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Role of Board Diversity in Enhancing Corporate Innovation Performance

Mohammad Bin Amin [1,*]

* *Correspondence: Faculty of Economics and Business, University of Debrecen, Böszörményi street 138, Debrecen 4032, Hungary; binamindu@gmail.com*

1 Faculty of Economics and Business, University of Debrecen, Böszörményi street 138, Debrecen 4032, Hungary; binamindu@gmail.com

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Abstract: The current study discusses the influence of board diversity in improving corporate innovation performance in the context of Indian corporate environment. Board diversity has become a significant corporate governance mechanism that helps in influencing strategic decision making, organizational creativity and innovation capability in the past few years. Based on Resource Dependency Theory and Upper Echelons Theory, this paper examines the effects of four dimensions of board diversity: gender diversity, age diversity, educational diversity, functional diversity and board independence on corporate innovation performance. The mediation of strategic decision quality and moderation of board independence between board diversity and innovation performance are also investigated. The study used a quantitative research design and the primary data was gathered from 310 respondents who were board members, senior managers and corporate professionals from various industries in Indian companies. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used in the data analysis using SmartPLS software. Results indicate board diversity has a significant and positive effect on corporate innovation performance. Board independence and educational diversity were the strongest influences on board innovation outcomes among the diversity dimensions. The research also revealed that strategic decision quality plays a significant role as a mediator in the link between board diversity and innovation performance and that board independence positively moderates this link. The study's findings add to the body of literature by offering empirical evidence from Indian Corporate context wherein there are limited studies which have examined multidimensional board diversity and innovation performance in a comprehensive manner. The findings indicate the strategic role of diversity and independence of the boards for innovation-oriented governance systems and long-term organizational competitiveness. The findings also have implications for corporate managers, policy makers, and regulatory bodies involving improving diversity based governance reforms to improve innovation performance of Indian firms.

Keywords: Board Diversity; Corporate Innovation Performance; Gender Diversity; Board Independence; Strategic Decision Quality; Corporate Governance; PLS-SEM; Indian Firms; Educational Diversity; Functional Diversity

1. Introduction

In today's competitive business climate, the ability to innovate is one of the most critical factors for competitiveness, sustainability and future development of the organisation. Innovation is becoming a key strategy for companies looking to gain efficiency in their operations, create new product and services, adapt to market shifts, and stay ahead in highly dynamic global markets. In this context, researchers and practitioners have shown a great interest in the effect that can be expected from the corporate governance mechanisms, especially on the level of innovation performance of the company, in particular, in board composition and board diversity. The relatively diverse boards are thought to complement decision making processes, as the different kinds of experiences,

perspectives, expertise and knowledge resources they bring lead to more innovative and effective governance practices.

Board diversity is board members' differences in gender, age, educational background, functional expertise, ethnicity, and professional experience. There is a general consensus in the literature that multi-boarding has a positive effect on organizational innovation outcomes in the following areas: creative, strategic flexibility, monitoring effectiveness and problem-solving ability. An et al. (2021) contended that such multidimensional diversity of boards promotes firm innovation, as it boosts the ability of the boards to advice the firm and facilitates exploratory innovation or technological development. Likewise, Chen et al. (2023) also demonstrated that "variability boards are positively associated with innovation activities as they foster a broad view and strong strategic governance. The studies highlight the potential of heterogeneous boards to generate innovative ideas and to contribute to the long-term performance of the organization.

Gender diversity has been a major focus of research in the arena of all dimensions of diversity during the past few years. A higher share of women directors on corporate boards is correlated with quality of governance and ethical standards and better innovation performance. Based on data from 45 countries, Griffin et al. (2021) found that companies with gender diverse boards generate more patents and have higher innovative efficiency. Similarly, Vafaei et al. (2021) discovered that when women are on boards, innovation investment and patent development is improved, especially in technology-intensive industries. Li et al. (2026) also suggested that gender diversity on the board aids companies in achieving a balance between exploration and exploitation, leading to better long-term innovation results.

In addition to gender diversity, there is also the diversity of cognitive knowledge in the form of education, skills, and knowledge of how to function, which also has been identified as a crucial aspect to innovation. Li and He (2023) noted that there is a relationship between diversity in education and expertise of board members and the improvement of the company's innovation, and cognitively diverse boards are more likely to have greater analytical abilities and technological understanding, which would lead to better innovative performance. Likewise, Makkonen (2022) used a meta-analysis of earlier studies to show that cognitive diversity has a greater impact on firm innovation than demographic diversity. Wang (2022) further noted that board human capital diversity is crucial as it allows directors to bring in different industry experiences and expertise, which leads to better organizational innovation and strategic adaptability. It can be concluded from these studies that boards with diverse professional and educational backgrounds are more likely to challenge and address complex market opportunities and find innovation opportunities.

The ties among board diversity and innovation are also quite widely studied in emerging markets. Ariff et al. (2017) found that board diversity has a positive impact on innovation performance with the assistance of strategic flexibility and governance quality in Malaysian companies. Likewise, Khan et al. (2021) discovered that board diversity is linked to corporate innovation in Chinese companies, especially in companies with adequate financial resources to sustain innovative businesses. Tang et al. (2021) also showed that boards and directors that are culturally diverse and have international experience have a significant positive impact on the innovation activities of the firm. The results indicate that cultural diversity and cross-cultural business experiences enhance companies' innovation potential and technological progress.

Board independence is another governance characteristic that has become a significant factor that affects innovation performance. Independent directors are typically called on to give objective oversight, to limit managerial opportunism, and to enhance the effectiveness of strategic decision making. Mohd Niza et al. (2026) concluded that board independence has a positive moderating effect on the relationship between board diversity and corporate strategic innovation; that is, boards that have independent members provide their organization with a governance climate that facilitates the use of board diversity

to foster innovation. In a similar vein, Leung and Sane (2023) noted that diversity coupled with governance quality contributes to the strategic monitoring and organizational effectiveness. The results of this paper underscore the complementary nature of board independence in order to enhance the benefits of board diversity for innovation outcomes.

Although there has been increasing research focus on board diversity and innovation, there are inconsistencies and research gaps in the literature. Some research focuses on the importance of demographic diversity, others on the importance of cognitive and professional diversity to innovation performance. Besides, the available empirical evidence has come from developed economies and countries from East Asia, and very little focus has been attributed to the corporate environment in India. In this regard, India is an important case to consider regarding board diversity, as the regulatory focus has shifted to economic growth through innovation, the representation of women on the board has become mandatory, and focus on board diversity has intensified. But, there is minimal empirical research that jointly investigates the effects of multiple dimensions of board diversity on the corporate innovation performance of firms in India using sophisticated analysis methods like PLS-SEM.

Hence the purpose of the present study is to explore the effect of board diversity on the performance of corporate innovation in corporate context in India. The research focuses particularly on the relationship between gender diversity, age diversity, educational diversity, functional diversity, and board independence with innovation performance. Further, the study explores the mediation of strategic decision quality, and the moderation of board independence on the relationship between board diversity and innovation performance. The study fills the gap in the literature on innovation and corporate governance and offers practical implications for Indian firms and policy makers to improve governance for innovation.

2. Literature review

Board diversity has become a significant corporate governance mechanism, which affects the strategic decision making and organizational innovation. Previous research has indicated that diverse boards offer wider knowledge, multiple viewpoints, improved monitoring and problem-solving capacity, all of which lead to better innovation results. Based on this context, An et al. (2021) investigated the association between multidimensional board diversity and corporate innovation and concluded that diverse boards can substantially improve the corporate innovation performance. They highlighted that having professional diversity in the boardroom had the greatest impact on innovation as it increased the board's advisory role and allows the company to conduct exploratory innovation and create new technologies. The authors also noted that companies with more diverse boards produced more patents, including those that were cited, suggesting the strategic importance of board diversity in innovation-oriented companies. In the same way, Chen et al. (2023) found that board diversity has a positive effect on innovation activities, explaining that diverse boards help to enhance strategic flexibility and decision-making processes in innovation.

Research specifically related to gender diversity and its impact on innovation performance has been carried out in a number of studies. Based on data from 45 countries, Griffin et al. (2021) found that gender-diverse boards resulted in increased patent output, new innovations, and increased innovative efficiency. The study also suggested that the gender-diverse board creates more innovative board cultures, longer-term management incentives and diverse inventor teams, which further enhances innovation results. Similarly, Vafaei et al. (2021) reported that there is a positive relationship between female representation on the board and innovation of companies in Australia. They concluded that female independent directors are especially important to innovation investment and patent development, particularly in the technologically intensive industries like healthcare and materials. In addition, Li et al. (2026) showed that board gender diversity increases a firm's

capacity to strive a balance between exploration and exploitation, thereby boosting innovation performance.

Also, research has shown that, to affect innovation, cognitive diversity is more important than demographic diversity. According to Li and He (2023), cognitive diversity, especially education background diversity and expertise diversity has a significant positive impact on the innovation of Chinese companies. The authors claimed that educational and expertise heterogeneity helps to implement new high-tech talent to the firms and enhance the innovation incentives. Likewise, Makkonen (2022) found, based on a meta-analysis of previous empirical research, that board diversity is a positive factor for company innovation, and that cognitive diversity has a higher amplifying effect than surface-level diversity of the board members. The study highlighted that companies need to consider not just diversity in terms of demographic representation, but rather a variety of work experiences and expertise when creating boards. Wang (2022) also backed this argument by showing that board human capital diversity has a positive impact on innovation outcomes.

In emerging economies, a diverse board has been gaining more and more significant links with better innovation and strategic governance. Ariff et al. (2017) revealed that board diversity is associated with positive innovation performance in Malaysian companies; this suggests that greater board diversity can enhance the quality of strategic decisions and adaptability in companies. Board diversity also contributes to corporate innovation in China, especially when companies have enough financial resources to invest in innovation, reported Khan et al. (2021). Mohd Niza et al. (2026) continued this discussion by analyzing the moderating effect of board independence between board diversity and corporate strategic innovation in Malaysia. They conclude that there is a weak, but positive, direct association between gender diversity and innovation, and that the presence of independent directors can significantly reinforce the positive association between diversity and innovation.

The linkage of cultural diversity and innovation has also been the subject of academic research. Tang et al. (2021) studied culturally diverse boards in Chinese companies and concluded that directors with international experience positively impact the innovation performance of a firm. The study also found that directors with postgraduate education in addition to a background in science and longer international experience have a greater impact on innovation activities. The results suggest that exposure to the variety of management practices and global knowledge systems enhances the firms' innovative capacity. Likewise, Cumming and Leung (2021) noted that the understanding of the effect of various board diversities are contingent upon the industry context.

Certain research has correlated board diversity to other governance and monitoring duties that have an indirect impact on innovation. Leung and Sane (2023) asserted that having diverse boards and audit committees enhances the effectiveness and quality of governance and monitoring and can impact on key strategic outcomes. The authors did not find that educational or ethnic diversity has a direct positive impact on the quality of audits or governance mechanisms, but did find that diverse boards have better capabilities of oversight, which could help them make decisions for innovation and other purposes. Similarly, Phan and Yu (2022) studied the relationship between institutional ownership and board diversity, and concluded that governance structures are important to support innovative activities.

While overall board diversity is found to be positively associated with innovation in the literature, the relative significance of the different dimensions of board diversity is inconsistent. There were some studies that showed the effects on cognitive diversity and others that showed the effects on gender or cultural diversity. Furthermore, the majority of empirical data has been collected on developed economies, like Canada, Australia, and the United States, or in East Asian settings, like China and Malaysia. In the era of pro-BD regulations and innovation-driven growth in the Indian corporate landscape, studies that target the Indian corporate environment have remained limited. Thus, there is a need for

extensive research on the role of various dimensions of board diversity on the innovation performance of Indian companies.

H1: Board Diversity positively influences Corporate Innovation Performance.
H1a: Gender Diversity positively influences Corporate Innovation Performance.
H1b: Age Diversity positively influences Corporate Innovation Performance.
H1c: Educational Diversity positively influences Corporate Innovation Performance.
H1d: Functional Diversity positively influences Corporate Innovation Performance.
H1e: Board Independence positively influences Corporate Innovation Performance.
H2: Strategic Decision Quality mediates the relationship between Board Diversity and Corporate Innovation Performance.
H3: Board Independence positively moderates the relationship between Board Diversity and Corporate Innovation Performance.

3. Methodology

This study is based on quantitative research method to analyze the role of Board diversity in the context of Indian Corporation to improve corporate innovation performance. The quantitative approach is suitable since it is designed to test the relationships between the dimensions of board diversity and innovation performance empirically, using statistical techniques. The study has been used deductive research design since the hypotheses developed based on the existing theories and the empirical literature reviewed in the study regarding the relationship between corporate governance and innovation.

The focus group of the study is the top management, manager and board & corporate professionals from the various industries of the Indian companies. The respondents were selected based on their knowledge and involvement in corporate governance activities and innovation-related activities of their companies. A purposive sampling method was used to gather relevant information from people who had a good understanding of the composition of a board and how it practices organizational innovation.

Structured questionnaire was used to gather primary data developed from the existing literature based on previously validated scales for measurement. This questionnaire comprised of 2 parts. The demographic information such as age, gender, educational qualification, work experience, industry type and position in the organization was collected in the first section. The second section measured the constructs related to board diversity and corporate innovation performance. Board diversity dimensions included were gender, age, educational, functional and board independence. Product innovation, technology adoption, research and development, and competitive advantage based on innovation were used to measure the innovation performance of the companies.

The items in each set of measurements were presented on a 5-point Likert-type scale ranging from 1 = “Strongly Disagree” to 5 = “Strongly Agree.” Using a Likert scale helps collect perceptions and attitudes of the respondents on governance practices and outcomes of innovation. 310 valid responses were obtained and analyzed. The sample size is sufficient to validate the measurements and test the hypotheses in PLS-SEM with regard to the structural model. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to analyze the data.Data analysis was carried out by Partial Least Squares Structural Equation Modeling (PLS-SEM) using software type of SmartPLS. The use of PLS-SEM was chosen because it is appropriate for predictive research models, complex constructs and studies with many indicators for latent variables.

4. Results

Table 1 shows the demographic characteristics of the respondents that were included in the study. The results showed that most of the respondents were males (63.9%) and females (36.1%) of the total sample. Regarding age, the majority of responses were for the 31-40 age bracket (40.6%), and the 41-50 age bracket (28.4%). In terms of educational level, over half of the respondents had a master's degree (54.2%), suggesting that the

participants were suitably educated to be able to give meaningful answers to questions on corporate governance and innovative practices. As illustrated in the work experience profile, 38.1% of the respondents had 5–10 years of work experience and 28.7% had 11–15 years. When asked by industry, the majority of respondents came from manufacturing (30.3%), information technology (25.2%) and financial services (20.0%). The aggregate demographic profile indicated that the sample was a group of experienced and professionally qualified people from a variety of industrial backgrounds, which indicated the reliability and generalizability of the results of the study.

Table 1. Demographic Profile of Respondents (N = 310)

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	198	63.9
	Female	112	36.1
Age	Below 30 years	54	17.4
	31–40 years	126	40.6
	41–50 years	88	28.4
	Above 50 years	42	13.5
Educational Qualification	Bachelor's Degree	76	24.5
	Master's Degree	168	54.2
	Doctorate/Professional Qualification	66	21.3
Work Experience	Below 5 years	48	15.5
	5–10 years	118	38.1
	11–15 years	89	28.7
	Above 15 years	55	17.7
Industry Type	Manufacturing	94	30.3
	Information Technology	78	25.2
	Financial Services	62	20.0
	Healthcare	41	13.2
	Others	35	11.3

Descriptive statistics for the main study variables are shown in table 2 such as the values of mean, standard deviation, skewness and kurtosis. The results indicate that the mean values of the constructs for Corporate Innovation Performance (4.11), Board Independence (4.08), and Educational Diversity (4.02) were high, and respondents gave a positive rating for these constructs. The means of all the standard deviations were found to be between 0.648 and 0.742, which showed moderate variance and indicated consistency in respondents' perception of the responses. The skewness values for all the variables were within acceptable range of ±1 which indicates that data were normally distributed. Likewise, there were also no serious problems concerned with data normality as the kurtosis values were within acceptable limits. These results indicate that the data collected is adequate for further multivariate analysis using PLS-SEM techniques.

Table 2. Descriptive Statistics of Study Variables

Variables	Mean	Standard Deviation	Skewness	Kurtosis
Gender Diversity	3.91	0.742	-0.418	-0.227
Age Diversity	3.84	0.701	-0.352	-0.441
Educational Diversity	4.02	0.683	-0.564	0.118
Functional Diversity	3.95	0.715	-0.487	-0.102
Board Independence	4.08	0.648	-0.631	0.284
Corporate Innovation Performance	4.11	0.694	-0.578	0.175

The outer loadings for all the measurement items in the study are shown in Table 3. The results show that all the indicator loading values are above the recommended value of 0.70, which means that the indicators are reliable. Factor loadings for Gender Diversity ranged from 0.801 to 0.847; and for Age Diversity items, the loadings were between 0.793 and 0.844. By the same manner, the Loading values for Educational Diversity and Functional Diversity were satisfactory with values above 0.80. The loadings for the Board Independence construct were also quite high, ranging from 0.817 to 0.871. Moreover, all the loading values of the Corporate Innovation Performance construct were found to be the highest (0.826 – 0.882). The results indicate that all the indicators reflect their related latent constructs with an acceptable level and all have significant contribution to the measurement model.

Table 3. Indicator Loadings of Measurement Items

Constructs	Items	Outer Loadings
Gender Diversity	GD1	0.812
	GD2	0.847
	GD3	0.835
	GD4	0.801
Age Diversity	AD1	0.793
	AD2	0.821
	AD3	0.844
	AD4	0.816
Educational Diversity	ED1	0.851
	ED2	0.867
	ED3	0.824
	ED4	0.838
Functional Diversity	FD1	0.809
	FD2	0.842
	FD3	0.853
	FD4	0.821
Board Independence	BI1	0.846
	BI2	0.871
	BI3	0.835
	BI4	0.817
Corporate Innovation Performance	CIP1	0.864
	CIP2	0.882
	CIP3	0.841
	CIP4	0.853
	CIP5	0.826

The reliability analysis results of the constructs are shown in Table 4 in terms of Cronbach's Alpha and Composite Reliability (CR). The results showed that all constructs fulfilled the suggested Cronbach's Alpha (0.70). The most reliable were the items in the Corporate Innovation Performance with Cronbach's Alpha of 0.891, Board Independence (0.867) and Educational Diversity (0.861). This is also true for the Composite Reliability of all constructs (ranging from 0.885 - 0.920). Results show that the constructs has good reliability and consistency, so that the measurement scale in this study is reliable and appropriate for structural equation modeling analysis.

Table 4. Reliability Analysis: Cronbach's Alpha and Composite Reliability

Constructs	Cronbach's Alpha	Composite Reliability (CR)
Gender Diversity	0.842	0.894
Age Diversity	0.826	0.885

Educational Diversity	0.861	0.905
Functional Diversity	0.848	0.898
Board Independence	0.867	0.910
Corporate Innovation Performance	0.891	0.920

Table 5 shows the convergent validity of the constructs in terms of Average Variance Extracted (AVE). Results showed that, all AVE values were greater than the recommended value (0.50), indicating acceptable convergent validity of all construct. The AVE value was highest for Board Independence (0.717), then Educational Diversity (0.705), and followed by Corporate Innovation Performance (0.698). All the other AVE values were above the acceptable threshold, indicating that the AVE for each construct accounted for an appreciable amount of variance in its indicators. The findings validate the adequacy of the measurement model with the measurement items converging well towards the constructs they are measuring.

Table 5. Convergent Validity: Average Variance Extracted (AVE)

Constructs	**AVE**
Gender Diversity	0.678
Age Diversity	0.659
Educational Diversity	0.705
Functional Diversity	0.689
Board Independence	0.717
Corporate Innovation Performance	0.698

The discriminant validity was tested using the Fornell–Larcker criterion, the results of which are presented in Table 6. Based on this criterion, the square root of the Average Variance Extracted (AVE) for each construct should be higher than the value of the correlation between two constructs in the model. The numbers on the diagonal in bold are the square roots of AVE for each construct. As can be seen from the results, all diagonal values are higher than inter-construct correlation values which indicates that the constructs have enough discriminant validity. For example, the correlation of Gender Diversity, Age Diversity, Educational Diversity, Functional Diversity and Board Independence is lower than the square root of AVE for the Corporate Innovation Performance. The results show that each construct is empirically distinct and that each measure is of a different concept within the framework of the research.

Table 6. Discriminant Validity using Fornell–Larcker Criterion

Constructs	**GD**	**AD**	**ED**	**FD**	**BI**	**CIP**
Gender Diversity (GD)	0.823					
Age Diversity (AD)	0.541	0.812				
Educational Diversity (ED)	0.586	0.573	0.840			
Functional Diversity (FD)	0.562	0.548	0.617	0.830		
Board Independence (BI)	0.594	0.567	0.638	0.621	0.847	
Corporate Innovation Performance (CIP)	0.628	0.592	0.671	0.655	0.704	0.836

Note: Diagonal values (bold) represent the square root of AVE.

The outcomes of the discriminant validity tests according to Heterotrait–Monotrait Ratio (HTMT) is presented in Table 7. Constructs are considered as having satisfactory discriminant validity when the HTMT is below 0.90. The results demonstrated that all the HTMT values were in the range of 0.661-0.845 which is still within the recommended limit. The results showed the highest HTMT value between Board Independence and Corporate Innovation Performance (0.845) which is still within the limit. Results also showed that

the constructs measured in the study have good discriminant validity, and that the measurement model does not have significant problems.

Table 7. Discriminant Validity using HTMT Ratio

Constructs	GD	AD	ED	FD	BI	CIP
Gender Diversity (GD)	—					
Age Diversity (AD)	0.672	—				
Educational Diversity (ED)	0.701	0.684	—			
Functional Diversity (FD)	0.688	0.661	0.742	—		
Board Independence (BI)	0.724	0.695	0.781	0.759	—	
Corporate Innovation Performance (CIP)	0.793	0.741	0.826	0.801	0.845	—

Note: All HTMT values are below the threshold value of 0.90.

The collinearity assessment results are showed in table 8 with Variance Inflation Factor (VIF) values. The presence of multicollinearity among predictor variables in structural model is examined using the VIF values. It is seen from the results that all VIF values are in the range of 1.986 to 2.492 which is much lower than the recommended threshold value of 5.0. The highest VIF value recorded was the educational diversity (VIF = 2.347) and the lowest was for age diversity (VIF = 1.986). Based on these results, it can be concluded that multicollinearity is not a problem in this research and that the independent variables do not overlap or overlap so much that they explain the variation in innovation performance of corporations without redundancy.

Table 8. Collinearity Assessment (VIF Values)

Constructs	VIF Values
Gender Diversity	2.114
Age Diversity	1.986
Educational Diversity	2.347
Functional Diversity	2.281
Board Independence	2.492

Note: All VIF values are below the threshold value of 5.0, indicating no multicollinearity issue.

The outcome of hypothesis testing and structural model results are shown in table 9. Based on the results, all the proposed hypotheses are supported and there are significant positive relationships between the dimensions of board diversity and the corporate innovation performance. Board Independence had the greatest influence on Corporate Innovation Performance ($\beta = 0.287$, $p < 0.001$) followed by Educational Diversity ($\beta = 0.251$, $p < 0.001$) and Functional Diversity ($\beta = 0.221$, $p < 0.001$). Gender Diversity and Age Diversity had also significant positive results on innovation performance. Furthermore, the overall model of Board Diversity has significantly and positively affected the Corporate Innovation Performance ($\beta = 0.614$, $p < 0.001$), which also substantiates that board diversity has a positive impact on the innovative performance of the companies. Further evidence of the robustness of the proposed relationships comes from values of the significant t's and the p's that are below 0.05.

Table 9. Structural Model Results and Hypothesis Testing

Hypotheses	Relationship	Path Coefficient (β)	t-value	p-value	Decision
H1a	GD → CIP	0.184	3.216	0.001	Supported
H1b	AD → CIP	0.143	2.748	0.006	Supported
H1c	ED → CIP	0.251	4.387	0.000	Supported
H1d	FD → CIP	0.221	3.964	0.000	Supported
H1e	BI → CIP	0.287	5.102	0.000	Supported
H1	Board Diversity → CIP	0.614	9.883	0.000	Supported

The explanatory power, effect size and predictive relevance of the structural model are shown in Table 10. The R2 value for the Corporate Innovation Performance was 0.587, which means that 58.7% of the variance in this innovation performance can be explained by the board diversity dimensions used in the model. This is moderate to good explanation of the model. The Q2 value of the model is 0.421 which is greater than zero, showing that the model has a satisfactory predictive power. Moreover, the effect size $f^2 = 0.364$ indicates a very strong practical effect of the board diversity on the performance of innovativeness of the company. The results show that the proposed structural model is statistically acceptable and is predictive and explained the results in the context of India's corporate world in a general way.

Table 10. Coefficient of Determination (R^2), Effect Size (f^2), and Predictive Relevance (Q^2)

Endogenous Construct	R^2	Q^2	Effect Size (f^2)
Corporate Innovation Performance	0.587	0.421	0.364

Table 11 presents the results of the mediation and moderation analyses conducted in the study. The mediation analysis reveals that Strategic Decision Quality significantly mediates the relationship between Board Diversity and Corporate Innovation Performance ($\beta = 0.218$, $t = 4.126$, $p < 0.001$). This finding suggests that diverse boards improve the quality of strategic decisions, which subsequently enhances firms' innovation performance. In other words, board diversity contributes indirectly to innovation outcomes by facilitating more effective, informed, and innovation-oriented decision-making processes. Furthermore, the moderation analysis indicates that Board Independence positively moderates the relationship between Board Diversity and Corporate Innovation Performance ($\beta = 0.173$, $t = 3.487$, $p = 0.001$). This implies that the positive effect of board diversity on innovation becomes stronger when firms have a higher level of board independence. Independent directors may create a more transparent and objective governance environment that enables diverse perspectives to be effectively integrated into strategic innovation activities.

Table 11. Mediation and Moderation Analysis Results

Hypotheses	Relationship	Path Coefficient (β)	t-value	p-value	Decision
H2	Board Diversity → Strategic Decision Quality → Corporate Innovation Performance	0.218	4.126	0.000	Supported
H3	Board Diversity × Board Independence → Corporate Innovation Performance	0.173	3.487	0.001	Supported

Note: Mediation analysis was conducted using bootstrapping procedures in SmartPLS. The moderation effect was assessed through interaction term analysis. Significant p-values below 0.05 indicate support for the proposed hypotheses.

5. Discussions

The results of the current study show that board diversity has a significant positive effect on corporate innovation in Indian companies. The findings suggest that there are positive effects of different boards on innovation-related activities, through a better strategic thinking, a greater degree of creativity, and access to a wider knowledge base. The strong positive correlation between the overall board diversity and corporate innovation performance is consistent with the assumptions of Resource Dependency Theory and Upper Echelons Theory, which suggest that diverse boards are good sources of resources, different viewpoints, and better strategic direction, all of which enhance organizational performance. The findings are aligned with those of the studies by An et al. (2021) and Chen et al. (2023), who stated that the multidimensional board diversity has a positive

effect on innovation performance and increases the firms' ability to undertake exploratory innovation and technological development. The observed results also conform to the results of the meta-analysis carried out by Makkonen (2022), who found that the diversity of the boards was statistically significantly and positively related to the innovation of the companies.

The study also revealed that the diversity of gender is positively related with the performance of corporate innovation. This finding indicates that involving women directors increases a firms creativity, cooperative decision making and innovative governance. Women directors can bring valuable insights and more diverse forms of leadership that can enable sustainable innovation strategies. The results are similar to Griffin et al. (2021), who discovered that companies with gender-diverse management boards have more patents and higher innovative efficiency in several countries. Moreover, Vafaei et al. (2021) found that women's representation on the board is a positive determinant of the innovation investment and patent process, especially in technologically advanced industries. The present results also corroborate the arguments of Li et al. (2026) that board gender diversity enhances firms' capacity to conduct both exploration and exploitation activities, resulting in better long-term performance in innovation.

The positive effect of age diversity was also confirmed with regard to corporate innovation performance. Having directors from various ages can balance a young creative with an older experienced one, thus enhancing strategic flexibility and problem-solving skills. Boards with a diversity of age groups can bring on different perspectives that help with innovative decision-making. The results are also partially aligned with the conclusions of Cumming and Leung (2021) that different types of diversity have different effects on innovation in various industries and in organizational settings. Their study, however, shows mixed evidence of age diversity and patent quality, whereas the present study shows that age diversity in the Indian corporate environment can positively impact innovation performance.

The educational diversity was one of the most significant predictors of innovation performance in the current study. That finding implies that directors with diverse educational backgrounds can bring multiple cognitive viewpoints, analytical abilities, and knowledge assets to enable innovative approaches. The findings of the study support the assertions of Li and He (2023) that a high degree of cognitive diversity, particularly in terms of educational background and expertise diversity, has a positive impact on corporate innovation. Likewise, Tang et al. (2021) revealed that directors with higher education levels and international experience have a more positive impact on innovation activities. The present findings also corroborate the findings by Makkonen (2022) that found that cognitive diversity is a more important factor in stimulating innovation than demographic diversity.

The findings also show a positive relationship between functional diversity and the performance of corporate innovation. Experienced directors from various functional backgrounds (finance, marketing, operations, technology, and human resources management) bring their expertise to enhance strategic versatility and concept development. The results complement the study by An et al. 2021, which revealed that professional diversity had the greatest impact on the outcome of innovations from board diversification. Likewise, Wang (2022) found that board human capital diversity has a positive effect on the innovation of the companies, especially when it comes along with high internal social capital.

Among all dimensions of diversity studied, board independence had the largest positive effect on corporate innovation performance. Independent directors can enhance the quality of governance, mitigate management bias and help promote an objective review of the company's strategy, fostering an innovative atmosphere. The results align with Mohd Niza et al., (2026), who established that board independence had a significant positive relationship with board diversity. Similarly, Vafaei et al. (2021) highlighted the important role of independent female directors in driving innovation activities. The pronounced moderating effect of board independence observed in the current study also

suggests that independent board structures contribute to the success of various boards by promoting transparent and unbiased decision-making processes.

The mediation analysis verified that strategic decision quality has a significant mediating effect for the relationship between Board diversity and Corporate innovation performance. The discovery means that diversity on the board can boost the result of innovation by better quality of strategic decisions in the fields of research and development, technology adoption, and innovation investment. A combination of different viewpoints and experiences on the board could lead to more complete analysis of opportunities and threats, thus leading to more effective strategic decisions. The results of this study align with the governance perspective of Leung and Sane (2023) which suggested that diversity enhances the effectiveness of monitoring and quality of strategic governance.

6. Conclusions

This study analyzed the effects of board diversity on the performance of corporate innovation in the context of Indian corporate environment through PLS-SEM. The results showed that the board diversity could play a significant role in the organizational innovation, which can be achieved by enhancing the strategic perspectives, decision making quality and access to other knowledge resources. The study found that gender diversity, age diversity, educational diversity, functional diversity and board independence all positively impact corporate innovation performance. The former, board independence, and the latter, educational diversity, showed the highest impacts among these dimensions and therefore are important for innovation-driven strategies, as they represent objective governance structures and cognitive diversity.

The study also concluded that the strategic decision quality is the mediating factor between board diversity and corporate innovation performance. This indicates that mixed boards increase the output of innovative results through better informed, more effective and innovation oriented strategic decisions. In addition, the moderating role of board independence confirmed that the positive role of board diversity on innovation is enhanced through the role of independent directors in ensuring transparent, balanced, and unbiased governance practices.

This study offers empirical evidence from an emerging economy standpoint and India in particular, and fills an important gap in the research on corporate governance and innovation, as few studies have examined multidimensional board diversity and innovation performance at the same time. The study contributes to the understanding of the applicability of Resource Dependency Theory and Upper Echelons Theory by showing that the heterogeneous boards help firms strengthen their innovative capacity and long-term competitiveness as resources.

In practical terms, the findings indicate that Indian businesses need to focus on forming boards that are diverse and independent to drive innovation and ensure competitive advantage in the ever-changing business landscape. Policymakers and regulatory authorities can also promote more robust diversity-related governance reforms to foster innovative growth of the corporate sector. In general, the study findings suggest that board diversity is not just a governance obligation, but a key organizational asset that can help improve innovation performance and long-term corporate sustainability.

Declarations

Ethics and Guidelines: The study was conducted in accordance with the Declaration of Helsinki. The ethical approval specifically covers the research procedures and data collection activities conducted for this study.

Consent to participate: Written informed consent was obtained from all participants prior to data collection. Consent was obtained using a standardized written form, signed by each participant before participation in the survey.

Consent to publish: The authors have provided consent to publish.

Competing interests: The authors declare no competing interests.

Data availability statement: Data will be made available on reasonable request from the corresponding author.

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Declaration of using generative AI: During the preparation of this work the author(s) used ChatGPT in order to correct the grammatical errors. After using this tool/service, the author(s) reviewed and edited the content as needed and take full responsibility for the content of the published article.

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