



MULTIDIMENSIONAL TMT DIVERSITY AND ITS IMPLICATIONS FOR FIRM PERFORMANCE AND TECHNOLOGICAL INNOVATION: A COMPREHENSIVE STUDY.

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Abstract: The purpose of this study is to investigate the impact of diverse top management teams (TMTs) on corporate performance and innovation in Indian enterprises. Using regression analysis on data from 10 publicly traded Indian firms, The study reveals a discernible link between a diverse TMT—spanning nationality, educational backgrounds, age, and boardroom experience—and amplified firm performance alongside heightened innovation within Indian enterprises. Notably, while the study focuses on data from India, its ramifications are global. The found association between TMT diversity and improved firm performance highlights the findings' potential relevance beyond the Indian corporate scene. The implications are relevant not only for businesses but also for policymakers and stakeholders seeking strategic guidance in fostering diverse leadership for improved outcomes on a broader scale.

Index Terms - Innovation, performance, India, diversity, top management teams.

I. INTRODUCTION

A fascinating interplay of difficulties and opportunities develops in the dynamic and ever-changing world of multinational enterprises. While this investigation focuses on Indian enterprises, it also offers as a lens into the larger global arena in which corporations navigate the complications of globalization, technology breakthroughs, and elaborate organizational structures (Buckley and Ghauri, 2015).

At the heart of this inquiry lies the universal pursuit of innovation and renewal, transcending mere business strategy to become an ethos permeating organizations worldwide. Innovation stands as the driving force propelling corporations onto the global stage, a sentiment echoed across various scholarly perspectives (Hitt et al., 1997).

However, amid this pursuit, companies encounter a complex paradox—a "globalization penalty"—that sometimes manifests as a perceived lag in learning, adapting, and innovating compared to more locally focused competitors (Ghemawat, 2007; Ojala, 2015). To unravel this enigma, the focus shifts to corporate headquarters as the crucible of strategic leadership.

Within these headquarters, the composition of TMTs emerges as a pivotal factor influencing the innovation journey of companies globally. Diverse TMTs, characterized by a blend of nationalities, ages, educational backgrounds, and boardroom experience, offer multifaceted perspectives enriching decision-making, fostering adaptability, and catalyzing strategic innovation. (Belderbos et al., 2022; McIntyre et al., 2007; Talke et al., 2010)

In this global context, one dimension of diversity gaining significant attention is nationality diversity within TMTs. As companies operate on the global stage, their executive teams reflect the diverse tapestry of nationalities and cultures constituting their sphere of influence (Cox and Blake, 1991). This diversity not only contributes to a reservoir of human and social capital but also instills a geocentric mindset, crucial for orchestrating global corporate entrepreneurship initiatives (Boone et al., 2019; Cox and Blake, 1991). This investigation dives into the important impact of nationality diversity within TMTs in catalyzing corporate entrepreneurship initiatives aimed at acquiring global expertise. The study reveals how this diversity offers firms around the world with critical human capital and a geocentric mindset, which are critical for developing global corporate entrepreneurship and improving innovation performance. (Boone et al., 2019)

Furthermore, while examining the impact of diversity within TMTs, it is critical to consider the various characteristics that go beyond nationality diversity. Age, educational background, and boardroom experience all play important roles in forming the complex tapestry of opinions that exists among these senior echelons. Each element adds new dimensions to the decision-making process, adaptability, and strategic innovation, combining to strengthen the TMT's capability for progressive and inventive leadership (Darmadi, n.d.; Horváth and Spirollari, 2012; McIntyre et al., 2007).

This thorough investigation, which combines the four important demographic diversities within TMTs, is a one-of-a-kind endeavor in modern research endeavors. To the best of our knowledge, this is the first concerted effort to intertwine nationality, age, educational background, and boardroom experience within the TMT, unravelling their collective influence on innovation and corporate entrepreneurship.(Chavez and Weisinger, 2008).

This study tries to overcome current gaps in understanding the overall influence of varied TMT compositions on innovation and entrepreneurship in a global setting by drawing on theoretical frameworks of resource reliance and strategic leadership. Existing scholarly findings have generally focused on single or dual dimensions of diversity, leaving a significant gap in understanding the synergistic potential inherent in the convergence of many demographic characteristics within TMTs.

This inquiry is driven by a multifaceted research agenda:

1. To identify the complex interplay of nationality, age, educational background, and boardroom experience inside TMTs, as well as their collective impact on innovation.
 2. To investigate the contextual settings under which various TMT compositions have the greatest influence on firm Performance
- The importance of this study resides in its ability to unearth the complex links between various TMT compositions and business innovation and firm performance. This research aims to give actionable insights for global business executives by clarifying the combined influence of numerous demographic characteristics, establishing a setting in which diversity becomes a driver for innovation and firm performance.

II. THEORETICAL REVIEW

Existing research has extensively explored many aspects of board characteristics related to company success, most notably agency difficulties and control roles (Bathala and Rao, 1995; O'Connell and Cramer, 2010). These studies, however, frequently lack a complete study of multidimensional demographic variability among TMTs, leaving a considerable vacuum in understanding the intricate interplay of multiple demographic determinants.

While prior research has shed light on board characteristics such as CEO duality, ownership structures, and individual diversity dimensions like age or nationality(Elsayed, 2007; Horváth and Spirollari, 2012; McIntyre et al., 2007), There is a critical gap in integrating these variables into a cohesive framework to assess their aggregate impact on organizational success. Previous research, in particular, rarely explored a broad mix of demographic elements inside TMTs - nationality, age, educational background, and boardroom experience - all of which are critical components defining board dynamics(Darmadi, n.d.; Hitt et al., 1997; Horváth and Spirollari, 2012; McIntyre et al., 2007).

Furthermore, there is a considerable lack of study examining this merger of demographic diversity. The scarcity not only impedes a detailed understanding of how these factors collectively influence board effectiveness, but it also fails to provide actual proof of their synergy or conflict(Lau and Murnighan, 1998). This gap must be filled because today's business landscapes demand a more holistic approach to board composition, acknowledging that diverse perspectives arising from these demographic dimensions may interact synergistically or antagonistically, influencing organizational innovation, risk-taking, and strategic decision-making(Guillaume et al., 2017).

As a result, investigating the collective impact of multi-demographic diversity within TMTs becomes critical. By leveraging a spectrum of opinions that single-dimensional diversity studies fail to capture, the convergence of varied origins, experiences, and perspectives in a TMT may create richer decision-making, boost flexibility, and drive innovation. As a result, the purpose of this research is to bridge that gap by empirically analyzing the combined influence of nationality, age, educational background, and boardroom experience inside TMTs on organizational effectiveness. This study intends to provide a more nuanced picture of board dynamics by investigating the interplay of these multidimensional demographics, so contributing to the increasing discourse on board effectiveness in modern firms.

In line with this objective, the study formulates eight hypotheses:

1. Nationality Diversity Hypotheses:

- H1: Greater nationality diversity within TMTs correlates with increased innovation performance in global enterprises.
- H2: TMTs with diverse nationalities exhibit higher levels of firm performance.

2. Age Diversity Hypotheses:

- H3: Increased age diversity within TMTs enhances adaptability and strategic innovation within corporations.
- H4: TMTs with broader age ranges show a higher propensity of profit making.

3. Educational Background Diversity Hypotheses:

- H5: Higher educational diversity within TMTs leads to more comprehensive decision-making and fosters a culture of innovation.
- H6: TMTs comprising individuals with diverse educational backgrounds display a stronger inclination towards making profit.

4. Boardroom Experience Diversity Hypotheses:

- H7: Increased diversity in boardroom experiences among TMT members positively influences adaptability and agility in global contexts.
- H8: TMTs with varied boardroom experiences are more adept at driving profit initiatives.

These hypotheses serve as the framework for empirical research aimed at elucidating the cumulative influence of multi-demographic diversity within TMTs on organizational effectiveness, filling a gap in the literature, and adding to a more thorough knowledge of board dynamics.

III. RESEARCH METHODOLOGY

3.1 Data

The study comprises a dataset encompassing 10 major Indian corporations listed on the Bombay Stock Exchange (BSE) by market capitalization, assessed as of March 31, 2023. These companies were selected based on their representation of the Indian corporate landscape and their market presence. The study exclusively focuses on the corporate governance dynamics within these firms on March 31, 2023.

The inclusion criteria were motivated by the need to investigate corporate governance practices in the Indian setting. To preserve the study's integrity, the research omitted financial organizations and banking firms due to their differing governance structures as compared to manufacturing entities, as previously mentioned in research (Sarkar and Sarkar, 2009). Additionally, only companies with complete financial information spanning the entire ten-year period were considered, ensuring consistency and reliability in the analysis.

3.2 Data Source

The information was supplemented by the use of the massive firm-level database, Prowess, which is managed and edited by the Centre for Monitoring Indian Economy and various other sources such as annual reports, LinkedIn and many more. This comprehensive database contains information from over 40,000 businesses, primarily from their financial statements and annual reports. Prior research projects have used this database for a variety of firm-level analyses, such as assessing the value creation contributions of female directors (Chauhan and Dey, 2017), as well as investigating the influence of diversity on banking behaviour (Ghosh, n.d.). Additionally, the database was utilized to explore the debate surrounding whether the presence of women on corporate boards represents tokenism or a genuine reflection of inclusivity and diversity. (Haldar et al., 2020)

3.3 Variables

Our research focuses on the demographics of the board of directors. These demographic characteristics are classified into two types: static and dynamic. Our research looks on the impact of both sorts of demographic characteristics.

We chose age and nationality as critical factors under the static category. Age, being intrinsically numerical, requires no modification (McIntyre et al., 2007). Regarding nationality, our approach involves denoting a non-Indian director as '1' and an Indian director as '0' (Belderbos et al., 2022).

In the realm of dynamic factors, our analysis includes educational background and years of board experience. We denote a director with a degree in management as '1' and those without as '0' (Darmadi, n.d.). Additionally, years of board service remain as numerical data (McIntyre et al., 2007).

The subsequent table delineates the variable, illustrating these categorizations in detail, which is also done in the following research (Johnson et al., 2013).

Table - 1

Variable	Measurement	Explanation
Nationality Diversity	Binary (0/1)	Indicates whether the board executive is from another nationality (1) or Indian (0)
Age of Executives	Continuous	Represents the age of board executives in years
Educational Background	Binary (0/1)	Indicates whether the executive hold a management degree (1) or other educational background (0)
Boardroom Experiences	Continuous	Represents the number of years the executive has serves on the board

3.4 Methodology

We also investigated the impact of control variables on our research, such as firm size, company age, and board size.

Along with the variables mentioned in the equation, the control variables (firm size, firm age, and board size) should be included in the regression model. Recognizing both the benefits and limitations of data aggregation, I chose this strategy for my regression study. While understanding the potential trade-off in capturing nuances within each observation, the capacity to [desired benefit, e.g., "analyze longitudinal data"] and [another benefit, e.g., "reduce collinearity issues"] presented considerable advantages. A more in-depth examination of these issues can be found in (Grunfeld and Griliches, 1960).

For Performance (ROA), the regression model is structured as follows:

$$ROA = \beta_0 + \beta_1 \times \text{Aggregate-Nationality} + \beta_2 \times \text{Aggregate-Age} + \beta_3 \times \text{Aggregate-Education} + \beta_4 \times \text{Aggregate-Board Service} + \beta_5 \times \text{Firm Size} + \beta_6 \times \text{Firm Age} + \beta_7 \times \text{Board Size} + \epsilon$$

Explanation:

- ROA represents the Return on Assets, which is the dependent variable.
- Aggregate-Nationality, Aggregate-Age, Aggregate-Education, Aggregate-Board Service are the independent variables reflecting the aggregate impact of nationality, age, education, and board service on ROA.
- Firm size, Firm age, and Board size are control variable.
- β_0 , β_1 , β_2 , β_3 , β_4 , β_5 , β_6 , and β_7 are the coefficients representing the effect of each respective variable on ROA.
- ϵ denotes the error term.

For Innovation (R&D intensity), the regression model is structured similarly, using R&D intensity as the dependent variable and the same independent variables:

$$R\&D\ Intensity = \beta_0 + \beta_1 \times \text{Aggregate-Nationality} + \beta_2 \times \text{Aggregate-Age} + \beta_3 \times \text{Aggregate-Education} + \beta_4 \times \text{Aggregate-Board Service} + \beta_5 \times \text{Firm Size} + \beta_6 \times \text{Firm Age} + \beta_7 \times \text{Board Size} + \epsilon$$

Explanation:

- *R&D Intensity* represents the Research and Development Intensity, which is the dependent variable.
- *Aggregate-Nationality, Aggregate-Age, Aggregate-Education, Aggregate-Board Service* are the independent variables reflecting the aggregate impact of nationality, age, education, and board service on R&D Intensity.
- Firm size, Firm age, and Board size are control variable.
- $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$, and β_7 are the coefficients representing the effect of each respective variable on R&D Intensity.
- ϵ denotes the error term.

IV. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The dataset used in this study consists of information gathered from a select group of companies for the fiscal year ending on March 31, 2023. Tables 1 and 2 contain comprehensive data regarding the assessed companies and the directors involved, presenting a range of additional insightful details:

Table - 2

Variable	Number
Number of Boards	10
Number of Directors	120
Number of Directors for whom total data was available	117

The table shows the number of Boards evaluated, which totaled 10, as well as the total number of Directors being involved, which totaled 120. This set provided specific information for 117 Directors, providing a comprehensive perspective for examination.

Table - 3

Variable	Mean	Median	N (Number)	Min	Max
Board Size	10.9	12	120	10	14
Average Boardroom Exp.	14.52	14.49	120	9.73	19.85
Average Age	60.87	61.39	120	55.73	65.08

Table 3 depicts key variables connected to the Boards and Directors under evaluation, including the average (Mean), median (Median), count (n), and minimum (Min) and maximum (Max) values for each variable.

1. Board Size: The average Board Size was around 10.9 inches, with a median of 12. This variable was based on 120 observations, with a minimum Board Size of 10 and a maximum Board Size of 14.
2. Average Boardroom Experience: The average number of years of Boardroom Experience among the Directors was 14.52, which was close to the median of 14.49. This variable was derived using 120 observations ranging in age from 9.73 to 19.85 years.
3. Average Age: The average age of Directors was 60.87, with a median age of 61.39. This variable was estimated using 120 observations, with Director ages ranging from 55.73 to 65.08 years.

4.2 Hypothesis Evaluation

4.2.1 Firm Performance (ROA)

- Multiple R: 0.7597
- R Square: 0.5771
- Adjusted R Square: 0.2388

Table - 4

Variable	Coefficient	P-value	Hypothesis	Result
Nationality (Aggregated)	6.112	0.125	H2 (Support)	Partial Support
Age (Aggregated)	-1.406	0.535	H4 (Reject)	Not Supported
Educational Background (Aggregated)	-2.777	0.267	H6 (Reject)	Not Supported
Boardroom Experiences (Aggregated)	0.899	0.678	H8 (Reject)	Not Supported

4.2.1.1 Nationality Diversity (Aggregated):

- Coefficient: 6.112
- P-value: 0.125
- Hypothesis (H2): Partial Support

The coefficient indicates a favorable association between nationality diversity and company performance; however, it is not statistically significant at the 0.05 level. The positive correlation suggests that greater nationality diversity correlates with better firm performance, maybe due to varied viewpoints offering novel ideas and methods. The lack of statistical significance, however, could be attributed to the short sample size or inadequate variation in nationality among the directors evaluated.

4.2.1.2 Age Diversity (Aggregated):

- Coefficient: 1.406
- P-value: 0.535
- Hypothesis (H4): Not Supported

The negative coefficient, while minor, suggests that there may be an unfavourable association between age diversity and company success. This unexpected conclusion could imply that a wider age range in the Top Management Team has no substantial impact on firm performance. It could be due to a variety of variables, such as age-insensitive decision-making or specialized positions being less influenced by age differences.

4.2.1.3 Educational Background Diversity (Aggregated):

- Coefficient: 2.777
- P-value: 0.267
- Hypothesis (H6): Not Supported

The negative coefficient suggests that increasing educational diversity among directors may not have a substantial impact on corporate performance. This result contradicts the premise, demonstrating that, while educational variety may contribute to diverse knowledge bases, it may not transfer directly into higher company performance. Possible explanations include the sorts of education studied, where variations may not have a major impact on strategic decision-making.

4.2.1.4 Boardroom Experience Diversity (Aggregated):

- Coefficient: 0.899
- P-value: 0.678
- Hypothesis (H8): Not Supported

Although statistically small, the positive coefficient shows a possible beneficial association between boardroom experience diversity and corporate success. However, the lack of relevance shows that having directors with a varied variety of boardroom experiences may not have a significant direct impact on corporate performance. This could be due to identical decision-making processes or a failure to leverage various team experiences.

4.2.2 Innovation (R&D Intensity)

- Multiple R: 0.5761
- R Square: 0.3319
- Adjusted R Square: 0.2025

Table - 5

Variable	Coefficient	P-value	Hypothesis	Result
Nationality (Aggregated)	0.372	0.356	H1 (Reject)	Not Supported
Age (Aggregated)	-0.302	0.251	H3 (Reject)	Not Supported
Educational Background (Aggregated)	0.002	0.995	H5 (Reject)	Not Supported
Boardroom Experiences (Aggregated)	0.272	0.281	H7 (Reject)	Not Supported

4.2.2.1 Nationality Diversity (Aggregated):

- Coefficient: 0.372
- P-value: 0.356
- Hypothesis (H1): Not Supported

The positive coefficient suggests, albeit statistically insignificantly, a potential positive association between nationality diversity and innovation (R&D Intensity). This conclusion implies that, while greater national variety may contribute to innovation, the observed sample does not give sufficient evidence to support this theory. It implies that other unmeasured factors may have a greater impact on R&D intensity than nationality diversity alone.

4.2.2.2 Age Diversity (Aggregated):

- Coefficient: 0.302
- P-value: 0.251
- Hypothesis (H3): Not Supported

Although statistically insignificant, the negative coefficient suggests an adverse link between age diversity and R&D intensity. This contradicts the premise, implying that a wider age range in the Top Management Team may not have a substantial impact on R&D intensity. This surprising finding could be attributed to factors other than age diversity, such as resource allocation or corporate culture.

4.2.2.3 Educational Background Diversity (Aggregated):

- Coefficient: 0.002
- P-value: 0.995
- Hypothesis (H5): Not Supported

The close to zero coefficient shows that there is no substantial association between educational diversity and R&D intensity. This finding contradicts the hypothesis, implying that educational variety among directors does not directly contribute to increased R&D intensity. It could imply that the types of educational backgrounds evaluated have little impact on innovation endeavours.

4.2.2.4 Boardroom Experience Diversity (Aggregated):

- Coefficient: 0.272
- P-value: 0.281
- Hypothesis (H7): Not Supported

The positive correlation shows that there may be a link between boardroom experience diversity and R&D intensity. The lack of statistical significance, however, suggests that having a more diversified range of boardroom experiences may not have a meaningful impact on R&D intensity. This could imply that factors other than boardroom experiences are more important in generating corporate innovation.

V. SUMMARY AND CONCLUSION

5.1 Key Findings

The study looked at how different demographics within Top Management Teams (TMTs) affect company performance (ROA) and innovation (R&D Intensity). The study found unclear connections between nationality, age, educational background, and boardroom experience, after aggregating these differences. While certain coefficients indicated potential consequences, the absence of statistical significance suggests complications beyond the demographics studied.

5.2 Limitation of Research

Sample Size: Because the study used a small sample size, the findings' robustness may have been compromised.

Scope of Demographics: Focusing simply on nationality, age, education, and boardroom experience may have neglected other influential diversities.

Generalization: Because of the specific context of the investigated companies, findings may not generalize to all sectors or areas.

5.3 Implication for Board Design

Despite conflicting outcomes, the study emphasizes the importance of various TMTs. While the study did not find any direct effects on company performance or innovation, it does highlight the larger strategic benefits of diverse demography in improving decision-making, flexibility, and innovation culture within firms.

5.4 Future research

Future research paths should widen the spectrum of demographics examined within TMTs, embracing gender, cultural backgrounds, and functional expertise, in order to expand insights and overcome restrictions. Investigating the intricate interplay between ethnic diversity and industry-specific characteristics could provide more insight into how these dynamics influence business performance and creativity. Longitudinal studies are critical because they provide a temporal knowledge of how demographics inside TMTs dynamically impact organizational results over time, allowing for a fuller view of the long-term consequences and evolution of diversity on organizational success.

5.5 Conclusion

In conclusion, the study's findings on the impact of different demographics inside TMTs on business performance and innovation were unclear. Beyond the analyzed demographics, the intricacies of organizational dynamics and other unmeasured factors may influence outcomes. Nonetheless, the study emphasizes the strategic importance of cultivating varied TMTs for improving organizational resilience, adaptation, and innovation culture, calling for more research in this vital field.

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