SME) performance, yet limited evidence explains how distinct financial capabilities relate to financial behavior and firm-level outcomes, particularly in Oman. This study examines the relationships among financial knowledge, financial communication, financial abilities, financial planning, financial behavior, and SME financial performance. Using a quantitative cross-sectional design, data were collected from 384 SME decision-makers in Oman and analyzed using partial least squares structural equation modeling (PLS-SEM) with 5,000 bootstrap resamples. All four financial-literacy dimensions were positively and significantly associated with financial behavior and SME financial performance. Financial behavior showed the strongest direct association with performance ($\beta = .343$), while financial abilities had the strongest capability-to-performance association ($\beta = .234$). Financial planning showed the strongest association with financial behavior ($\beta = .279$) and the largest indirect effect through financial behavior ($\beta = .096$). Financial behavior significantly mediated all four capability–performance relationships, indicating complementary partial mediation. The model explained 53.5% of the variance in financial behavior and 75.2% in SME financial performance. The findings highlight the importance of treating financial literacy as a multidimensional capability and translating financial capabilities into systematic financial-management practices.

Keywords: Financial literacy; Financial behavior; Financial knowledge; Financial planning; Financial capability; SME financial performance; Oman

1. INTRODUCTION

Small and medium-sized enterprises (SMEs) rely heavily on the financial decisions made by owners and senior managers, who are responsible for managing working capital, financing, expenditure, investment, and resource allocation, often in environments characterized by limited resources, incomplete information, and market uncertainty (Agyapong & Attram, 2019). Financial literacy is a critical managerial capability that can enhance the quality of financial decision-making and improve SME performance. While prior research generally identifies positive associations between financial literacy and SME outcomes, the existing literature remains conceptually and methodologically fragmented (Eniola & Entebang, 2017). Systematic reviews show substantial variation in how financial literacy is defined, operationalized, and measured. Additionally, the mechanisms linking specific financial capabilities to firm-level outcomes remain poorly understood (Graña-Alvarez et al., 2024; Rekha et al., 2025).

A significant limitation in current research is the frequent treatment of financial literacy as a single composite construct. However, financial management within small and medium-sized enterprises (SMEs) encompasses several related yet conceptually distinct capabilities (Al Musheifri et al., 2026). Financial knowledge refers to the understanding of financial concepts and information (Huston, 2010). Financial communication involves interpreting and exchanging financial information with relevant stakeholders. Financial abilities denote the practical competence required to perform financial tasks. Financial planning encompasses budgeting, forecasting, resource allocation, and future-oriented decision-making (Eniola & Entebang, 2017). Combining these dimensions into a single measure might obscure important differences in how each relates to financial behavior and SME financial performance.

Another important issue is the gap between financial knowledge and effective practice. While SME decision-makers may understand concepts such as liquidity, interest rates, leverage, and cash flow, they do not always translate this understanding into practices such as budgeting, expenditure control, receivables monitoring, debt management, investment evaluation, and financial goal setting (Agyapong & Attram, 2019). Research in financial education demonstrates that enhanced financial knowledge can positively affect subsequent financial behavior (Kaiser et al., 2022). However, the relationship between specific dimensions of financial literacy, managerial financial practices, and, consequently, small and medium-sized enterprise (SME) performance remains insufficiently explored (Devender et al., 2025; Graña-Alvarez et al., 2024).

Oman Vision 2040 prioritizes entrepreneurship, private-sector development, investment, and economic diversification, thereby integrating small and medium-sized enterprises (SMEs) into the national development agenda. SME sustainability depends on decision-makers' ability to manage liquidity, allocate financial resources, assess financing alternatives, and plan effectively under uncertainty. Despite the policy significance, empirical research on the relationships among specific financial literacy dimensions, financial behavior, and SME financial performance remains scarce in Oman and the broader Gulf region.

This study examines financial knowledge (FK), financial communication (FC), financial abilities (FA), and financial planning (FP) as distinct dimensions, and investigates their relationships with financial behavior (FB) and small and medium-sized enterprise (SME) financial performance (SFP). Specifically, the study evaluates the direct associations between the four financial literacy dimensions and SFP, examines their associations with FB, assesses the relationship between FB and SFP, and determines whether FB statistically mediates the relationships between each financial literacy dimension and SFP. Using a quantitative cross-sectional survey design, data from 384 SME decision-makers were analyzed using PLS-SEM with 5,000 bootstrap resamples. This study offers three primary contributions: it delineates four dimensions of financial literacy, identifies financial behavior as a mediating mechanism connecting these capabilities to SME performance, and presents context-specific evidence from Oman, a relatively under-researched Gulf economy.

2.0 LITERATURE REVIEW

This research integrates three complementary perspectives, the financial capability perspective, the Theory of Planned Behavior (TPB), and behavioral finance. The financial capability perspective provides the foundation by distinguishing between financial knowledge and its practical application (Lusardi & Mitchell, 2014). The TPB clarifies the capability-to-behavior relationship by explaining how perceived capability and control facilitate action (Ajzen, 1991). Behavioral finance addresses how cognitive biases influence financial decisions and show how structured financial practices can promote more consistent decision-making (Agyapong & Attram, 2019).

2.1 The Theory of Planned Behavior

The Theory of Planned Behavior (TPB) proposes that behavior is shaped by behavioral intentions, which are influenced by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). In the SME context, financial knowledge and abilities support informed decision-making, while financial communication and planning facilitate the implementation of financial practices. TPB therefore provides a behavioral rationale for the proposed relationships between financial-literacy dimensions and financial behavior. However, because this study does not directly measure the core TPB constructs, TPB is used as a supporting theoretical lens rather than as a fully tested framework; the financial capability perspective remains the primary conceptual foundation.

2.2 The Financial Capability Perspective

The financial capability perspective extends financial literacy beyond knowledge to the ability to understand, evaluate, and apply financial information in practice (Lusardi & Mitchell, 2014). This perspective is particularly relevant to SMEs, where decision-makers manage interconnected activities involving cash flow, financing, expenditure, investment, and resource allocation.

Therefore, this study conceptualizes financial literacy through four distinct dimensions of financial knowledge, understanding financial concepts and information; financial communication, interpreting and exchanging financial information; financial abilities, applying practical financial skills; and financial planning, organizing resources and anticipating future financial needs. Treating these dimensions separately improves conceptual precision and addresses inconsistencies in how SME financial literacy has been defined and measured (Molina-García et al., 2023; Graña-Alvarez et al., 2024; Rekha et al., 2025).

2.3 Behavioral Finance Perspective

Behavioral finance complements the financial capability perspective by explaining why financial knowledge and skills may not always translate into consistent financial decisions. Cognitive biases and reliance on ad hoc judgment can influence decision-making, particularly under uncertainty and resource constraints. Structured financial practices, such as budgeting, cash-flow monitoring, expenditure control, and investment evaluation, can promote more systematic financial management. Accordingly, behavioral finance supports the conceptualization of financial behavior as a mediating mechanism between financial-literacy dimensions and SME financial performance (Kaiser et al., 2022; Sajid et al., 2024).

These three perspectives support the proposed capability behavior performance framework. The financial capability perspective provides the primary conceptual foundation, TPB supports the translation of capability into behavior, and behavioral finance explains the role of structured financial practices. Accordingly, financial knowledge (FK), financial communication (FC), financial abilities (FA), and financial planning (FP) are modeled as independent variables, financial behavior (FB) as the mediator, and SME financial performance (SFP) as the dependent variable. The model examines both direct and indirect relationships. Each financial-literacy dimension is hypothesized to relate positively to FB and SFP, while FB is expected to relate positively to SFP. The model further tests whether FB statistically mediates each capability–performance relationship. Because the study is cross-sectional, these indirect effects are interpreted as statistical mediation rather than evidence of temporal causality (Hayes, 2022; Zhao et al., 2010).

2.4 Conceptual Framework and Hypothesis Development

The conceptual framework distinguishes four financial-literacy dimensions—financial knowledge (FK), financial communication (FC), financial abilities (FA), and financial planning (FP)—as antecedent capabilities. Financial behavior (FB) represents the application of these capabilities through recurring financial-management practices, while SME financial performance (SFP) represents the firm-level outcome. Accordingly, the model examines direct relationships among the four financial-literacy dimensions, FB, and SFP, alongside specific indirect relationships mediated by FB. This structure operationalizes the capability–behavior–performance framework. In total, the model specifies four capability-to-performance paths, four capability-to-behavior paths, one behavior-to-performance path, and four indirect mediation pathways.

2.4.1 Financial-Literacy Dimensions and SME Financial Performance

Financial knowledge supports the interpretation and evaluation of financial information; financial communication facilitates the exchange of financial information with relevant stakeholders; financial abilities enable the practical execution of financial tasks; and financial planning supports budgeting, forecasting, resource allocation, and financial control. Prior research generally associates financial literacy and related financial capabilities with improved SME outcomes (Agyapong & Attram, 2019; Graña-Alvarez et al., 2024; Padi et al., 2025). The following hypotheses are therefore proposed:

H1: Financial knowledge is positively associated with SME financial performance.

H2: Financial communication is positively associated with SME financial performance.

H3: Financial abilities are positively associated with SME financial performance.

H4: Financial planning is positively associated with SME financial performance.

2.4.2 Financial-Literacy Dimensions and Financial Behavior

Financial behavior reflects the practical application of financial capabilities through activities such as budgeting, cash-flow monitoring, expenditure control, debt management, and investment evaluation. Financial capability research distinguishes possessing financial knowledge from applying it effectively, while empirical evidence indicates that financial knowledge and education are associated with subsequent financial behavior (Lusardi & Mitchell, 2014; OECD, 2018; Kaiser et al., 2022).

H5: Financial knowledge is positively associated with financial behavior.

H6: Financial communication is positively associated with financial behavior.

H7: Financial abilities are positively associated with financial behavior.

H8: Financial planning is positively associated with financial behavior.

2.4.3 Financial Behavior and SME Financial Performance

Consistent financial-management practices can strengthen financial control, liquidity management, expenditure discipline, and resource allocation. Evidence also suggests that the application of financial

capabilities through organizational and behavioral processes is important for financial outcomes (Duréndez et al., 2023; Sajid et al., 2024). Therefore:

H9: Financial behavior is positively associated with SME financial performance.

2.4.4 Mediating Role of Financial Behavior

Financial capabilities may influence SME performance not only directly but also through their application in financial-management practices. Financial behavior therefore represents the proposed mechanism through which knowledge, communication, abilities, and planning are translated into firm-level outcomes. Previous evidence supports the role of financial behavior and related organizational processes in linking financial capabilities with financial outcomes (Duréndez et al., 2023; Sajid et al., 2024).

H10: Financial behavior mediates the relationship between financial abilities and SME financial performance.

H11: Financial behavior mediates the relationship between financial communication and SME financial performance.

H12: Financial behavior mediates the relationship between financial knowledge and SME financial performance.

H13: Financial behavior mediates the relationship between financial planning and SME financial performance.

Because this study uses cross-sectional data, these mediated relationships are interpreted as statistical indirect effects rather than evidence of temporal causality (Hayes, 2022; Zhao et al., 2010). Figure 1 present the conceptual framework of the study.

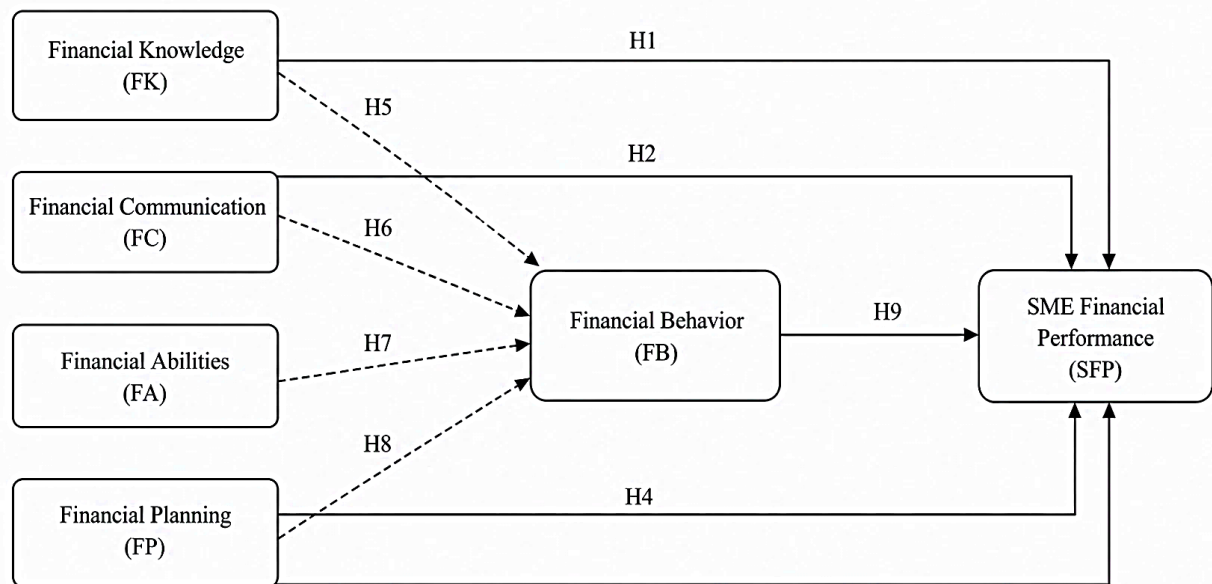


Figure 1. Conceptual Framework of the Study

3.0 METHODOLOGY

3.1 Research Design

A quantitative, explanatory, cross-sectional survey design was employed to examine the hypothesized relationships among financial knowledge (FK), financial communication (FC), financial abilities (FA), financial planning (FP), financial behavior (FB), and SME financial performance (SFP). As data were collected at a single point in time, the estimated relationships are interpreted as statistical associations and indirect effects rather than evidence of causality. The unit of analysis was the individual SME decision-maker an owner, chief executive officer (CEO), or senior manager with direct knowledge of the enterprise's financial practices and performance

3.2 Population, Sampling and Sample Size

The target population comprised SMEs operating across various sectors in Oman. Eligible respondents were SME owners, chief executive officers (CEOs), or senior managers with direct responsibility for, or knowledge of, their firm's financial management and performance. A total of 730 questionnaires were distributed, of which 396 were returned, yielding a response rate of 54.25%. After excluding 12 questionnaires with substantial missing information, 384 usable responses remained for analysis, representing a usable response rate of 52.60% and 96.97% of returned questionnaires.

3.3 Survey Instrument and Construct Measurement

Data were collected using a structured questionnaire comprising demographic questions and six constructs: financial knowledge (FK), financial communication (FC), financial abilities (FA), financial planning (FP), financial behavior (FB), and SME financial performance (SFP). Each construct was measured using six indicators, resulting in 36 measurement items, rated on a five-point Likert-type scale. FK assessed understanding of financial concepts; FC assessed the interpretation and exchange of financial information; FA measured practical financial competence; and FP captured budgeting, forecasting, goal setting, and resource allocation. FB measured recurring financial-management practices, while SFP captured perceived firm-level financial outcomes. Table 1 summarizes the operationalization of the six constructs, detailing their measurement domains, number of indicators, and measurement specifications.

Table 1. Operationalization of the Study Constructs

Construct	Operational domain	Items	Measurement specification
Financial Knowledge (FK)	Understanding of financial concepts and information	6	Reflective
Financial Communication (FC)	Interpretation and exchange of financial information	6	Reflective
Financial Abilities (FA)	Practical competence in performing financial tasks	6	Reflective
Financial Planning (FP)	Budgeting, forecasting, goal setting, and resource allocation	6	Reflective
Financial Behaviour (FB)	Expenditure, investment, debt, budgeting, monitoring, and goal-setting practices	6	Reflective
SME Financial Performance (SFP)	Efficiency, revenue generation, asset utilisation, liquidity management, and leverage	6	Reflective

3.4 Data Analysis

Data were analyzed using PLS-SEM in SmartPLS 4 following a two-stage approach (Hair et al., 2014). The measurement model was assessed using outer loadings, Cronbach's alpha (α), composite reliability (CR), average variance extracted (AVE), and the heterotrait-monotrait ratio (HTMT) for discriminant validity (Henseler et al., 2015). The structural model was evaluated using inner variance inflation factors (VIF), R^2 , adjusted R^2 , and standardized path coefficients. Statistical significance was assessed using 5,000 bootstrap resamples at $p < .05$. Mediation was assessed through the specific indirect effects for H10–H13. An indirect effect was considered statistically significant when its bootstrapped 95% confidence interval excluded zero (Hayes, 2022; Zhao et al., 2010). Given the cross-sectional design, mediation is interpreted as a statistical indirect relationship rather than causal evidence.

3.5 Ethical and Procedural Considerations

Participation was voluntary, and respondents were informed of the study's academic purpose, their right to decline participation, and the confidential handling of their responses. No personally identifiable information was included in the analysis.

4.0 RESULTS AND DISCUSSION

4.1 Measurement Model Assessment

The measurement model demonstrated satisfactory reliability and convergent validity in Table 2. Cronbach's (α) ranged from .942 to .965, rho_A (ρ_A) from .942 to .966, and composite reliability (CR) from .954 to .972, exceeding the recommended .70 threshold (Hair et al., 2014). AVE values ranged from .775 to .852, exceeding the .50 criterion and supporting convergent validity (Fornell & Larcker, 1981).

Discriminant validity was established using the heterotrait–monotrait ratio (HTMT), with the maximum value of .797 remaining below the .90 threshold (Henseler et al., 2015). Overall, the results support the reliability and validity of the measurement model. However, the high reliability coefficients should be interpreted with attention to potential indicator redundancy.

Table 2. Construct Reliability and Convergent Validity

Construct	Items	Cronbach's α	ρ_A	CR	AVE
Financial Abilities (FA)	6	.943	.948	.955	.782
Financial Behaviour (FB)	6	.964	.965	.971	.848
Financial Communication (FC)	6	.942	.942	.954	.775
Financial Knowledge (FK)	6	.965	.966	.972	.852
Financial Planning (FP)	6	.951	.952	.961	.804
SME Financial Performance (SFP)	6	.961	.962	.969	.840

Note. α = Cronbach's alpha; ρ_A = Dijkstra–Henseler's reliability coefficient; CR = composite reliability; AVE = average variance extracted; FA = financial abilities; FB = financial behaviour; FC = financial communication; FK = financial knowledge; FP = financial planning; SFP = SME financial performance.

4.2 Explanatory Power of the Structural Model

The explanatory power of the structural model was assessed using R^2 and adjusted R^2 shown in Table 3. The four financial-literacy dimensions collectively explained 53.5% of the variance in financial behavior (FB) ($R^2 = .535$; adjusted $R^2 = .531$).

The model explained 75.2% of the variance in SME financial performance (SFP) ($R^2 = .752$; adjusted $R^2 = .749$). The small differences between R^2 and adjusted R^2 indicate that adjustment for the number of predictors had minimal effect on the estimates. These values represent in-sample explanatory power and should not be interpreted as evidence of predictive performance or causality.

Table 3. Explanatory Power of the Structural Model

Endogenous construct	R^2	Adjusted R^2	Interpretation
Financial Behaviour (FB)	.535	.531	Moderate
SME Financial Performance (SFP)	.752	.749	Substantial

Note. R^2 = coefficient of determination; FB = financial behavior; SFP = SME financial performance. Interpretations are based on commonly applied PLS-SEM guidelines (Hair Jr et al., 2014).

4.3 Direct Structural Relationships

The structural model results supported all nine hypothesized direct relationships, as presented in Table 4. Financial behavior exhibited the strongest direct association with SME performance ($\beta = .343$, $t = 2.821$, $p = .005$). Of the four financial literacy dimensions, financial abilities had the largest direct effect on performance ($\beta = .234$, $t = 2.456$, $p = .014$), followed by financial communication ($\beta = .224$, $t = 3.344$, $p = .001$), financial planning ($\beta = .154$, $t = 2.254$, $p = .025$), and financial knowledge ($\beta = .144$, $t = 2.988$, $p = .003$).

Each of the four financial literacy dimensions also demonstrated positive and statistically significant direct effects on financial behavior. Financial planning showed the strongest relationship with financial behaviour ($\beta = .279$, $t = 2.233$, $p = .026$), followed by financial communication ($\beta = .233$, $t = 2.564$, $p = .011$), financial abilities ($\beta = .214$, $t = 2.270$, $p = .024$), and financial knowledge ($\beta = .211$, $t = 2.586$, $p = .010$). Overall, these results indicate that all financial literacy dimensions were positively associated with both financial behavior and SME performance, and that financial behavior was positively associated with SME performance. All nine hypothesized direct relationships were positive and statistically significant and financial behavior showed the strongest association with SME financial performance ($\beta = .343$, $p = .005$).

Table 4. Direct Structural Path

Hypothesis	Structural path	β	t	p	Decision
H1	FK → Performance	.144	2.988	.003	Supported
H2	FC → Performance	.224	3.344	.001	Supported
H3	FA → Performance	.234	2.456	.014	Supported
H4	FP → Performance	.154	2.254	.025	Supported
H5	FK → FB	.211	2.586	.010	Supported
H6	FC → FB	.233	2.564	.011	Supported
H7	FA → FB	.214	2.270	.024	Supported
H8	FP → FB	.279	2.233	.026	Supported
H9	FB → Performance	.343	2.821	.005	Supported

Note. β = standardised path coefficient; FK = financial knowledge; FC = financial communication; FA = financial abilities; FP = financial planning; FB = financial behaviour. All hypothesised direct relationships were statistically significant at $p < .05$.

Figure 2 presents the estimated structural model with standardized path coefficients and the explained variance (R^2) of the endogenous constructs. All direct structural relationships were positive and statistically significant.

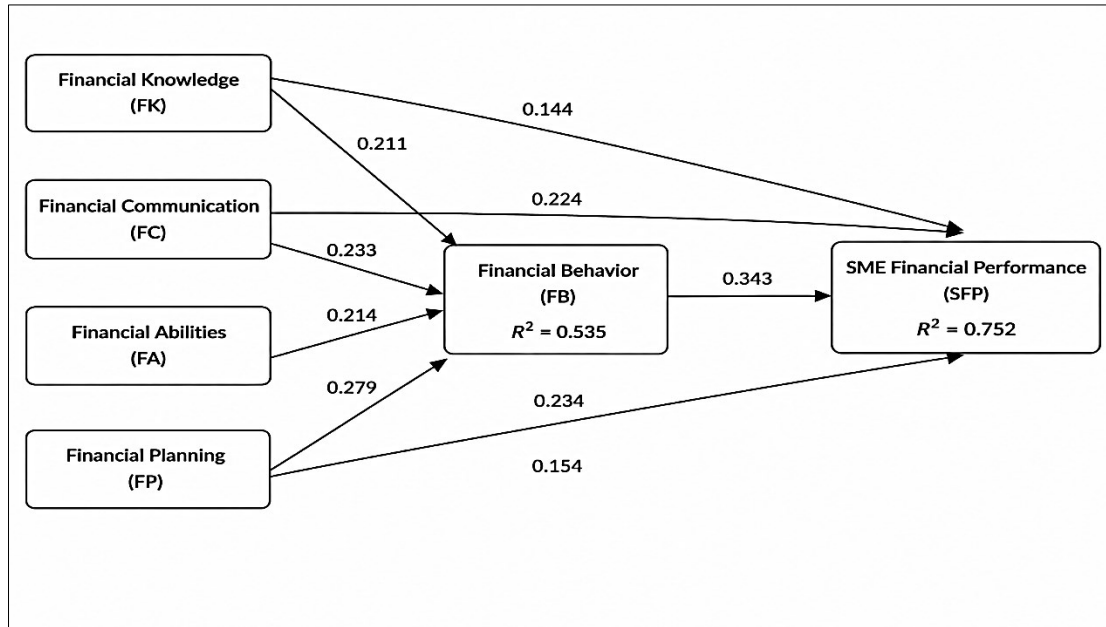


Figure 2. Structural Model Results

4.4 Indirect Effects of Financial Behavior

All four specific indirect effects through financial behavior (FB) were positive and statistically significant, as their 95% bias-corrected bootstrap confidence intervals excluded zero as shown in Table 5. Financial planning showed the largest indirect effect ($\beta = .096$), followed by financial communication ($\beta = .080$), financial abilities ($\beta = .073$), and financial knowledge ($\beta = .072$). Thus, H10–H13 were supported. Because the corresponding direct effects were also positive and significant, the results indicate complementary partial mediation (Zhao et al., 2010).

Table 5. Indirect Effects through Financial Behavior

Hypothesis	Indirect path	B	95% CI LL	95% CI UL	<i>t</i>	Decision
H10	FA → FB → SFP	.073	.013	.211	2.390	Supported
H11	FC → FB → SFP	.080	.014	.183	2.641	Supported
H12	FK → FB → SFP	.072	.012	.178	2.292	Supported
H13	FP → FB → SFP	.096	.015	.237	2.785	Supported

Note. CI = confidence interval; LL = lower limit; UL = upper limit. Indirect effects were evaluated using 95% bias-corrected bootstrap confidence intervals. An indirect effect is considered statistically significant when its confidence interval does not include zero.

4.5 Discussion

The findings support the proposed capability behavior performance framework. Financial knowledge (FK), financial communication (FC), financial abilities (FA), and financial planning (FP) were positively associated with both financial behavior (FB) and SME financial performance (SFP), while

FB showed the strongest direct association with SFP. These findings support the financial capability perspective by demonstrating that financial literacy involves both understanding financial information and applying financial competencies in practice (Lusardi & Mitchell, 2014; OECD, 2018, 2023).

Among the four dimensions, FA showed the strongest direct association with SFP, emphasizing the importance of practical competence in financial management. FC also demonstrated a meaningful association with performance, highlighting the role of effective financial-information exchange and coordination. FP showed the strongest association with FB and the largest indirect effect through FB, suggesting that budgeting, forecasting, financial targets, and monitoring can help translate financial capability into recurring financial practices. Although FK showed comparatively smaller direct and indirect associations, it remained significant, supporting its role as an important foundation for informed financial decisions (Kaiser et al., 2022).

FB was positively associated with SFP and significantly mediated all four capability–performance relationships. Because the corresponding direct and indirect effects were positive and significant, the results indicate complementary partial mediation (Zhao et al., 2010). This finding supports the view that financial capabilities are associated with SME performance both directly and through their application in financial-management practices, consistent with related evidence on financial behavior and organizational financial processes (Duréndez et al., 2023; Sajid et al., 2024). Overall, the findings extend previous research by distinguishing the roles of individual financial-literacy dimensions rather than treating financial literacy as a single aggregate construct. They also provide evidence from the Omani SME context that FB represents an important pathway linking financial capabilities with financial performance. However, given the cross-sectional design, these relationships should be interpreted as statistical associations and indirect effects rather than causal relationships.

5.0 CONCLUSION

The present study examined the relationships among financial knowledge (FK), financial communication (FC), financial abilities (FA), financial planning (FP), financial behavior (FB), and SME financial performance (SFP) in Oman. All four financial-literacy dimensions were positively associated with FB and SFP, while FB showed the strongest direct association with SFP. Among the capability dimensions, FA had the strongest direct association with SFP, whereas FP showed the strongest association with FB and the largest indirect effect through FB. The significant direct and indirect relationships indicate complementary partial mediation, supporting FB as an important pathway linking financial capabilities with SME financial performance.

The findings reinforce the value of conceptualizing financial literacy as a multidimensional capability rather than a single aggregate construct. They further highlight the importance of translating financial knowledge, communication, abilities, and planning into systematic financial-management practices. The model explained 53.5% of the variance in FB and 75.2% in SFP, demonstrating strong in-sample explanatory power. Given the cross-sectional design, however, the findings should be interpreted as statistical associations and indirect effects rather than evidence of causality.

6.0 LIMITATIONS AND FUTURE RESEARCH

This study is limited by its cross-sectional, single-respondent, and self-reported design, which restricts causal interpretation and may introduce common-method bias. Its focus on Omani SMEs also limits generalizability to other contexts.

Future research should employ longitudinal and multi-source designs, incorporate objective financial measures, and test the model across different sectors, GCC countries, and emerging economies. Additional mediators and moderators may also be examined to extend the capability–behavior–performance framework.

Declarations

Author Contributions: Al Musheifri conceptualized the study, collected the data, conducted formal analysis, and drafted the manuscript. Kadir and Jamaluddin provided academic supervision, and critically reviewed the manuscript. All authors read and approved the final version.

Competing Interests: The authors declare no competing financial or non-financial interests.

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Data Availability: Data supporting the findings are available from the corresponding author upon reasonable request.

Declaration of Generative AI: Generative AI tools were used solely for language and grammatical refinement; the authors independently verified all research, analysis, interpretation, and conclusions and take full responsibility for the manuscript’s accuracy and integrity.

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