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International Journal of Corporate Governance

ISSN online: 1754-3045 - ISSN print: 1754-3037
https://www.inderscience.com/ijcg

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DOI: 10.1504/IJCG.2024.10060297

Article History:

Received:	12 June 2023
Last revised:	14 June 2023
Accepted:	04 October 2023
Published online:	12 February 2024

Impact of family board members and CEO's business education on the investment in information technology

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Abstract: The current study investigates the impact of family board members (*FBM*) and the CEO's business education (*CEO_BUSEDU*) on the investment in information technology (*INVEST_IT*) in family business enterprises (FBEs). This study considered using a survey research design to collect data from owners of FBEs in India. As robustness checks, this study utilised a two-stage least (2SLS) square model to reduce endogeneity problems. Empirical analysis shows that *FBM* and *CEO_BUSEDU* increase *INVEST_IT*, and financial support from foreign family members moderates the relationship between *FBM* and *INVEST_IT*. The empirical results contribute to the literature on the impact of *FBM and CEO_BUSEDU* on *INVEST_IT*. In addition, the results may help academia extend the studies on family board members, CEOs' business

education, and *INVEST_IT* by collecting data from different countries. Furthermore, family business owners may find the results helpful in increasing *INVEST_IT*.

Keywords: family board members; FBM; CEO's business education; investment in information technology; India.

Reference to this paper should be made as follows: Gill, A., Mand, H.S., Kang, P.S. and Kaur, G. (2024) 'Impact of family board members and CEO's business education on the investment in information technology', *Int. J. Corporate Governance*, Vol. 14, No. 1, pp.47–64.

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1 Introduction

Modern firms are under pressure from stakeholders to maintain long-term sustainability to survive, grow, prosper, and maximise shareholders' wealth in the long run (Linnenluecke and Griffiths, 2010). Therefore, investment in information technology (IT) has become a critical organisational factor in sustaining financial gains (Baswani et al., 2021) to maximise shareholders' wealth. Investment in IT is an investment in a broad range of digital technologies. For example, firms invest in management information system (MIS), internet of things devices, sensors, blockchain, artificial intelligence, machine learning, and employee/user training devices to collect, store, retrieve, transmit, process data, and disseminate information to make crucial data-driven decisions (Fraga-Lamas et al., 2021; Hartikayanti et al., 2018).

Investment in IT is among the crucial decisions of the board of directors, the family board members (FBM), and the CEO to maximise stakeholders' wealth. Business education increases internal financing sources in FBEs (Gill et al., 2023b) to enhance investment in IT. Studies by Bartell (2003) and Schworm et al. (2017) defined business education as a synergistic and transformative learning process resulting in awareness,

competence, and expertise in business management. In this study, business education refers to business management diplomas/degrees the firm's CEO earned (i.e., a Diploma in Business Management, Bachelor of Commerce or Business Administration, Master of Commerce or Business Administration, and Doctor of Philosophy in Business Management).

Boards make significant decisions (Chen et al., 2017), such as investment in IT, and family members act as the board of directors (Andres, 2011). In addition, foreign family members provide financial support to family business firms in India (Gill et al., 2016) to enhance internal financing sources for investment in IT. FBM increase investment in IT to reduce agency problems between the FBEs and the stakeholders (Jensen and Meckling, 1976). On the other hand, IT acts as an enabler in corporate governance (Abraham, 2012) to improve communications among board members to make decisions, leading to a win-win situation in the firm.

Family firms operate with a higher level of investment injected by family members to obtain majority shareholding (i.e., 50 + 1% votes) (Gill et al., 2022). For example, Anderson et al. (2003) argued that family members invest a significant proportion of their wealth, manage FBEs themselves, and they seek to pass these enterprises to their heirs. The involvement of family boards helps address agency problems between the firm and stakeholders by making crucial investment decisions, such as those related to IT. Indian firms have been criticised for lack of corporate social responsibility (Arevalo and Aravind, 2011), and family board help reduce agency problems between the firm and the stakeholders by making, for example, vital IT investment decisions. In addition, family business firms operate with higher internal financing sources (Gill et al., 2022), leading to higher investment in IT to maximise shareholders' wealth.

Investment in IT minimises agency problems between firms and stakeholders by improving corporate governance and reducing fraud in corporations (Cumming et al., 2017). Many studies have been conducted on IT investment since the late 1960s when the research started on IT in India (Halawi and McCarthy, 2006). This study concentrates on the impact of FBM and the CEO's business education on investment in IT by using the following research questions:

- Do FBM increase investment in IT?
- Does the CEO's business education increase investment in IT?

A study by Mand et al. (2022) examined the impact of family control on IT investment and adoption and found that family members increase IT investment in family business firms in India. A previous study by Kuo et al. (2018) focussed on the role of the education of directors in influencing firm R&D investment and found that education increases firm investment. Empirical analysis of this study shows that FBM, CEO's business education, the CEO's duality, financial support from non-resident family members, and internal financing sources increase investment in IT. The empirical results contribute to the literature on the impact of FBM and CEOs' business education on investment in IT. In addition, the results may help academia extend the studies on CEOs' business education, internal financing sources, and investment in IT by collecting data from different countries. The empirical results lend some support to the findings of Kuo et al. (2018) and Mand et al. (2022) in that FBM and the business education of the CEO increase investment in IT. Moreover, the results may be generalised to family business enterprises (FBEs). The remaining sections include:

1 a literature review

2 methodology, data analysis and results

3 discussion, limitations, and recommendations for future research.

2 Literature survey

2.1 Necessities of IT investment in corporate governance

The board of directors makes all the critical decisions, such as corporate investment (e.g., investment in IT) (Agyei-Mensah, 2021). In addition, IT helps the board of directors prevent fraud (Halbouni et al., 2016), thus helping the board maximise shareholders' wealth. IT, for example, helps executives and directors monitor cash transactions, inventories holdings, accounts receivable, and accounts payable transactions by storing, retrieving, and transmitting data (Impagliazzo et al., 2016; Gill et al., 2023a) to decrease earnings manipulations. Besides, investment in IT plays a crucial role in the firm's corporate governance by enabling executives to obtain real-time information and online communication with other board members, (e.g., foreign family directors) to make strategic corporate decisions with enhanced transparency, compliance, and accountability (Elizabeth Abraham, 2012).

Weaven et al. (2021) argued that micro, small, and medium enterprises are critical to India's economic development. Therefore, improvement in the operating efficiency of family business firms is necessary for their survivability, prosperity, and growth to maximise stakeholders' wealth. Emerging digital technologies, (e.g., blockchain technology) help reduce unethical activities and provide business-to-business (B-B) and business-to-consumer (B-C) digital solutions across business units and supply chains (Zavolokina et al., 2016) to improve financial efficiency and transparency (Rakshit et al., 2022) of the firm. Similarly, FinTech enhances the brand reputation, expands the availability of products and services through digitisation, and lowers operational costs with process automation (Temelkov, 2018). Overall, MISs support executives, directors, and owners of the firm in enhancing day-to-day operations to manage cash, inventory holding, accounts receivables, and accounts payable to improve operating efficiency (Banker et al., 2006; Gill et al., 2023a). Thus, IT investment helps the board of directors improve the financial efficiency of the FBEs to maximise shareholders' wealth.

2.2 FBM and investment in IT

Family members play a vital role in investment in IT by injecting funds and voting in favour of IT investment. For example, foreign family members financially support their family business owners and serve on the board (Gill et al., 2016). Thus, they influence and pressure the board's decisions to invest in IT. In addition, maximising shareholders' wealth is among the essential goals of corporations (Gill et al., 2023a). Therefore, family business managers/executives, such as the board of directors, make IT investment decisions to maximise shareholders' wealth (Santos et al., 1993). Fadhilah and Subriadi's (2019) study found that IT contributes to achieving strategic alignment, provides business support, and enhances firm performance. In addition, IT investment increases the firm

value to maximise shareholders' wealth (Dehning et al., 2005) by improving working capital management efficiency (WCME) (Gill et al., 2023a).

Family business owners tend to operate their firms with higher internal financing sources by receiving financial support from non-resident family members (Gill et al., 2016). In addition, IT investment, (e.g., MIS investment) improves WCME to enhance internal financing sources (Gill et al., 2023a). However, as the literature shows, micro and small firms are financially constrained and face hard capital rationing since external capital suppliers are reluctant to supply the capital to these firms (Joeveer, 2013). Besides, the literature also documents that internal financing sources encourage IT investment (Gill et al., 2019). Moreover, the pecking order theory supported the reliance on internal financing sources (Myers and Majluf, 1984). Under the pecking order theory, information asymmetry between corporate insiders and the capital market creates a pecking order over financing choices, and firms prefer using internally generated funds over external funds (Vogt, 1994). The findings of Fazzari et al. (1988) and Whited (1992) reported that internal financing sources play an independent role in explaining investment spending for firms that face hard capital rationing in which firms face external financing constraints.

Mand et al.'s (2022) findings showed that family control enhances an investment in IT in family business firms in India. The findings of Chen and Hsu (2009) indicated that firms with higher family ownership, (e.g., a higher number of board members) manage research and development investment more efficiently than firms with low family ownership in Taiwan. Ashwin et al.'s (2015) study showed that high family involvement positively and significantly affects research and development investments in Indian pharmaceutical sectors. In summary, FBM increase investment in IT by injecting funds into FBEs and impacting board decisions in favour of IT investment. Hence, the following hypotheses:

- *First hypothesis:* the more family members serve on the board, the higher the investment in IT.

2.3 Impact of business education on investment in IT

Section 2.2 shows the literature review on the relationships among business education, internal financing sources, and investment in IT. A study by Gill et al. (2023a) showed that 82% of business owners act as a CEO and director of the board in India. Therefore, CEO's business education is crucial to operating FBEs to cope with business challenges by making sound business management decisions, such as building internal financing sources to bootstrap and make sound IT investment decisions. Koechlin (2020) argued that rational decision theory predicts that humans make choices to maximise the subjective expected utility. The subjective expected utility is an attractive economic opportunity perceived by FBEs board members to maximise shareholders' wealth. Business education enables CEOs to make better strategic planning decisions to increase economic opportunity and improve operational control skills (Kissi et al., 2017), thus increasing investment in IT.

The business education of the CEO helps improve internal financing sources of the FBEs by increasing retained earnings and liquid assets such as cash and cash equivalents. Ajayi and Ross (2020) found that education affects financial decision-making. Mun et al. (2020) collected data from the TS2000 database and found that CEOs' business education

improves cash holding, and the firm's financial policy depends on CEOs' educational background in Korea. Thus, Mun et al. (2020) indicated that CEO's business education improves internal financing sources. Internal financing sources increased with the help of business education act as determinants of investment (Hubbard et al., 1995). An empirical study by Gill et al. (2019) collected data from Indian small business firms and found that owner education and internal financing sources increase IT investment in India.

CEO's business education signals legitimacy by encouraging investment in IT to increase social welfare in the eyes of stakeholders to deal with exogenous shocks such as the COVID-19 pandemic. Furthermore, micro and small family business ventures face the liability of newness, and the increase in legitimacy helps them overcome the liability of newness in the eyes of stakeholders (Stinchcombe, 1965) by increasing IT investment in the eyes of stakeholders. Thus, increasing legitimacy helps firms improve their performance by increasing sales and, consequently, increasing internal financing sources to enhance IT investment. The findings of Kuo et al. (2018) suggested that the higher education of corporate directors encourages a higher level of investment in the firm's research and development areas in Taiwanese publicly traded firms. In addition, an empirical study by Mand et al. (2022) showed a positive correlation between owner education and investment in IT, indicating that educated owners/board members make better IT investment decisions.

In summary, the literature shows that business education helps improve investment in IT. Therefore, CEO's business education is crucial for investment in IT since micro and small business enterprises face the liability of newness and external financing challenges (Gill et al., 2019) in India. Accordingly, the following hypothesis:

- *Second hypothesis:* the higher the CEO's business education level, the higher the firm's investment in IT.

2.4 FBM and investment in IT: role of financial support from foreign family members

Foreign family members provide financial support to their family business firms and serve as foreign directors on the family boards (Gill et al., 2016); therefore, they have pressure on the board of directors to enhance investment in IT. In addition, financial support from foreign family members increases internal financing sources to enhance investment in IT. Besides, financial support from foreign family members decreases the issues of liability of newness in the eyes of capital suppliers under the hard capital rationing situation. Thus, foreign family directors enhance financing sources to increase IT investment in the family business firms and moderate the association between the family board of directors and investment in IT. Hence, the fourth hypothesis:

- *Third hypothesis:* the effect of FBM on investment in IT is pronounced for financial support from foreign family members.

3 Methodology

3.1 Research design

Survey research is crucial in collecting sensitive data from a large population (Gill et al., 2022). This study used survey research considering the benefits of the survey research design. The natural logarithm of data decreases heteroscedasticity, (i.e., stabilise variance) (Gill et al., 2023a); therefore, this study calculated the natural logarithm of sales revenue, firm size measured by assets, internal financing sources, firm age, number of employees, owner age, and owner experience.

3.2 Measurements of dependent, independent, and control variables

The followings are the measurements of the dependent, independent, and control variables:

- *Investment in IT (INVEST_IT):* this study measured the *INVEST_IT* variable as the total investment in IT made by FBEs.
- *Family board members (FBM):* FBM variable was measured as the number of family members serving as directors on the board.
- *The CEO's business education (CEO_BUSEDU):* the *CEO_BUSEDU* was measured as a categorical variable with assigned values 0 = No business management diplomas/degrees, 1 = CEO earned diploma in business management, 2 = CEO earned B.Com./B.B.A. degree, 3 = CEO earned M.Com./M.B.A. degree, and 4 = CEO earned PhD in Business Management.
- *CEO duality (DUAL):* the *DUAL* is measured as a dummy variable with an assigned value of one if the FBE owner serves as the director of the board and CEO; otherwise, zero.
- *Board size (B_SIZE):* we measured *B_SIZE* as the total number of directors serving on the board.
- *Financial support from foreign family members (FS_FFM):* we measured the FS_FFM variable as a categorical variable with the assigned value of 0 = No financial support from foreign family members, 1 = Financial support from foreign family members decreased a lot, 2 = Financial support from foreign family members slightly decreased, 3 = Financial support from foreign family members stayed the same, 4 = Financial support from foreign family members slightly increased, and 5 = Financial support from foreign family members increased a lot.
- *Internal financing sources (IFS):* the *IFS* variable measures total personal and family savings that can be used for IT investment in the FBE.
- *Family business assets (FB_ASSETS):* the *FB_ASSETS* variable is measured as the actual assets of FBEs.
- *Family business sales (FB_SALES):* the *FB_SALES* variable is measured as the actual sales revenue of FBEs.

- *Family business net profit margin (FB_NPM):* the *FB_NPM* is measured as the net income of the family business firm after tax divided by the total sales revenue of FBEs.
- *Firm age (FIRM_AGE):* the *FIRM_AGE* is measured as the actual age of FBEs (in years).
- *Firm leverage (FIRM_LEV):* the *FIRM_LEV* is measured as total debt ÷ total assets.
- *The number of employees (EMP):* the EMP variable is measured as the number of non-family employees the FBE uses to operate.
- *Family business location (FB_LOC):* the *FB_LOC* variable is measured as a dummy variable with the assigned value of one if a FBE operates in a city; otherwise, zero.
- *Owner age (O_AGE):* the *O_AGE* is measured as the actual age of the FBE owner.
- *Owner gender (O_GEN):* this study measured *O_GEN* as a dummy variable with the assigned value of one if the FBE owner reports female; otherwise, zero.
- *Owner experience (O_EXP):* the *O_EXP* is measured as the number of years of experience of a FBE owner.
- *Family business industry (FB_IND):* the *FB_IND* is measured as a dummy variable with the assigned value of one if a FBE operates in the manufacturing/production industry; otherwise, zero.

3.3 Sample and response rate

This study used a non-probability sampling method, (e.g., purposive and convenience), considering it is impossible to collect data from all focal population members (Huck, 2008). We targeted family business owners to collect data since about 85% of Indian firms operate as family businesses (Dewan, 2021). This study selected research participants from Punjab, Haryana, Himachal, Utter Pradesh, Rajasthan, and Maharashtra, India. The data collection team selected research participants who were representative of the population. For example, we excluded non-Indian family business owners.

We prepared a list of research participants using referrals from families, friends, and religious places to collect data. Two hundred thirty-six research participants cooperated, although we contacted 900 research participants. Unfortunately, three surveys were non-usable. Thus, the response rate was 26.22%. The data collection team collected most surveys over the telephone and asked for research participants' permission before starting the telephone interview. In addition, the data collection team assured all the research participants that their confidentiality would be strictly maintained. Besides, the data collection team did not force research participants to cooperate in this study.

4 Econometric models, analysis, and results

4.1 Econometric models

We used *FBM* serving as directors on the board and the CEO's business education (*CEO_BUSEDU*) as main explanatory components in the investment in IT (*INVEST_IT*). Family members, including foreign family members, provide financial support and participate in the decision-making in the family business firms in India to build internal financing sources (Gill et al., 2016). In addition, business education helps increase internal financing sources (Gill et al., 2023b). Therefore, this study considered FBM and *CEO_BUSEDU* as the main explanatory variables in *INVEST_IT*.

Table 1 Descriptive statistics

	Mean	*Std. deviation*	*Minimum*	*Median*	*Maximum*
INVEST_IT	13.683	1.036	9.90	13.59	16.81
FBM	1.31	0.657	1	1	5
CEO_BUSEDU	1.00	1.391	0	0	4
DUAL	0.92	0.268	0	1	1
B_SIZE	2.06	1.413	1	2	7
FS_FFM	2.20	1.602	0	2	5
IFS	13.846	1.007	11.51	13.59	17.73
FB_ASSETS	16.369	1.173	12.43	16.52	19.81
FB_SALES	16.566	1.321	11.51	16.81	20.14
FB_NPM	0.134	0.088	0.01	0.10	0.50
FIRM_AGE	2.845	0.414	1.61	3	3.85
FIRM_LEV	0.371	0.209	0.03	0.36	.88
EMP	1.247	1.031	0.00	1.10	4.09
FB_LOC	0.58	0.494	0	1	1
O_AGE	3.836	0.168	3.33	3.87	4.33
O_EXP	2.817	0.468	1.39	3	3.91
O_GEN	0.80	0.399	0	1	1
FB_IND	0.18	0.389	0	0	1

Notes: Variables include investment in information technology (*INVEST_IT*), family board members (*FBM*), CEO's business education (*CEO_BUSEDU*), CEO duality (*DUAL*), board size (*B_SIZE*), financial support from foreign family members (*FS_FFM*), internal financing sources (IFS), family business assets (*FB_ASSETS*), family business sales (*FB_SALES*), family business net profit margin (*FB_NPM*), firm age (*FIRM_AGE*), firm leverage (*FIRM_LEV*), number of employees (*EMP*), family business location (*FB_LOC*), owner age (*O_AGE*), owner experience (*O_EXP*), owner gender (*O_GEN*), and family business industry (*FB_IND*).

Table 2 Correlation analysis

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	*INVEST_IT*	1																	
2	*FBM*	0.207**	1																
3	*CEO_BUSEDU*	0.243**	0.237**	1															
4	*DUAL*	0.153*	–0.033	0.115	1														
5	*B_SIZE*	0.053	0.193**	0.138*	0.069	1													
6	*FS_FFM*	0.202**	0.222**	0.302**	0.117	0.023	1												
7	*IFS*	0.163*	0.090	0.249**	–0.110	0.133*	0.315**	1											
8	*FB_ASSETS*	0.131*	0.021	0.116	–0.098	0.083	0.075	0.681**	1										
9	*FB_SALES*	0.157*	–0.006	0.067	–0.095	–0.011	0.016	0.600**	0.734**	1									
10	*FB_NPM*	–0.056	0.091	0.096	0.110	0.137*	0.249**	–0.028	–0.336**	–0.433**	1								
11	*FIRM_AGE*	0.108	–0.059	–0.118	–0.029	–0.046	–0.129*	0.157*	0.384**	0.321**	–0.168*	1							
12	*FIRM_LEV*	–0.019	–0.023	–0.066	–0.016	0.015	0.020	0.161*	0.096	0.142*	–0.133*	0.146*	1						
13	*EMP*	0.035	0.185**	0.251**	–0.059	0.142*	0.411**	0.684**	0.361**	0.299**	0.208**	–0.077	0.039	1					
14	*FB_LOC*	–0.097	0.005	–0.040	0.049	0.122	–0.024	–0.062	–0.169**	–0.141*	0.153*	0.019	–0.008	–0.060	1				
15	*O_AGE*	0.122	–0.067	–0.088	0.093	–0.092	–0.042	0.086	0.210**	0.241**	–0.103	0.700**	0.139*	–0.053	0.149*	1			
16	*O_EXP*	0.112	–0.088	–0.162*	–0.003	–0.076	–0.184**	0.156*	0.379**	0.395**	–0.175**	0.689**	0.089	–0.087	–0.043	0.556**	1		
17	*O_GEN*	–0.051	–0.026	–0.009	0.018	0.052	0.056	0.065	–0.012	0.027	0.028	–0.042	0.026	0.060	–0.003	–0.056	–0.035	1	
18	*FB_IND*	0.008	–0.025	0.097	–0.028	–0.012	0.175**	–0.081	–0.178**	–0.225**	0.170**	–0.142*	–0.071	0.081	0.020	–0.149*	–0.176**	–0.042	1

Notes: *$p < 0.05$ and **$p < 0.01$; Variables include investment in information technology (*INVEST_IT*), family board members (*FBM*), CEO's business education (*CEO_BUSEDU*), CEO duality (*DUAL*), board size (*B_SIZE*), financial support from foreign family members (*FS_FFM*), internal financing sources (*IFS*), family business assets (*FB_ASSETS*), family business sales (*FB_SALES*), family business net profit margin (*FB_NPM*), firm age (*FIRM_AGE*), firm leverage (*FIRM_LEV*), number of employees (*EMP*), family business location (*FB_LOC*), owner age (*O_AGE*), owner experience (O_EXP), owner gender (*O_GEN*), and family business industry (*FB_IND*).

However, it is arguable that FBM and *CEO_BUSEDU* increase investment in IT by enhancing internal financing sources (IFS), causing endogeneity problems. Therefore, this study used a two-stage instrumental variables regression analysis and an ordinary least square (OLS) regression analysis to decrease endogeneity and reverse causality between FBM, IFS, and *INVEST_IT* changes. For example, an increase in investment in IT could be associated with greater retained earnings built with the help of assets, sales, net profit margin, family board size, CEO duality, and personal and family savings (i.e., *IFS*). FBM, the CEO's business education, family business assets (*FB_ASSETS*), family business sales (*FB_SALES*), family business net profit margin (*FB_NPM*), board size (*B_SIZE*), and CEO duality (*DUAL*) will likely affect internal financing sources. Thus, this study considered *FBM*, *CEO_BUSEDU*, *FB_ASSETS*, *FB_SALES*, *FB_NPM*, *B_SIZE*, and *DUAL* as good candidates to act as instruments in two-stage least square (2SLS) regression analysis. The followings are the baseline OLS and two-stage regression models used in this study:

$$Y_i = \alpha_0 + \alpha_1 FBM_i + \alpha_2 CEO\_BUSEDU_i + \sum \beta_i X_i + \varepsilon_i \tag{1}$$

$$Y_i = \alpha_0 + \alpha_1 FBM * FS\_FFM_i + \sum \beta_i X_i + \varepsilon_i \tag{2}$$

In the above regression models, Y is the dependent variable investment in IT (*INVEST_IT*), i refers to family business enterprise (FBE), X represents the control variables (j) corresponding to FBE i, and ε_i is a normally distributed disturbance term. In model (1), α_1 and α_2 measure the magnitude at which *FBM* and *CEO_BUSEDU* increase *INVEST_IT*. In model (2), α_1 measures the magnitude at which financial support from foreign family members (*FS_FFM*) moderates the relationship between the FBM and investment in IT. We extended the above models by using a different set of control variables once at a time. We used model (1) to test the first and second hypotheses, and model (2) was used to test the third hypothesis.

This study used a two-stage instrumental variables regression analysis to address endogeneity issues. The first stage involved regressing *IFS* on *FBM*, *CEO_BUSEDU*, *FB_ASSETS*, *FB_SALES*, *FB_NPM*, *B_SIZE*, *DUAL*, and the other control variables. Next, we regress changes in *INVEST_IT* on the fitted value of IFS obtained from the first-stage regression. The followings are first and second-stage regression models used in this study:

First stage regression model:

$$\begin{aligned} Z_i = {} & \beta_0 + \beta_1 FBM_i + \beta_2 CEO\_BUSEDU_i + \beta_3 FB\_ASSETS_i \\ & + \beta_4 FB\_SALES_i + \beta_5 FB\_NPM_i + \beta_6 B\_SIZE_i \\ & + \beta_7 DUAL_i + \sum \delta_i X_i + \varepsilon_i \end{aligned} \tag{3}$$

Second stage regression model:

$$Y_i = \gamma_0 + \gamma_1 \bar{Z}_i + \sum \delta_i X_i + \varepsilon_i \tag{4}$$

In equation (3), Z_i refers to *IFS* for the FBE i, and *FBM*, *CEO_BUSEDU*, *FB_ASSETS*, *FB_SALES*, *FB_NPM*, *B_SIZE*, and *DUAL* imply FBM, the CEO's business education, family business assets, family business sales, family business net profit margin, the board size, and CEO duality associated with FBE i. β_1, β_2, β_3, β_4, β_5, β_6, and β_7 measure the

magnitude at which *FBM*, *CEO_BUSEDU*, *FB_ASSETS*, *FB_SALES*, *FB_NPM*, *B_SIZE*, and *DUAL* influence the probability of an increase IFS. In equation (4), Y_i is the FBE owner's perception of an increase in *INVEST_IT*, whereas $\bar{Z}_i$ is the predicted probability of *IFS*. Hence, γ_1 estimates the effect of the *FBM*, *CEO_BUSEDU*, *FB_ASSETS*, *FB_SALES*, *FB_NPM*, *B_SIZE*, and *DUAL* on *INVEST_IT* by increasing *IFS*. We estimated the coefficients of equations (3) and (4) by applying the OLS method, and the expected probabilities of IFS obtained from equation (3) were used in equation (4).

4.2 Descriptive statistics

While Table 1 shows descriptive statistics, Table 2 provides correlation analysis. This study's average family business assets are INR24,732,189, and family business sales revenue is INR36,371,245. Therefore, our sample size falls within the small business category based on Mishra's (2021) merged criteria. That is, under Mishra's (2021) merged criteria, any firm with an investment of less than ten crore rupees (i.e., 100,000,000 rupees) and sales revenue up to 50 crore rupees (i.e., 500,000,000 rupees) falls with small business category in India.

Table 2 shows that *FBM*, *CEO_BUSEDU*, *DUAL*, *FS_FFM*, *IFS*, *FB_ASSETS*, and *FB_SALES* are positively and significantly correlated with *INVEST_IT* ($\rho_{FBM,INVEST\_IT}$ = 0.207; $\rho_{CEO\_BUSEDU,INVEST\_IT}$ = 0.243; $\rho_{DUAL,INVEST\_IT}$ = 0.153; $\rho_{FS\_FFM,INVEST\_IT}$ = 0.202; $\rho_{IFS,INVEST\_IT}$ = 0.163; $\rho_{FB\_ASSETS,INVEST\_IT}$ = 0.131; and $\rho_{FB\_SALES,INVEST\_IT}$ = 0.157), implying that FBM, CEO's business education, CEO duality, financial support from foreign family members, internal financing sources, family business assets, and family business sales increase investment in IT.

5 Data analysis and results

Table 3 reports the results calculated using equations (1) to (4). The results show that *INVEST_IT* is positively and significantly associated with *FBM*, *FBM*FS_FFM*, *CEO_BUSEDU*, *IFS*, *IFSfit*, *DUAL*, and *FS_FFM*, and negatively and significantly associated with *EMP* and *FB_LOC*.

The coefficients of *FBM* in columns (1) and (5) of *INVEST_IT* are positive and significant at the 1% levels, implying that FBM increase investment in IT. Likewise, the coefficients of *CEO_BUSEDU* in columns (1), (2), and (6) of *INVEST_IT* are positive and significant at the 5% and 1% levels, suggesting that CEO's business education increases investment in IT. Similarly, the coefficient of *CEO_BUSEDU* in columns (3) of IFS is positive and significant at the 5% level, indicating that CEO's business education increases internal financing sources. Further, *FBM*FS_FFM*'s coefficient in column (2) of *INVEST_IT* is positive and significant at the 1% level, suggesting that financial support from foreign family members moderates the relationship between FBM and investment in IT. These findings support the first hypothesis, second hypothesis, and third hypothesis.

The IFS's coefficients in columns (1) and (2) of *INVEST_IT* are positive and significant at the 5% level, implying that internal financing sources increase investment in IT. Likewise, the coefficients of *IFSfit* in column (4) of *INVEST_IT* are positive and significant at the 5% level, indicating that the fitted value of internal financing sources increases investment in IT. Similarly, the coefficients of *DUAL* and *FS_FFM* in columns

(1) and (2) are positive and significant at the 5% level, suggesting that the CEO duality and financial support from family members increase investment in IT. Further, the coefficients of *EMP* and *FB_LOC* in columns (1) and (2) are negative and significant at the 5% and 10% levels, implying that a higher number of employees and family business location decrease investment in IT. Finally, the coefficients of *FB_ASSETS*, *FB_SALES*, *EMP*, *FS_FFM*, *FB_NPM*, and *FIRM_LEV* in column (3) of IFS are positive and significant at the 1% and 5% levels, indicating that family business assets, family business sales, employees, financial support from foreign family members, family business net profit margin, and firm leverage increase internal financing sources for the family business firms.

Table 3 Impact of FBM and the CEO's business education on investment in IT[1]

	OLS			*2SLS*	*Auxiliary regressions*	
Variables	*INVEST_IT*	*INVEST_IT*	*IFS*	*IT_INVEST*	*INVEST_IT*	*INVEST_IT*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
FBM	0.276**		–0.069		0.316**	
	(2.66)		(–1.19)		(3.06)	
*FBM*FS_FFM*		0.092**				
		(4.11)				
CEO_BUSEDU	0.114*	0.104*	0.056*			0.137**
	(2.23)	(2.06)	(1.99)			(2.70)
IFS	0.240*	0.232†			0.277*	0.214†
	(1.97)	(1.94)			(2.27)	(1.74)
IFSfit				0.308*		
				(1.98)		
DUAL	0.534*	0.520*	–0.226		0.609*	0.471†
	(2.14)	(2.13)	(–1.64)		(2.44)	(1.87)
B_SIZE	0.027	0.027	0.014	0.052	0.034	0.048
	(0.56)	(0.57)	(0.54)	(1.06)	(0.70)	(1.01)
FS_FFM	0.099*		0.056*		0.113*	0.120*
	(2.07)		(2.12)		(2.36)	(2.51)

Notes: Dependent variables = *INVEST_IT* and *IFS*. [1]The lowest tolerance is 0.266, and the highest variance inflation factor (*VIF*) is 3.755, indicating that multicollinearity is not a serious issue. †$p < 0.10$, *$p < 0.05$, and **$p < 0.01$; in the regression models, the dependent variables include investment in information technology (*INVEST_IT*) and internal financing sources (IFS). Independent variables are family board members (*FBM*), CEO's business education (*CEO_BUSEDU*), CEO duality (*DUAL*), board size (*B_SIZE*), financial support from foreign family members (*FS_FFM*), internal financing sources (*IFS*), family business assets (*FB_ASSETS*), family business sales (*FB_SALES*), family business net profit margin (*FB_NPM*), firm age (*FIRM_AGE*), firm leverage (*FIRM_LEV*), number of employees (*EMP*), family business location *(FB_LOC*), owner age (*O_AGE*), owner experience (*O_EXP*), owner gender (*O_GEN*), and family business industry (*FB_IND*). Model (3) was used to calculate the fitted value of IFS.

Table 3 Impact of FBM and the CEO's business education on investment in IT[1] (continued)

	OLS			*2SLS*	*Auxiliary regressions*	
FB_ASSETS	–0.106	–0.108	0.326**		–0.102	–0.110
	(–1.09)	(–1.12)	(6.56)		(–1.04)	(–1.12)
FB_SALES	0.074	0.070	0.166**		0.076	0.074
	(0.91)	(0.87)	(3.78)		(0.92)	(0.90)
FB_NPM	–0.777	–0.893	1.087*		–0.763	–0.798
	(–0.84)	(–0.98)	(2.14)		(–0.82)	(–0.46)
FIRM_AGE	0.061	0.034	0.008	–0.107	0.050	0.083
	(0.24)	(0.13)	(0.06)	(–0.40)	(0.19)	(0.31)
FIRM_LEV	–0.312	–0.306	0.440*	–0.336	–0.375	–0.318
	(–0.98)	(–0.97)	(2.52)	(–1.05)	(–0.118)	(–0.99)
EMP	–0.219*	–0.225*	0.399**	–0.181	–0.225*	–0.191*
	(–2.32)	(–2.41)	(8.80)	(–1.44)	(–2.35)	(2.01)
FB_LOC	–0.221	–0.233†	0.114	–0.254†	–0.236†	–0.219
	(–1.62)	(–1.73)	(1.50)	(–1.79)	(–1.71)	(–1.58)
O_AGE	0.489	0.469	–0.191	0.931	0.511	0.434
	(0.87)	(0.84)	(–0.61)	(1.58)	(0.90)	(0.76)
O_EXP	0.157	–0.116	0.019	0.023	0.108	0.161
	(0.78)	(–0.73)	(0.17)	(0.11)	(0.53)	(0.78)
O_GEN	–0.132	–0.132	0.066	–0.136	–0.145	–0.153
	(–0.82)	(–0.82)	(0.74)	(–0.80)	(–0.89)	(–0.94)
FB_IND	0.122	0.112	–0.092	0.162	0.153	0.073
	(0.70)	(0.66)	(–0.95)	(0.89)	(0.87)	(0.42)
Constant	7.840**	8.462**	5.601**	6.565*	7.313**	8.714**
	(3.47)	(3.84)	(4.66)	(2.43)	(3.22)	(3.84)
N	233	233	233	233	233	233
F-Value	3.07**	3.52**	37.19**	1.39	2.89**	2.74**
R^2	0.195	0.207	0.734	0.059	0.176	0.169

Notes: Dependent variables = *INVEST_IT* and *IFS*. [1]The lowest tolerance is 0.266, and the highest variance inflation factor (*VIF*) is 3.755, indicating that multicollinearity is not a serious issue. †$p < 0.10$, *$p < 0.05$, and **$p < 0.01$; in the regression models, the dependent variables include investment in information technology (*INVEST_IT*) and internal financing sources (IFS). Independent variables are family board members (*FBM*), CEO's business education (*CEO_BUSEDU*), CEO duality (*DUAL*), board size (*B_SIZE*), financial support from foreign family members (*FS_FFM*), internal financing sources (*IFS*), family business assets (*FB_ASSETS*), family business sales (*FB_SALES*), family business net profit margin (*FB_NPM*), firm age (*FIRM_AGE*), firm leverage (*FIRM_LEV*), number of employees (*EMP*), family business location *(FB_LOC*), owner age (*O_AGE*), owner experience (*O_EXP*), owner gender (*O_GEN*), and family business industry (*FB_IND*). Model (3) was used to calculate the fitted value of IFS.

In summary, FBM and CEO's business education increase investment in IT investments in India. Results show that financial support from foreign family members moderates the relationship between FBM and investment in IT. The CEO's business education enhances internal financing sources. In addition, we used 2SLS as robustness to reduce endogeneity problems.

6 Discussion, conclusions, limitations, and recommendations for future research

This study intended to test the relations between FBM, the CEO's business education, and investment in IT using survey research. The empirical analysis shows that FBM and the CEO's business education increase investment in IT in India. In addition, financial support from foreign family members moderates the relationship between FBM and investment in IT. The empirical results lend some support to the findings of Kuo et al. (2018) and Mand et al. (2022) in that FBM and the business education of the CEO increase investment in IT.

While internal financing sources, CEO duality, and financial support from foreign family members enhance investment in IT, more employees and family business locations decrease investment in IT. In addition, financial support from foreign family members, family business assets, family business sales, family business net profit margin, firm leverage, and a higher number of employees increase internal financing sources to increase investment in IT.

In conclusion, CEOs' business education and FBM are vital in increasing investment in IT. While FBM increase the probability of an investment in IT by 27.60%, the CEO's business education increases the probability of an investment in IT by 11.40%. Table 3 shows that CEOs' business education and financial support from foreign family members increase FBM. In addition, the CEO's business education increases financial support from foreign family members.

6.1 Limitations/implications and recommendations for future research

Although empirical analysis provides valuable results for FBE owners, consultants, and academia, this study has limitations. For example, the data collection team collected most data through telephone interviews. Furthermore, this study relied on a sample size limited to Punjab, Haryana, Himachal Utter Pradesh, Rajasthan, and Maharashtra states of India. Besides, this study relied on the perceptions of the research participants.

The limitation related to implementing the findings is that if FBE owners perceive a higher level of CEO's business education, they tend to perceive a higher level of internal financing sources and investment in IT, and vice versa. In addition, the empirical findings may not be generalised to the FBEs that are unlike those we used in this study. Besides, this study used a single country and a specific type of business. Therefore, future research should collect data from various countries and industries to generalise the findings further. Nonetheless, this study provides valuable insights into the relationship between FBM, CEO's business education, and investment in IT and offers recommendations for future research.

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