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People and Technology for a Sustainable Future

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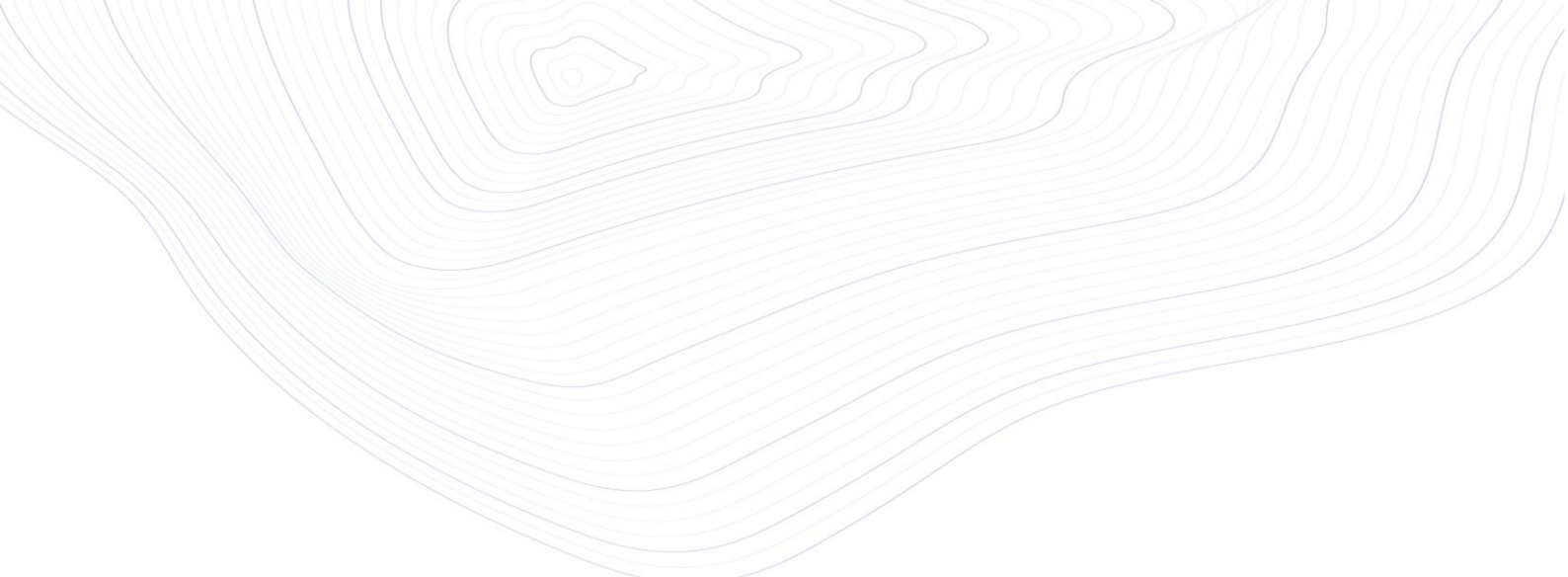
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PROGRAMME SCHEDULE

Day 1 - Sunday 24 th May 2026	
8.00am - 8.45am	Registration
8.45am - 9.00am	Opening Session
9.00am - 9.15am	Welcome Speech Mr. Ahmed Nafees Rector Zikura International College
9.15am - 9.30am	Inaugurating the Conference and Officiating Speech Chief Guest Ms. Aneesa Ahmed
9.30am - 10.00am	Keynote Address I Dr. S. M. Ferdous Azam Associate Professor Management Science University, Malaysia “From Innovation to Impact: Bridging Technology People and Policy for a Sustainable Future”
10.00am - 10.15am	Group Photo
10.15am - 10.30am	Break
10.30am - 11.30am	Panel Discussion I Mr. Ismail Rafeeq, Mayor of Fuvahmulah City Dr. Hajah Dalila Daud, Senior Lecturer Dr. Fathimath Shafeeqa, Director “AI, Human-Centered Innovation & Sustainable Impact”

11.30am - 12.00pm	Keynote Address II Mr. Hassan Mohamed Managing Partner Crowe Maldives LLP “How to Kill Innovation: When Fear of Failure Becomes Strategic Failure”
12.00pm - 1.30pm	Lunch Break
1.30pm - 2.00pm	Keynote Address III Mr. Afeef Hussain Executive Coach The John Maxwell Team “Regenerative Leadership: From Performance to Positive Impact”
2.00pm - 2.30pm	Keynote Address IV Dr. Elif Baykal Head of Business Administration Department Istanbul Medipol University, Turkey “Leadership Beyond Hierarchy: Designing Organizations Where People and Technology Co-Evolve”
2.30pm - 3.30pm	Parallel Session I
3.30pm - 4.00pm	Break
4.00pm - 6.00pm	Parallel Session II
6.00pm	End of Day 1



ICTHM 2026, Day 1



ICTHM 2026, Day 2

Day 2 - Sunday 25th May 2026

8.45am - 9.00am	Opening Session
9.00am - 9.15am	Welcome Speech Dr. Nurhidayah Yahya Senior Lecturer Universiti Teknologi MARA, Malaysia
9.15am - 9.45am	Keynote Address V Assoc. Prof. Dr. Norziation Ismail Khan Head of Postgraduate Studies University Teknologi MARA, Malaysia “Guarding the Gate: Law Firms Facilitations and Dirty Money Risks”
9.45am - 10.15am	Keynote Address VI Ms. Mariyam Fizanaa Rashyd Chief Executive Officer Maldives Qualification Authority “Cognitive Cost of Convenience: Is AI Gradually Replacing Human Intelligence”
10.00am - 10.15am	Keynote Address VII Dr. Mohamed Faizal Former Secretary General National Pay Commission, Maldives “Towards A Public Service Pay Framework for Sustainable Impact: Integrating Policy Knowledge, Human Capital and Systematic Reform in the Maldives”
10.45am - 10.55pm	Break

11.00am - 12.00pm	Panel Discussion II Uza. Thasleema Usman, Commissioner of Quality Assurance Dr Nurhidayah Yahya, Senior Lecturer Dr. Abdulla Rasheed, Assistant Professor “Governance, Quality & Accountability in Innovation & Sustainability Ethics and Future-Oriented Decision Making”
12.00pm - 1.30pm	Lunch Break
1.30pm - 3.30pm	Certificate Awarding & Closing Ceremony Closing Speech for the Day, Mr. Ismail Rafeeq Mayor of Fuvahmulah City





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1. Exploring the Work-Life Balance of Female Employees Working in a Public Institution in the Maldives *(Paper ID: 03)*
2. A Study on Motivational Factors and Talent Retention in Maldives Electricity Industry *(Paper ID: 06)*
3. Transformational Leadership and the Success Factors of the Implementation of Dual Language Program at Public Schools in Male' Maldives *(Paper ID: 07)*
4. Quantum State Transitions and Liquidity Singularities: Modeling the 2026 Natural Gas Case *(Paper ID: 16)*
5. The Strategic Role of Feedback Culture in Business Management: A Qualitative Study From a Managerial Perspective *(Paper ID: 17)*
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ICTHM 2026, Day 2



ICTHM 2026, Day 1

EXPLORING THE WORK-LIFE BALANCE OF FEMALE EMPLOYEES WORKING IN A PUBLIC INSTITUTION IN THE MALDIVES

Hawwa Noora Abdul Azeez, Aishath Maasha Hameed
Zikura International College, Fuvahmulah City, Maldives

**Corresponding author: umairie123@gmail.com*

Abstract

Work-life balance has emerged as a critical issue globally, particularly for women managing both professional and domestic responsibilities. In the Maldivian context, female public sector employees often face intensified challenges due to traditional gender norms, limited institutional support, and infrastructural constraints. Despite the growing interest in work-life balance, there remains a gap in research focusing on the lived experiences of women in the Maldives. This study aimed to explore the factors influencing work-life balance and the coping strategies employed by female employees within a selected public institution. Using a qualitative case study approach, data were collected through semi-structured interviews with eight female staff members and analyzed thematically. The findings revealed four major themes on work life balance: 1. work-related demands, personal and familial responsibilities; 2. cultural and social norms and expectations; 3. The availability of support systems. Participants adopted both behavioral and cognitive strategies to manage stress and maintain balance. While these challenges are consistent with findings from other contexts, the study highlights how they are experienced within the specific social, cultural, and institutional context of the Maldives. The study offers valuable implications for policymakers seeking to promote gender equity in workplace settings, employee well-being, and organizational effectiveness in the public sector.

Keywords: *Work-life balance, Public Institutions, Female Employees*

1. Introduction

1.1 Background of the research

Work-life balance has evolved from a focus on role conflict to a multidimensional view emphasizing the integration and enrichment of professional and personal domains (Malik, 2023; Amstad et al., 2011). While globalization and technology have increased connectivity, they have also blurred boundaries and intensified the "second shift"¹ for women, who continue to manage disproportionate domestic burdens (Emslie & Hunt, 2009) despite rising workforce participation (Hochschild, 1989; Muna & Albattat, 2023). This imbalance can create negative spillover effects, contributing to chronic stress, reduced job satisfaction, higher employee turnover, and limited career progression among women (Irfan et al., 2023; Pace & Sciotto, 2021). In the Maldivian context, these challenges are intensified by traditional gender mindsets and systemic discrimination, making it essential for the public sector to implement targeted policies that promote gender equality and organizational effectiveness (Shifna, 2021; Shareef, 2023).

1.2 Problem statement

¹ Despite their participation in the paid workforce, women often have to fulfill their other responsibilities at home such as household chores and taking care of children. This Double shift is named as "Second Shift" (Hochschild, 1989).

Research indicates that Maldivian women struggle to balance work and family due to demanding work cultures, persistent gender norms, and unequal domestic labor, with women performing double the amount of work done by men (Sundaresan, 2014; Shifna, 2021; Maldives Bureau of Statistics, 2016). These challenges, compounded by limited childcare and systemic discrimination, severely restrict women's workforce participation and advancement into leadership positions (Shahid, 2024; United Nations Maldives, 2025). Furthermore, persistent challenges like these conflicts result in heightened stress, burnout, and reduced job satisfaction for employees, alongside organizational issues like decreased productivity and higher turnover (Marecki, 2024; Adriano & Callaghan, 2020). Despite the clear impact on individual well-being and institutional performance, a significant research gap remains regarding the qualitative, lived experiences and coping mechanisms of female employees specifically within the Maldivian public sector (Hassan et al., 2024).

1.3 Purpose statement

This study explores the factors influencing work-life balance for women in the Maldivian public sector, a critical yet under-researched area within the nation's unique socio-cultural and developmental context. The research aims to identify specific organizational challenges (e.g., workload and policies) and socio-cultural barriers (e.g., traditional gender roles) alongside the facilitators that support balance. Furthermore, it investigates the coping strategies and interventions currently used by employees to manage competing demands. Ultimately, the findings seek to provide policymakers and stakeholders with evidence-based insights to promote gender equality, enhance employee well-being, and improve organizational effectiveness.

1.5 Research questions

- What are the factors influencing the work-life balance experiences of female employees?
- What strategies do female employees use to manage the interface between their work and personal life?

1.5 Significance of the study

This study addresses a critical research gap by providing the first focused exploration of work-life balance for female employees within a Maldivian public institution. By documenting their lived experiences, the research identifies specific stressors and coping mechanisms, offering actionable insights for developing gender-sensitive policies, such as flexible work arrangements and formal support services. Beyond the individual benefits of reduced burnout and improved well-being, the study highlights how enhancing balance drives organizational effectiveness, employee retention, and better public service delivery. Furthermore, by addressing the unique logistical and cultural challenges of a Small Island Developing State (SIDS), the findings support broader efforts toward gender equity, women's empowerment, and the redistribution of caregiving responsibilities within Maldivian society.

1.6 Definition of terms

Work life balance: The state of equilibrium in which an individual effectively manages the demands of work and personal life, including family, social activities, and self-care (Kerdpitak & Jermstittiparsert, 2020).

Job satisfaction: The degree to which employees feel content with their roles, responsibilities, work environment, and the rewards they receive from their job (Raddaha et al., 2012).

Mental Health: The emotional and psychological well-being of individuals, including their ability to cope with stress, manage workloads, and maintain a balanced life (Westerhof & Keyes, 2010).

Burnout: Persistent negative state of mind regarding work, personal life, and other different domains in life, characterized by fatigue, insomnia, exhaustion, depression, inability to concentrate and disruption in mental and emotional processes (Canu et al., 2021).

Wellbeing: Wellbeing refers to the state of mind of an individual and represents the state of life one has attained which can be a result of many factors such as consumption, health, status, achievement and security (Paim, 1995; Jarden & Roache, 2023).

2. LITERATURE REVIEW

2.1 Search strategy

The literature sources for this proposal have been searched mainly through google scholar search engines and research gate. Keywords used were mainly “Work-life balance”, “Work-life balance of female employees”, “Work life balance and Public Sector Maldives”, “Female employees work life balance Maldives”, “Public Sector Maldives” and “Challenges women face to balance work and life” covering the period of the past 5 to 10 years. However, to obtain details of certain theories, research from all different years has been searched.

2.2 Understanding work life balance

According to Khateeb (2021), work-life balance refers to the extent to which an employee perceives a sense of control over their time allocation between work and non-work domains. This perception of control is critical, as it signifies the individual's ability to manage competing demands and maintain a sense of equilibrium (Paudel et al., 2024). Work-life balance has been increasingly recognized as an essential concept for both organizations and employees, as it directly impacts productivity, job satisfaction, and overall well-being (Waworuntu et al., 2022). Historically, the focus of work-life balance research centered on exploring the causes of imbalance and inter-role incompatibility, examining the factors that lead to conflicts between work and personal life (Brough et al., 2022). These early studies aimed to identify the sources of stress and strain that arise from competing demands (Abedalhafiz et al., 2010).

Later studies of work-life balance have shifted their focus to the personal attributes and traits that contribute to achieving balance (Shah & Gawande, 2024). These investigations explored individual differences in coping mechanisms, resilience, and self-regulation, highlighting the role of personal agency in managing work and personal responsibilities (Pillay et al., 2022; Malik, 2023).

Meta-analyses have consistently revealed certain work-related antecedents that significantly impact work-life balance (Vaziri et al., 2022). These antecedents include factors such as workload, job autonomy, organizational support, and work culture (Bouwmeester et al., 2021). Excessive workloads, lack of job control, and unsupportive work environments are consistently associated with work-life imbalance, while flexible work arrangements, supportive leadership, and a culture that values personal time are linked to improved balance (Waworuntu et al., 2022).

The positive correlation between work-life balance and job satisfaction has been well-documented. A study by Agarwal & Bhakuni (2024) demonstrates this positive relationship, highlighting that employees who achieve a healthy work-life balance are more likely to experience greater job satisfaction. This connection underscores the importance of addressing work-life balance issues to enhance employee morale and engagement (Marecki, 2023). Job satisfaction, in turn, contributes to improved performance, reduced absenteeism, and lower turnover rates, benefiting both the individual and the organization (Adriano & Callaghan, 2020).

Work-life balance is an important aspect, which extends beyond the mere absence of conflict; it encompasses the harmonious integration of work and personal life, allowing individuals to thrive in all domains (Kuschel, 2017). Various studies provide empirical evidence of the benefits of work-life balance, highlighting its positive effects on job satisfaction, employee well-being, productivity, and overall work outcomes (Waworuntu et al., 2022; Agarwal & Bhakuni, 2024; Marecki, 2023). For instance, the European Working Conditions Survey 2013 found that 85% of respondents who worked less than 30 hours per week reported higher satisfaction with their work experience. This finding highlights the importance of reasonable working hours and flexible work arrangements in promoting work-life balance.

Studies like those of Owusu & Louw (2019) argue that beyond organizational practices, national culture also influences perceptions and management of work-life balance, making context-sensitive interventions essential, especially in traditional societies like the Maldives.

Furthermore, work-life balance is not a static state but a dynamic process that requires continuous adjustment and adaptation (Gragnano et al., 2020). Individuals' needs and priorities evolve over time,

and organizations must be responsive to these changes (Chen et al, 2020). The concept of work-life integration, which emphasizes the seamless blending of work and personal life, has also gained prominence (Kumar & Rao, 2025). This approach recognizes that work and personal life are not mutually exclusive but rather interconnected. It encourages individuals to find ways to integrate their work and personal responsibilities in a way that aligns with their values and priorities (Kumar & Rao, 2025).

2.3 Work life balance Theories

2.3.1 Role theory

Role Theory, as defined by Biddle (1986), explains how social life is organized through normative expectations associated with multiple and simultaneous roles. Anglin et al. (2022) further apply this perspective to the work-life balance context, highlighting how individuals navigate the demands and expectations associated with their different roles. While work-life conflict can cause stress when demands from different roles interfere (Tavassoli & Sunyer, 2025), role enrichment and positive spillover can enhance satisfaction, mental well-being, and performance (Carlson et al., 2019; Adnan Bataineh, 2019; Yang et al., 2024). Ultimately, this framework provides a useful perspective for understanding work-life balance as the process of managing and negotiating multiple roles and identities, rather than focusing solely on conflict between them.

2.3.2 Work Family Border theory

Work-Family Border Theory (Clark, 2000) describes individuals as "daily border-crossers" navigating physical, temporal, and psychological boundaries between work and home. Balance is determined by the permeability, flexibility, and blending of these borders, where high permeability allows one domain to intrude upon the other, while flexibility allows boundaries to expand to meet shifting demands. While some researchers suggest that permeable borders facilitate integration, others caution that high blending can increase work-family conflict (Desrochers et al., 2005) due to constant transitions (Bellavia & Frone, 2005). Ultimately, achieving equilibrium requires aligning organizational values with employee needs, recognizing that individuals actively shape their environments to manage the trade-off between segmented domains and seamless integration (Jerab & Mebrouk, 2023).

2.4 Work life balance and public sector

Public sector employment offers unique advantages, such as structured work environments and formalized work-life balance policies, including flexible working hours and parental leave (Burke, 2004). While these policies are associated with higher job satisfaction and reduced burnout, their effectiveness may be limited by bureaucratic constraints, resource limitations, and gaps in implementation arising from unsupportive managerial attitudes (Oktosatrio & Liu, 2019; Adriano & Callaghan, 2020). In addition, although formal work-life balance measures may be available, employees may be reluctant to utilize them due to concerns about negative career implications (Drew & Murtagh, 2005).

2.5 Challenges and factors influencing work life balance of working women

Research consistently shows that women face greater work-life balance challenges than men due to the "second shift" of disproportionate domestic and caregiving responsibilities (Hochschild, 1989; Nwankwo et al., 2025). In the Maldivian context, traditional gender norms often dictate that a woman's primary role remains in the domestic sphere (Abdullah et al., 2018), leading to role overload, chronic stress, and slower career advancement (Shahid, 2024; O'Neil et al., 2011). These challenges are exacerbated by the country's unique geographical constraints, where scattered islands and limited infrastructure create significant hurdles for some female employees in commuting and accessing formal childcare or eldercare (Asian Development Bank, 2015; Laidey & Imthinan, 2024). Furthermore, South Asian societal expectations and a lack of institutional accountability often penalize women for caregiving interruptions, resulting in long-term wage disparities and fewer promotions (Bhakuni, 2025; Thébaud et al., 2024). Ultimately, while close-knit Maldivian communities offer social support, they also exert pressure on women to conform to traditional roles, necessitating more robust maternal support policies and job sharing options to ensure gender equity in the public sector (Grand-Guillaume-Perrenoud et al., 2022). Women continue to face gender disparities within government institutions,

where implicit biases and inadequate support mechanisms can limit their career advancement (OECD, 2019; Marthalina et al., 2025). Therefore, the effectiveness of work-life balance policies depends not only on their formal availability but also on a supportive organizational culture and managerial practices that encourage employees, particularly women, to make use of such measures without fear of negative career consequences (Teneng et al., 2024).

2.6 Leadership and Cultural Influence

Leadership is fundamental in shaping an organizational culture that either supports or undermines work-life balance (Stefanovska-Petkovska et al., 2019). Leaders who model healthy behaviors and practice transformational leadership characterized by empathy, empowerment, and responsiveness, correlate positively with better work-life outcomes for subordinates (Krishnan, 2012). In the public sector, effective leadership requires balancing operational efficiency with the well-being of female staff through clear expectations and a culture of trust and respect (Stanford et al., 1995; Rani et al., 2011). Ultimately, leaders serve as critical role models whose attitudes dictate organizational norms; while those prioritizing excessive workloads contribute to burnout, supportive leaders foster a more engaged and motivated workforce (Petkovska et al., 2019).

2.7 Coping Strategies and their Effectiveness

Employees employ various strategies to manage the interface between their work and personal lives. These strategies can be broadly categorized as Cognitive (time-based and strain-based), and behavior-based (Edwards & Rothbard, 2000). Time-based strategies involve managing schedules and prioritizing tasks, while strain-based strategies focus on managing stress and emotional spillover between work and home. Behavior-based strategies involve actively negotiating roles and boundaries between work and personal life.

2.7.1 Cognitive Coping Strategies

Cognitive strategies involve internal mental processes used to reframe and manage stressors, fostering resilience through techniques like cognitive reframing, where overwhelming tasks are viewed as growth opportunities (Bondarchuk, 2024; Savarimuthu, 2024). Positive self-talk and goal setting further enhance this balance by replacing negative thoughts with constructive messages and providing a sense of control and direction in both personal and professional domains (Latham, 2023). Additionally, mindfulness aids emotional regulation and focus, preventing individuals from becoming overwhelmed by role conflicts or emotional spillovers (Channawar, 2023). Together, these mechanisms allow employees to maintain emotional equilibrium and improve job satisfaction despite high demands.

2.7.2 Behavioral Coping Strategies

Behavioral strategies involve visible actions to modify one's environment and manage stress, most notably through the establishment of physical, temporal, and psychological boundaries (Çelik, 2022; Myrie & Daly, 2009). Seeking social support from colleagues or family acts as a buffer against emotional strain, while assertive communication empowers individuals to negotiate roles and advocate for flexible work arrangements (Çelik, 2022). Furthermore, engaging in leisure and selfcare is essential for psychological resilience and recovery from work related stress. Ultimately, the success of these strategies depends heavily on institutional flexibility and a workplace culture where leadership supports employees in acting on their needs without fear of retaliation (Kossek et al., 2011).

2.8 Conceptual Framework

This qualitative study's conceptual framework explores work-life balance as a dynamic, socially constructed process for female employees in Maldivian public institutions. It examines how work, family, and cultural factors intersect with traditional gender roles, forcing women to employ behavioral and cognitive coping strategies to navigate their responsibilities. The framework is grounded in Role Theory, which addresses the stress of managing multiple identities (e.g., mother, employee), and Work-Family Border Theory, which analyzes how workplace flexibility and personal routines influence the management of boundaries between domains. Ultimately, this holistic approach connects personal narratives to broader institutional structures, providing a deeper understanding of how Maldivian women interpret and achieve equilibrium amidst systemic constraints.

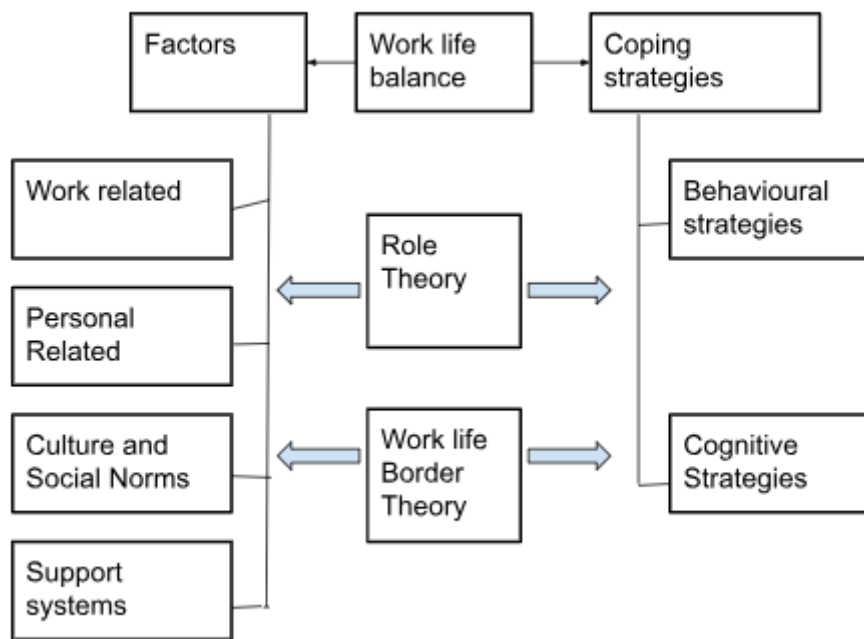


Figure 1. **Conceptual Framework**

2.9 Research Gap

Although previous studies (e.g., Hochschild, 1989; Clark, 2000; Kossek et al., 2011) have examined factors such as gender norms, leadership influence, and coping strategies, there remains a lack of context-specific research that focuses on the unique experiences of women in the Maldivian public sector. Specifically, little attention has been given to how Maldivian cultural norms and institutional constraints shape women's work-life balance in public institutions (Hassan & Azim, 2021; Rasheed & Aminath, 2022). Furthermore, there is limited understanding of the strategies of female employees in Maldives. use to navigate the demands of work and personal life, particularly in relation to organizational policies and personal coping mechanisms (Saleem et al., 2020). Additionally, previous research seldom applies multiple theoretical lenses, such as Role Theory (Kahn et al., 1964), Work-Family Border Theory (Clark, 2000), in a combined or comparative manner to explore the complex, multi-dimensional challenges Maldivian women face. This study addresses these gaps by offering a localized, theory-informed examination of work life balance among women working in a public institution in the Maldives.

3. RESEARCH METHODOLOGY

3.1 Research design

This research utilizes a qualitative case study method to provide an intensive, context-specific exploration of the lived experiences of female employees in public institutions (Krusenvik, 2016). According to Creswell and Poth (2016), this approach is ideal for addressing complex, less defined problems that require deep discovery rather than quantification. By employing data collection techniques such as in-depth individual interviews and focus group discussions, the study captures rich, real-world insights into how these women navigate the multifaceted dynamics of work-life balance (Mik-Meyer, 2020; Rahman & Lee, 2022). Ultimately, this design ensures a profound understanding of the phenomenon, making the findings accessible and relevant to both academics and practitioners (Rose et al., 2014).

3.2 Population, Sample Design and Size

This research was conducted in a Maldivian public institution specifically chosen for its high female workforce and significant public service impact. From a sample frame of 34 female employees, a purposive sampling strategy was used to select participants with over one year of service, ensuring they

possessed sufficient experience with the organizational culture and workload (Alchemer, 2021; Benoot et al., 2016). An exclusion criterion was applied to six staff members with less than one year of tenure. The final sample consisted of 28 female employees, providing a robust group for gathering the in-depth, relevant data needed to address the study's objectives.

3.3 Research Instrument

This research utilized a semi-structured interview guide (Appendix A) featuring open-ended questions to elicit rich, unbiased narratives from participants (Gall et al., 2007; Kallio et al., 2016). The instrument was specifically designed to explore the tenets of Role Theory and Work-Family Border Theory, investigating how factors like workload, leadership, and organizational culture influence the bidirectional relationship between work and personal life. Furthermore, the guide aimed to uncover the specific coping mechanisms used by female employees to manage these domains. This exploratory approach allowed for a deeper understanding of the complex interplay between professional and private roles while facilitating the discovery of unforeseen insights within the Maldivian public sector.

3.4 Credibility or transferability

To ensure trustworthiness, this study employed several credibility enhancing strategies, starting with member checking, where participants reviewed their transcripts to verify the accuracy of their narratives (Lincoln & Guba, 1985). Peer debriefing was also utilized, involving independent reviews by the researcher and supervisor to mitigate bias and ensure themes were firmly grounded in the data (Tiimub & Bans-Akuey, 2021). Furthermore, triangulation with existing literature and frameworks, such as Role Theory and Work-Life Border Theory, contextualized the findings within the broader academic landscape. Finally, to address transferability, the study provided a detailed account of the methodology, allowing future researchers to assess the applicability of these insights to similar settings (Yin, 2018).

3.5 Ethical considerations

To uphold ethical research practices, formal approval was secured from the Ethics Committee of Zikura International College, the Ministry of Health, and the specific public institute involved. Prior to participation, all employees received comprehensive information regarding the study's purpose and their right to say no at any point, including the freedom to withdraw at any time without penalty. Informed consent was formally documented through signed forms (Appendix B), which guaranteed participant anonymity and confidentiality. To ensure data security, all audio recordings and verbatim transcripts were stored on a password-protected personal computer inaccessible to third parties, ensuring that information is used strictly for academic purposes.

3.6 Data collection strategies

Data collection involved semi-structured individual interviews conducted via Google Meet, reaching data saturation after eight participants when no new themes emerged (Hennink et al., 2016). Using a consistent guide with open-ended questions, the 20-to-30-minute sessions allowed for direct interaction and the observation of non-verbal cues while minimizing researcher bias (George, 2022). With explicit informed consent, all interviews were audio-recorded and transcribed verbatim to capture nuances like pauses and intonations, forming a high-fidelity dataset. This exploratory approach provided the necessary flexibility to probe participant responses deeply while respecting their professional time constraints.

3.7 Data analysis method/ approach

Data were analyzed using thematic analysis via QDA Miner Lite, following the six-phase framework by Braun and Clarke (2016). The process began with familiarization, where researchers immersed themselves in transcripts to identify recurring ideas. This was followed by generating initial codes to label data segments relevant to the research questions and searching for themes by grouping codes with shared meanings. Potential themes then underwent a rigorous review to ensure coherence and relevance, leading to the refinement or removal of those lacking evidence. Finally, each theme was defined and named to capture its essence before being presented with supporting extracts to discuss its implications.

4. FINDINGS

4.1 Profile of respondents

From a sample size of 28 female employees a total of 8 female employees from the selected organization were interviewed as saturation reached after the 8th. Female employees of different age, income, position and dependents were interviewed to obtain diversity, which provides a comprehensive understanding of their work life balance.

Table 1. **Demographic Information**

Participants	Age	Gender	Marital Status	Position & Job Level	Qualifications	Work Experience	Income	Dependents
Participant 1	41	Female	Single	Social Worker, Rank 7	Bachelor's Degree	20 years	10,000	2 children & old aged father
Participant 2	23	Female	Divorced	Senior Community Health Officer, Rank 7	Bachelor's Degree	2 years	19,000	No dependents
Participant 3	26	Female	Married	Human Resources Officer, MS2	Bachelor's Degree	2-3 years	10,000	Old aged Mother & Father
Participant 4	29	Female	Married	Assistant Counselor, Rank 7	Bachelor's Degree	4-5 years	15,000-20,000	No dependents
Participant 5	24	Female	Married	Senior Public Health Officer	Bachelor's Degree	2-3 years	19,000-20,000	No dependents
Participant 6	50	Female	Married	Public Health Officer	Master's Degree	17 years	15,000-16,000	3 children
Participant 7	46	Female	Married	Senior Registered Nurse, Rank 7	Bachelor's Degree	5-7 years	20,000	2 children
Participant 8	38	Female	Married	Senior Registered Nurse, Rank 8	Bachelor's Degree	20 years	20,000 plus	1 child

4.2 Research findings

The data taken from the interviews were analyzed thematically, by identifying dominant and interconnected themes which were then organized according to the research questions mentioned in Chapter 1. Hence, these themes are presented in accordance with the research questions below.

4.2.1 Factors Influencing the work life balance of female employees

This research uncovered a range of factors that come together to shape how female employees in public institutions experience work-life balance. These factors do not exist in isolation; they overlap and influence each other in ways that make balancing work and personal responsibilities a real challenge for many women. To make sense of these experiences, the factors are grouped into four main categories. Which are work-related factors, personal factors, cultural and social influences and the support systems available. The categories in Figure 1, together offer a clearer picture of what women are dealing with while balancing their work and life.

4.2.1.1 Work related factors

Three Work related factors have been identified as a major theme with respondents frequently citing issues related to working hours, workload, and workplace culture.

4.2.1.1.1 Working hours and Flexibility

The length and rigidity of working hours emerged as a major source of stress for many participants. The shift to longer workdays, particularly when not accompanied by proportional benefits or support, was a significant concern. Several participants expressed frustration over this change, highlighting how it disrupted their personal routines and increased their daily burden. One participant shared, "Previously

we were working 6 hours. When the new pay framework came, Health decided that health staff will work 8 hours from now on.” This transition was not only perceived as abrupt but also inconsiderate of employees' existing commitments outside of work. Another participant remarked, *“Because of the change now, I can't go straight home at 2 o'clock.”* These extended hours were seen as directly interfering with family responsibilities and personal time. The lack of flexibility to accommodate caregiving duties or personal errands within working hours further intensified the challenge. Overall, participants felt that the extended schedules placed additional strain on their ability to achieve a work-life balance, highlighting the need for more responsive and supportive work-hour policies within the public sector.

4.2.1.1.2 Workload and responsibilities

Participants frequently discussed workload as a key factor affecting their ability to balance professional and personal responsibilities. While a few described their workload as manageable, many others expressed difficulty in coping—particularly due to persistent staffing shortages. These shortages often meant taking on additional tasks, extending work hours, and carrying responsibilities beyond their designated roles. As a result, the line between work and home became increasingly blurred, making it harder to meet family obligations. For those with caregiving duties, this imbalance was especially stressful. The varying experiences among participants underscore how organizational capacity and resource allocation directly impact individual work-life balance.

4.2.1.1.3 Management and workplace culture

The role of management and overall workplace culture emerged as a critical factor influencing participants' experiences with work-life balance. Many described their work environments as unsupportive, and in some cases, even toxic. Common concerns included favoritism in promotions, a lack of recognition for contributions, and poor communication between staff and leadership. One participant voiced frustration, stating, *“Others who have been in the job for just 2–3 years, whose work experience is just 2–3 years, have been given promotions over me very unfairly.”* Such perceptions of inequity contributed to feelings of demotivation and resentment. In addition to these concerns, participants often felt that their supervisors were disconnected from the realities of their roles. As one explained, *“Our supervisor is not from this field—they don't really understand our concerns that much.”* This lack of empathetic leadership made it difficult for employees to express challenges or request support, ultimately intensifying the strain of managing both work and personal responsibilities. The findings highlight the importance of supportive, informed, and equitable management practices in fostering a healthier, more balanced work environment.

4.2.1.2 Personal related factors

The personal responsibilities and circumstances, such as family obligations and health issues, also played a significant role in shaping work-life balance experiences.

4.2.1.2.1 Family responsibilities

Caring for children and dependent relatives emerged as one of the most significant challenges faced by participants, particularly for single mothers. The dual burden of full-time employment and caregiving responsibilities placed immense strain on their daily lives. One participant captured this struggle, stating, *“Think about it—working from 8 to 4 while taking care of children alone, taking care of parents—how big of a difficulty that will be.”* The emotional and physical toll of managing both roles was evident throughout the interviews. This challenge was further compounded when caregiving responsibilities conflicted with work obligations. For example, some participants highlighted the difficulty of attending to urgent family needs, such as medical appointments for elderly parents, during working hours. As one participant shared, *“If I need to take my parents to the doctor, it sometimes falls during working hours. It impacts work.”* These overlapping responsibilities often led to feelings of guilt, stress, and helplessness, underscoring the need for greater flexibility and institutional support for employees with caregiving duties. The experiences shared highlight how deeply personal and professional responsibilities are intertwined, especially for women balancing multiple care roles within the constraints of a full-time public sector job.

4.2.1.2.2 Marital status and relationship

Marital status, particularly divorce or the absence of a supportive partner, was identified as a significant source of stress that deeply affected participants' ability to manage work and family responsibilities. Several women shared that navigating single parenthood or household management alone intensified both emotional and practical challenges. The lack of a partner to share responsibilities often meant facing increased financial pressures, limited personal time, and a heavier mental load. One divorced participant reflected on the emotional toll of her experience, stating, *"Divorce brought a big change. At that time, I didn't even want to go to work—I was very stressed thinking about it."* Such accounts highlight how major life transitions, like divorce, can disrupt work-life balance and negatively impact well-being and job performance. For these women, the workplace was not only a space of professional obligation but also a source of added pressure when personal support systems were weakened or absent. These findings emphasize the importance of organizational sensitivity to employees' personal circumstances and the potential value of targeted support for those navigating significant life changes.

4.2.1.3 Culture and Social norms

Cultural and social norms surrounding gender roles and family responsibilities also exerted a considerable influence.

4.2.1.3.1 Traditional gender norms

The expectation that women should bear the primary responsibility for childcare and household duties was a recurring theme among participants and was identified as a major barrier to achieving work-life balance. This deeply rooted cultural norm placed significant pressure on women to prioritize family obligations, often at the expense of their professional roles. One participant reflected on this imbalance, stating, *"The way he works is that the mother has to do everything."* Such sentiments reveal how traditional gender roles continue to shape the division of labor within households, reinforcing the notion that caregiving is primarily a woman's duty. However, not all participants shared the same perspective. A few noted that these norms are beginning to shift, with some families adopting a more equitable distribution of responsibilities. These differing views suggest a gradual, though uneven, cultural transition. While deeply embedded expectations remain prevalent, there is growing awareness and, in some cases, change toward more balanced domestic roles. This evolving dynamic highlights the importance of both societal and institutional efforts in supporting gender equity at home and in the workplace.

4.2.1.4 Support system

The availability of a robust support system, encompassing colleagues, family, and friends, was a critical factor in mitigating the challenges of work-life balance.

4.2.1.4.1 Colleague support

Many participants highlighted the vital role of supportive colleagues in helping them manage both their workload and emotional well-being. Having understanding and cooperative coworkers was seen as a crucial buffer against the stress of balancing professional and personal responsibilities. For some, this peer support made a tangible difference in getting through demanding days. One participant expressed this sentiment simply yet meaningfully, stating, *"We get a lot of help from colleagues."* This sense of camaraderie fostered a more positive work environment, where shared responsibilities and mutual understanding helped ease individual burdens. Participants described how colleagues stepped in during busy periods, offered flexibility, or simply provided listening ear small gestures that had a significant impact on their day-to-day experiences. These findings underscore the importance of workplace culture and peer relationships in promoting a more manageable and compassionate work-life balance.

4.2.1.4.2 Family and friends' support

Practical and emotional support from family and friends was widely recognized by participants as essential to managing both childcare and household responsibilities. This support was especially crucial for single mothers and women with limited institutional assistance. One participant explained the value of informal support networks, stating, *"The biggest, as I said before, is colleagues. Colleagues in the*

field, right? Especially friends... Then family support—I can't say I get it fully, but most of the time I do get it. They're there when absolutely needed". Another participant shared how her family contributes to her emotional well-being: "Family and friends are supportive... like giving advice and taking me out, spending time outside".

Such support systems helped participants better navigate the pressures of balancing work and home life, especially when formal structures like childcare or flexible work arrangements were lacking. While the extent of support varied, participants consistently emphasized that having someone to turn to whether for help with tasks or significantly eased the burden of daily responsibilities. These insights highlight the importance of recognizing and reinforcing informal support networks as part of broader work-life balance strategies.

4.2.2 Strategies for managing work life balance

Female employees who were interviewed had a range of strategies to manage the interface between their work and personal lives. These strategies can be broadly categorized as behavioral and cognitive.

4.2.2.1 Behavioral strategies

Behavioral strategies used by the employees focused on concrete actions and adjustments to manage time, workload, and personal boundaries.

4.2.2.1.1 Time management and scheduling

Many participants emphasized the importance of time management and scheduling to juggle work and personal responsibilities effectively. One participant explained, "*Things are scheduled by dividing tasks into time slots. I'm able to manage because I can do things on time. I'll do it according to routine,*" highlighting how structured planning helps maintain balance between professional and personal duties. Another participant noted the importance of creating clear boundaries between work and home, saying, "*I try very hard to give the time after finishing work to family. And on weekends, I use that time for my daughter's matters without bringing office work home*". Similarly, another interviewee mentioned that "*Even if there's a lot of work, it's a bit easier to do when divided up,*" reinforcing the value of task segmentation and intentional scheduling.

4.2.2.1.2 Setting boundaries

Establishing clear boundaries between work and personal life emerged as a common and crucial strategy among participants. One participant emphasized this by saying, "*Things are scheduled by dividing tasks into time slots. I'm able to manage because I can do things on time. I'll do it according to routine*". She also stated firmly, "*Do official things during official hours,*" indicating that she had explicitly communicated with her workplace to avoid work-related interruptions during personal time. Another participant echoed this approach by describing how she deliberately separates work and home roles: "*I try very hard to give the time after finishing work to family... I play the role of mother and wife. I give time as much as possible*". These strategies reflect a conscious effort to protect personal time and mental space, ensuring that professional obligations do not intrude upon family responsibilities or personal well-being.

4.2.2.1.3 Lifestyle adjustments

Participants mentioned several lifestyle adjustments aimed at managing stress and maintaining overall well-being. Engaging in physical activity was one such strategy; as one participant shared, "*I exercise a lot; I started exercising after COVID*". Another emphasized the importance of rest, stating that she copes by "*exercising and sleeping well, trying to sleep well,*" recognizing that adequate rest plays a crucial role in sustaining energy levels amid demanding routines. Additionally, support with household responsibilities was highlighted as a key factor. One participant noted, "*There are helpers for household tasks too,*" which allowed her to focus on both her career and personal life without being overwhelmed. These personal adaptations demonstrate how female employees actively create supportive conditions to reduce stress and preserve their mental and physical health.

4.2.2.1.4 Efficient work habits

One of the most common habits participants adopted to manage their time more efficiently was skipping or minimizing lunch breaks to leave work earlier or better manage their responsibilities. One participant noted, *"We don't get many break times. There's just that 45 minutes... I only go out for urgent needs, otherwise I'm working,"* highlighting how work intensity often led to compressed break times. Another shared, *"The break isn't taken in a way that relaxes the mind,"* and suggested that in many work settings, *"that period should be without work... just do nothing and take a break,"* illustrating how limited or ineffective breaks were commonly repurposed to maintain workflow or finish earlier. In addition to skipping breaks, participants also adopted structured routines to increase work efficiency. One explained, *"Things are scheduled by dividing tasks into time slots. I'm able to manage because I can do things on time,"* demonstrating how organized scheduling supported productivity throughout the day. Another noted, *"Even if there's a lot of work, it's a bit easier to do when divided up,"* reinforcing the value of breaking down tasks into manageable portions. These efficient work habits, ranging from strategic time allocation to sacrificing rest, reflect the lengths to which female employees in state institutions go to navigate the demands of their dual roles at work and home.

4.2.2.2 Cognitive strategies

Cognitive strategies involved shifts in mindset and perspective to cope with stress and maintain a sense of control.

4.2.2.2.1 Mindset Shift

Several participants emphasized the importance of shifting their mindset as a key strategy for managing stress and preserving personal peace. One participant described how she drew clear lines between her personal and professional lives, stating, *"Do official things during official hours... I don't take out any anger from home issues either. No matter how bad something is at home,"* underscoring a conscious effort to mentally separate work from home life to maintain emotional stability. This mental boundary-setting was a recurring theme among participants who recognized that peace of mind required intentional internal discipline.

Another participant highlighted how her approach evolved over time, noting, *"Back then I didn't have children... Now that I have children it will be very different... I manage by giving time to myself,"* reflecting how life experiences reshaped her perspective on balance and stress management. Similarly, the act of setting aside weekends strictly for family, as one participant stated—*"I try very hard to take my daughter out on Friday and Saturday... play the role of mother and wife"*—reveals a mindful choice to focus on what brings fulfillment and emotional clarity.

These mindset adjustments built around conscious boundary-setting, redefining priorities, and affirming self-worth, played a central role in how women maintained their mental well-being in the face of demanding work and family roles.

4.2.2.2.2 Seeking encouragement

Seeking encouragement through open conversations with trusted friends and family was a key coping strategy reported by several participants. One participant shared the emotional value of close friendships, stating, *"Mostly friends, especially a very close friend. I get a lot of help from her now. Even in situations where I can't pick up the kids... even if I'm sick, most of the time I can call her. Even more than a family member"*. This highlights how emotional support networks can become essential for managing both personal and professional challenges.

Another participant emphasized the comfort of having people to turn to, saying, *"If there's anything, I can go and talk. Financially and if help is needed in anything, it's available"*. These supportive interactions provided not only practical help but also a source of encouragement during stressful times.

Through these connections, participants were able to share their struggles, receive reassurance, and feel less isolated, demonstrating how relational support plays a vital role in sustaining emotional well-being and resilience in the face of work-life pressures.

4.2.2.2.3 Acceptance and reframing

Acceptance and reframing emerged as key coping mechanisms for participants, particularly when facing the pressures of juggling work and personal obligations. One participant captured this mindset shift by stating, *“This is mommy’s life, I can’t come every hour,”* as she explained how she trained her daughter to take responsibility for herself. This reflected her recognition that she could not meet everyone’s needs all the time and needed to create a sustainable routine for both her and her family.

Another participant expressed how she stopped trying to meet unrealistic expectations, particularly in the face of societal or workplace pressures. She shared, *“Somehow I had to prove it... that it’s not something to think that way,”* referring to outdated perceptions that women should stay home and fulfill all caregiving roles. This comment highlights how reframing her role and refusing to internalize cultural pressure helped her establish a healthier, more self-defined balance.

These reflections reveal how women working in Maldivian state institutions are often coping by trying to meet every demand, but by consciously accepting their limitations and redefining success on their own terms. This mental shift allowed them to reduce stress and focus on what truly mattered in their personal and professional lives.

Table 2. Findings

Research Objective	Themes	Research Findings
To explore factors influencing work-life balance of female employees.	Work related Factors	<i>“Previously we were working 6 hours. When the new pay framework came, Health decided that health staff will work 8 hours from now on.”</i>
		<i>“With the additional working hours, workload increased too”</i>
		<i>“Our supervisor is not from this field—they don’t really understand our concerns that much.”</i>
	Personal Related Factors	<i>“Think about it—working from 8 to 4 while taking care of children alone, taking care of parents—how big of a difficulty that will be.”</i> <i>“Divorce brought a big change. At that time, I didn’t even want to go to work—I was very stressed thinking about it.”</i>
To explore coping strategies used by female employees to manage their work and personal responsibilities	Culture and Social Norms	<i>“The way he works is that the mother has to do everything.”</i>
	Support Systems	<i>“We get a lot of help from colleagues.”</i> <i>“Family and friends are supportive... like giving advice and taking me out, spending time outside”.</i>
	Behavioral Strategies	<i>“Things are scheduled by dividing tasks into time slots. I’m able to manage because I can do things on time. I’ll do it according to routine,”</i>
		<i>“Even if there’s a lot of work, it’s a bit easier to do when divided up,”</i> <i>“Do official things during official hours,”</i> <i>“I exercise a lot; I started exercising after COVID”</i> <i>“We don’t get many break times. There’s just that 45 minutes... I only go out for urgent needs, otherwise I’m working,”</i>

Cognitive
Strategies

“Do official things during official hours... I don't take out any anger from home issues either. No matter how bad something is at home,”
“If there's anything, I can go and talk. Financially and if help is needed in anything, it's available”
“This is mommy's life, I can't come every hour,”

4.3 DISCUSSION

4.3.1 Overview of the Findings

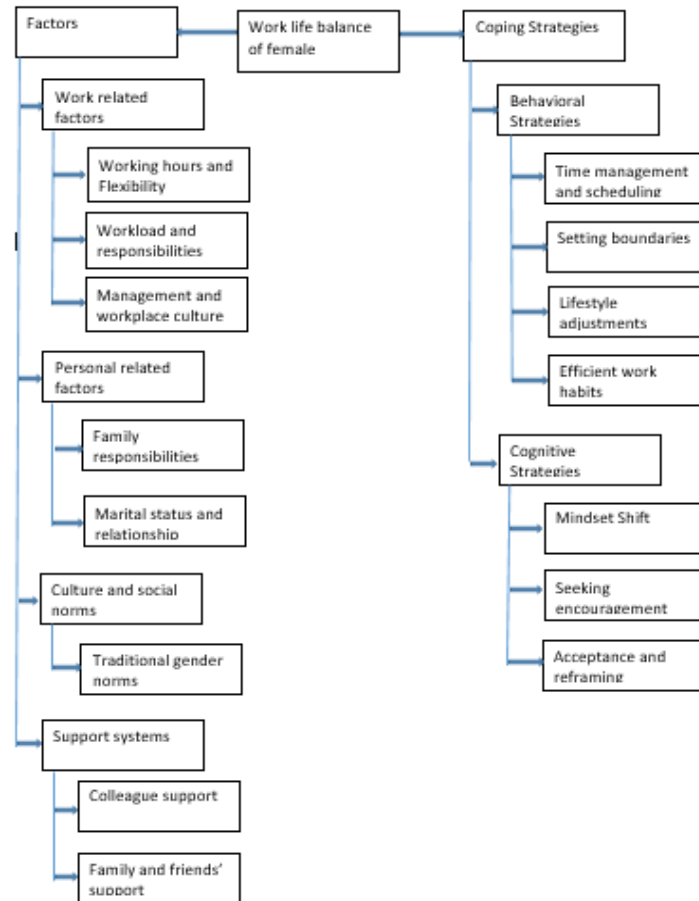


Figure 2. Overview of the Findings

4.4 Discussion of research results

4.4.1 Factors influencing the work life balance of female employees

4.4.1.1 Work related Factors and work life balance

The research identified inflexible working hours, excessive workload, poorly designed work schedules, and unsupportive management as primary barriers to work-life balance, consistent with Bouwmeester et al. (2021) regarding how rigid schedules impede personal responsibilities. Specifically, the extension of working hours and poorly designed work schedules in health institutions without additional support mirrors Teneng et al.'s (2024) findings on how implementation gaps adversely affect public sector employees. Furthermore, a workplace culture marked by favoritism and misaligned leadership reflects the observations of Drew and Murtagh (2005), where poor management prevents staff from utilizing formal policies. In the Maldivian context, these shortcomings highlight the absence of transformational leadership characterized by empathy and flexibility which Petkovska et al. (2019) argue is essential for positive outcomes but often lacking in bureaucratic settings.

4.4.1.2 Personal factors and work life balance

The findings revealed that caregiving responsibilities for children and elderly parents placed a considerable burden on female employees, with this challenge being particularly evident in the account of the single mother who participated in the study, reflecting the disproportionate domestic and caregiving responsibilities associated with the "second shift" (Hochschild, 1989; Marecki, 2024). In the Maldivian context, despite increased workforce participation, traditional gender roles continue to shape expectations around domestic responsibilities, with participants describing the expectation that women should "do everything at home" alongside full-time employment (IFES, 2014; Edition.mv, 2024). Furthermore, the experience shared by the divorced participant suggested that marital circumstances can also affect work-life balance, as she reported heightened stress and emotional strain, consistent with Parlak and Güneri (2022), who highlight the structural and emotional challenges experienced by single mothers.

4.4.1.3 Cultural and Social norms

Traditional gender roles significantly influence participants' experiences, aligning with findings by Bhakuni (2025) on the persistence of patriarchal norms and rigid expectations in South Asian contexts. Consistent with Marecki (2024), women in this study faced internal and societal pressure to prioritize domestic duties, often experiencing stigmatization for focusing on their careers. Viewed through Clark's (2000) Work-Family Border Theory, these findings illustrate how institutional inflexibility and cultural norms create rigid, impermeable boundaries between work and family domains. This lack of flexibility makes integration difficult, particularly when societal expectations discourage shared caregiving and reinforce the separation of roles.

4.4.1.4 Support Systems

This study highlights that social support from colleagues, family, and friends is critical in alleviating work-life pressures, serving as a buffer against stress in line with House's (1981) and Kossek et al.'s (2011) theories. While informal networks such as, practical help from friends and emotional support from family, currently fill the gap left by missing formal mechanisms, access to these networks is inconsistent. Specifically, single mothers or those isolated from extended family face significant inequities, underscoring the urgent need to institutionalize support through formal daycare and flexible schedules rather than relying solely on personal connections (Lewis & Humbert, 2010).

4.4.2 Coping strategies used by female employees

Participants demonstrated resilience through cognitive strategies like reframing and emotional compartmentalization, alongside behavioral strategies such as boundary-setting and time management, aligning with the framework by Edwards and Rothbard (2000). As highlighted by Savarimuthu (2024) and Çelik (2022), these mental and structured routines are essential for buffering chronic stress and maintaining professional boundaries. However, the success of these individual efforts relies heavily on the presence of support systems; consistent with Marthalina et al. (2025), emotional and practical reliance on colleagues and family significantly enhances an employee's overall coping capacity.

4.4.3 Theoretical integration

This study reinforces the applicability of Role Theory (Biddle, 1986) and Work-Family Border Theory (Clark, 2000) in understanding the challenges faced by female employees. According to Role Theory, participants experience inter-role conflict through emotional exhaustion and time-based pressures as they navigate multiple identities as professionals and caregivers (Chandorkar & Shetty, 2019); however, family support also facilitates positive spillover through role enrichment. Complementing this, Border Theory is reflected in how participants manage inflexible schedules and blurred boundaries, with those who create clear routines or compartmentalize emotions effectively constructing the firm borders necessary to achieve balance.

4.5 Limitations

The study's limitations primarily center on single-institution focus, as the eight participants from one Maldivian organization may not fully capture the diversity of cultural or operational dynamics across the broader public sector. Additionally, the exclusion of new employees (those with under one year of

service) means the findings may overlook the unique onboarding challenges and initial work-life balance struggles of early-career professionals. Finally, the reliance on self-reported narratives introduces potential social desirability bias, as participants may have been reluctant to openly discuss sensitive issues such as gender expectations, family responsibilities, or workplace experiences and may therefore have presented their circumstances in a more socially acceptable manner. They may have been trying to appear capable, responsible, resilient, or socially acceptable in managing their work and family roles.

4.6 Practical implications and recommendations

The findings of this study offer several important implications for institutional policy and workplace practices aimed at enhancing work-life balance, particularly for female employees in the public sector. Firstly, flexible work policies have been seen as a critical area for reform. Institutions should implement and actively promote a variety of flexible work arrangements, such as flextime, remote work, compressed workweeks, and job-sharing. These measures can help employees better manage their professional and personal responsibilities, particularly those with caregiving duties. Beyond improving work-life balance, such flexibility has been linked to increased job satisfaction, higher retention rates, and improved overall productivity.

Supportive leadership is another essential component of a balanced and inclusive workplace. Supervisors and managers should receive targeted training in areas such as empathy, fair decision-making, and gender sensitivity. Leaders who are aware of and responsive to the unique challenges faced by female employees are better equipped to create an environment of trust, respect, and collaboration, ultimately fostering a healthier organizational culture.

Workplace daycare services should be expanded and institutionalized to reduce the caregiving burden often disproportionately carried by women. Accessible and affordable childcare within or near the workplace allows working mothers to remain engaged in their roles without compromising the quality of care provided to their children. This support not only alleviates stress but also enables women to pursue career growth and leadership opportunities.

Mental health support is another critical area for intervention. Institutions should offer counseling services, stress management workshops, and wellness programs to support employees' emotional and psychological well-being. By proactively addressing mental health, organizations can help prevent burnout, improve resilience, and enhance employee engagement and performance.

Finally, awareness campaigns that challenge traditional gender norms and promote shared domestic responsibilities can contribute to long-term cultural change. Organizations can play a pivotal role in reshaping societal attitudes by promoting messages that value gender equity both at work and at home. Such initiatives can foster more balanced household dynamics and reduce the social pressures that often hinder women's participation and progression in the workforce.

Together, these practical measures can form a comprehensive framework to promote work-life balance, gender equality, and employee well-being in the Maldivian public sector and beyond.

4.7 Recommendations for further research

To deepen the understanding of work-life balance in the Maldivian context and build on the findings of this study, there are several recommendations for future research.

Firstly, comparative studies should be conducted across different sectors such as public versus private institutions and across various regions or islands within the Maldives. Such research would allow for an exploration of how institutional culture, resource availability, and geographic factors influence employees' work-life balance experiences, offering a more detailed and representative national perspective.

Second, longitudinal research is crucial for tracking how work-life balance evolves over time, especially in response to the introduction of new workplace policies or reforms. By following participants across

different life and career stages, researchers can assess the long-term impact of institutional changes and identify which interventions yield sustainable improvements.

Third, there is a need to include men's perspectives in future studies. Understanding how male employees navigate work-life balance and how societal gender norms influence their roles can provide a more holistic view of workplace dynamics. This can also help identify opportunities to promote shared responsibilities at home and challenge traditional assumptions about caregiving roles.

Fourth, policy impact assessments are essential for evaluating the effectiveness of specific work-life balance interventions. Future research should examine how policies such as workplace daycare services, maternity and paternity leave, and flexible work arrangements affect employee retention, job satisfaction, productivity, and well-being. These insights can guide evidence-based policymaking and resource allocation.

Finally, a quantitative expansion of the current study through large-scale surveys would allow for broader generalizability of the findings. This approach would enable researchers to identify statistically significant trends and correlations across demographics, organizational types, and geographic areas, thereby strengthening the empirical foundation for future research.

Collectively, these research directions would contribute to a more comprehensive understanding of work-life balance in the Maldives and inform the development of inclusive, context-specific policies that support gender equity and employee well-being.

5. CONCLUSION

The study's findings are highly consistent with the existing body of international and Maldivian literature on work-life balance, particularly in relation to gender norms, caregiving burdens, organizational culture, and individual coping mechanisms. It not only affirms previous research but also expands it by contextualizing these dynamics within the specific socio-cultural and institutional realities of a Small Island Developing State like the Maldives. This localized insight strengthens the case for culturally sensitive policy interventions and highlights the urgent need to address structural and normative barriers to work-life balance for women.

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A STUDY ON MOTIVATIONAL FACTORS AND TALENT RETENTION IN MALDIVES ELECTRICITY INDUSTRY

Dr. Aishath Faseeha Mohamed*, Mavee Mufeed

Maldives Business School, Nikagas magu, Maldives

**Corresponding author: faseeha@bussinessschool.mv*

Abstract

The purpose of this study is to investigate the Talent Retention factors such as Career Progression, Financial Rewards and Employee Motivation in the Maldives Electricity Industry. As this research tests theories derived from the literature, a deductive approach was used. The positivism paradigm was adopted, as the hypotheses relating to Career Progression, Financial Rewards, Motivation and Talent Retention are tested in this study. A quantitative research methodology was used, as it takes less time than qualitative methods to administer the survey questionnaire, while producing valid and reliable results that can be generalisable depending on the sampling technique employed. The survey questionnaire method was used to collect data. After analysis, it was concluded that Career Progression and Financial Rewards retain talent in the Maldives Electricity Industry, while Motivation was not found to be a significant factor in talent retention within this context. This adds a new approach to the literature of Talent Retention. Career Progression is more important to retaining talent in the organisation than Financial Rewards. The findings of this study provide researchers with new literature on talent retention, while practitioners can apply the results to design strategies for retaining talent within their organisations.

Keywords: *Talent Retention, Motivation, Financial Rewards, Career Progression, Electricity industry*

1. INTRODUCTION

Talent is a word that is commonly used in many organisations but there is no fixed definition for Talent, often associated with an individual's skills, competencies and potential contribution to organisational goals (Afrianto & Indriati, 2022). Retaining talent in organisations is vital, as the overall performance of the organisation depends on it (Azimi, et al., 2025). The Maldives' high turnover rate of employees is one of the major challenges, according to recent research by the Civil Service Commission in 2016. According to the data, 1,345 workers, representing almost 10% of the total public sector workforce (not necessarily limited to talented employees), left the public service in 2015. Identification of the causes of high talent turnover and adoption of talent retention methods in the Maldives' government service are essential for reducing talent loss there (Zuhair & Ibrahim, 2016). These investigations have given rise to the current research, which is being carried out in the electricity industry, a 100% state owned enterprise.

Despite growing research interest, there remains no universally agreed-upon definition of talent, and significant gaps persist in the body of knowledge on talent retention (Haris, et al., 2025; Afrianto & Indriati, 2022; Kwon & Jang, 2022). Since technical expertise and experience are required by the sector, and electricity is one of the fundamental utility services required by all Maldivians, talent retention is crucial in this industry. Studies on the skills shortage and retention have been conducted in other countries, but studies on talent retention specifically within the power sector remain uncommon (Utility Regulatory Authority, 2023).

There is a dearth of academic research on the connection between talent retention and career advancement in many businesses (Hall, 2019). There is a dearth of research on the connections between motivation and talent retention across industries. Due to a lack of literature, there is a gap in academic understanding between incentives and rewards in many industries (Vakil, et al., 2022).

Additionally, compared to five years ago, the government has had to boost the subsidies given to both electrical providers by up to three times due to the increasing cost of producing electricity (Utility Regulatory Authority, 2023). The high cost of producing electricity and the rise in demand for electricity have also resulted in higher electricity tariff rates. In the end, this has an impact on everyone who lives in the Maldives. The Greater Male' and the other Maldives islands currently have two tariff rates (Utility Regulatory Authority, 2023). Hence, Maldives talent retention Before things deteriorates further, the issue of electricity, which affects everyone living in the Maldives, needs to be resolved.

2. LITERATURE REVIEW

This section focuses on the literature review of talent retention and the variables used in the research. It begins by defining the key variables, followed by the theoretical foundation underpinning the conceptual framework, and concludes with an empirical review of the relationships among the variables and the resulting hypotheses.

Table 1. **Definition of Variables.**

Concept	Definition
Career Progression	The advancement of an employee through positions of increasing responsibility, skill and reward within an organisation, encompassing career path, training and development, and career opportunities (Darby & Morrell, 2019).
Financial Rewards (FR)	The monetary and non-monetary compensation, including pay and allowances, incentives and bonuses, and other benefits, that an organisation provides to employees in exchange for their contribution (Vakil, et al., 2022).
Motivation (M)	The internal and external forces that drive an employee's willingness to exert effort towards organisational goals, arising from the employee's perception of fairness between the inputs they contribute and the outcomes they receive (Kovach, 2018; Lloyd & Mertens, 2018).
Talent Retention (TR)	
	An organisation's ability to retain the skilled and high-performing employees whose contributions are critical to achieving its strategic objectives (Mayo, 2018; Mazil, et al., 2023).

2.1. Theoretical Foundation

This section explains the theoretical foundation for the conceptual framework designed for this study. The theory used in this study is John Stacey Adam's Equity Theory. Adams established the equity theory in 1963, which explains how an employee's motivation is shaped by their perception of fairness and can therefore be applied as a tool for motivating employees. This approach places a strong focus on the requirement that an employee's input, meaning the contributions such as effort and loyalty that they bring to the organisation, and output, meaning the rewards such as pay and recognition that they receive in return, be equal. An employee's inputs-loyalty, diligence, dedication, and trust-should be adequately balanced by the organisation's outputs-salary, other perks, acknowledgement of accomplishments, and so on. Employee motivation increases when there is a perceived balance between the employee's input and the organisation's output, as this signals that their efforts and labour have been fairly recognised

and appreciated (Shinde, 2025). Adams discovered, however, that when these input and output do not match, it has a detrimental effect on the workers, causing them to become demotivated and leave the organisation (Chanez, et al., 2024).

According to the literature, Adam's equity theory holds that employee motivation is based on how fairly employees perceive the balance between the work they put in and the outcomes they receive (Kovach, 2018), and is therefore linked to pay and allowances, other incentives, career opportunities, and career path (Darby & Morrell, 2019).

2.2 Empirical Review and the Relationships among Variables

Research conducted in telecommunication companies in Malaysia suggests that employee training programmes minimise the knowledge gap in the scope of work assigned to employees, which builds loyalty towards the company and increases the retention of talent, showing a positive and significant relationship between training and development and talent retention (Kanapathipillai & Azam, 2020). The retention of employees in the organisation is closely connected with compensation management, according to research employing the organisational justice theory done in the Malaysian electric and electronics industry. This indicates that a key factor in an organization's ability to retain talent is the financial compensation that employees get (Saad & Sudin, 2020).

In order to better understand how human resource management techniques affect employee retention in the Maldives retail industry, Mariyam Imna and Zubair Hassan (2015) conducted a study. For this study's data collection, quantitative methods were used, and a total of 280 questionnaires were given out to 30 companies. In this study, 254 fully filled questionnaires were received. To choose the sample, a practical sampling technique was employed. The Guest model, Michigan Model, and Harvard framework were all used in this study. This study demonstrated a favourable and significant correlation between career development, remuneration and benefits, health and safety, and the retention of talented employees (Imna & Hassan, 2015).

Research on talent retention in the US construction business was done in 2019 by Marvin D. Hall. The theoretical underpinnings of this study were the conservation of resources theory, the quality of work life theory, the hygiene theory, the hierarchy of needs theory, and the job demand theory. Career advancement and talent retention have a favourable association, according to statistics based on convenience sampling of 68 respondents (Hall, 2019).

Research conducted in Indian public sector with 472 employees showed that career growth is a vital factor in talent retention. Survey questionnaire was used to collect data and quantitative analysis was conducted. This study contributed to the existing knowledge of talent retention but more research in this field is required (Mukherjee, et al., 2020). In order to determine the parameters affecting talent retention in the Indian aviation business, Meera Shanker (2019) carried out study. A total of 225 commercial pilots from various Indian Airlines took part in this study. The five elements of talent retention identified by this quantitative study, which employed the questionnaire approach, included the causal link between opportunities for self-development and talent retention (Shanker, 2019).

Ashraf Elsafty and Mahmoud Oraby looked at how training affected employee retention in the Egyptian private sector. 270 participants in the study were from the private sector, and the study's theoretical framework was based on the Human Capital theory. This study found that by offering employees the training they need to stay employed, the organisation is able to retain talent (Elsafty & Oraby, 2022).

According to a study done in Indonesia, an organization's ability to retain talent is boosted by a good system of financial and non-financial rewards. With 10 participants, this study used interview questions at 5 private universities. The answers were analysed qualitatively, and the findings show that when employees are motivated by money, retention happens (Meilani, et al., 2021). Additionally, rewards have an impact in intention to stay in non-profit organisations also. This adds to the relationship between rewards and talent retention (Hopkins & Dowell, 2022).

Motivation serves as a mediator in the interaction between training and development and talent retention in an organisation, according to research done in Pune, India. 202 respondents responded to the survey that was distributed in Pune's first-class hotels, and a quantitative analysis was done to draw results

(Shende, et al., 2021). Financial awards appear to have a favourable effect on motivation, according to research done in the public sector in the Lebanese Republic by Carole Serhan, Eliane Hy, and Eva Nicolas. The theoretical underpinnings of the Lebanese study were the ERG Model and McClelland's Needs Theory (Serhan, et al., 2018). Furthermore, another research conducted to engineers working in Indian Construction Industry concluded that pay and compensation is imperative to retain talent in the organisation (Fathima & Umarani, 2023).

After the theoretical and empirical literature review the following conceptual framework has been made for this study.

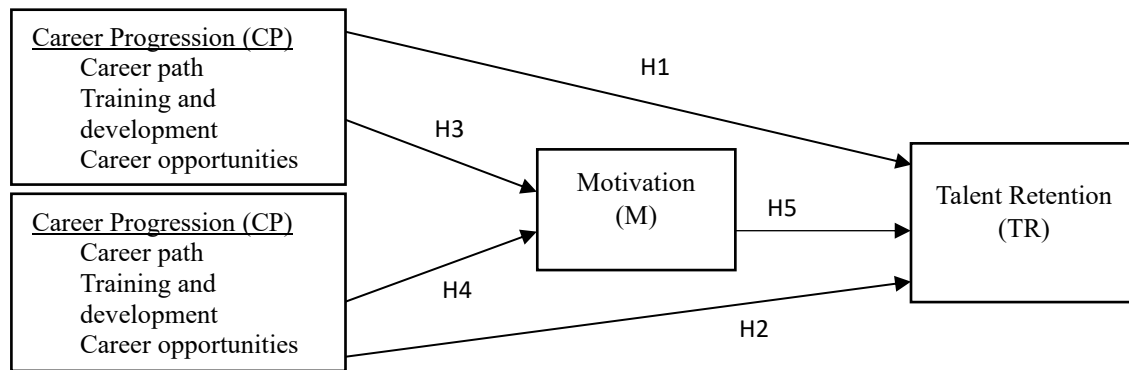


Figure 1. **Conceptual Framework**

From the above Figure 1: Conceptual Framework, the following hypotheses have been constructed, reflecting the direction of the relationships depicted.

- H1 = There is a relationship between Career Progression and Talent Retention.
- H2 = There is a relationship between Financial Rewards and Talent Retention.
- H3 = There is a relationship between Career Progression and Motivation.
- H4 = There is a relationship between Financial Rewards and Motivation.
- H5 = There is a relationship between Motivation and Talent Retention.
- H6 = Motivation mediates the relationship between Career Progression and Talent Retention.
- H7 = Motivation mediates the relationship between Financial Rewards and Talent Retention.

3. METHODOLOGY

The research objectives determined the study methodology. Following the simplified research procedure (derived from Gill and Johnson, 1997), the researcher first identified talent retention in the Maldives electricity industry as the area of investigation, then defined the study's subject and objectives, before deciding on the research methodology. This study employs a deductive methodology, in which theories are used to test a hypothesis; the theories are developed from two or more ideas or models describing the connections between variables, and the first phase of this method is the development of a set of principles that are then tested through empirical observation (Sekaran & Bougie, 2020). In this study, the researcher's goal was to evaluate the seven hypotheses that flow from the conceptual framework, which was developed using both theoretical and empirical literature, and these hypotheses were tested using a logical, quantitative technique.

The study population for this research comprised the skilled workers in the Maldives electricity sector, as talent is used in this study to describe employees who hold important roles within an organisation and whose contributions help the organisation accomplish its strategic goals. Given the shortage of talent in the industry, the researcher focused on employees holding critical positions across four tiers of the organisational hierarchy: executive level, senior management level, middle management level, and supervisory level. These workers play a crucial role in providing the Maldivian population with electricity services, and as a result, these four categories of personnel are the subject of this research.

There is a total of 1,953 electrical industry workers in the study, comprising employees of Fenaka Corporation Limited (FENAKA) and the State Electric Company (STELCO) (FENAKA, 2019;

STELCO, 2019). The cities in the Maldives where there is more talent turnover are the focus of this study. Male' City, Addu City, and Fuvahmulah City are the three cities of the Maldives. 723 employees are the target population. Individual personnel holding key positions in organisations as well as those working in the electrical and mechanical fields in the cities of the Maldives serve as the study's analytical unit.

All of the target population's employees have an equal chance of being chosen as a study participant according to the sample design. This study's time frame is cross-sectional. As a result, this study is not a continuous survey but a one-time survey. Because the researcher does not alter the participants' environment, there is little to no interference with the study's findings. This study's non-contrived study setting means that the survey is conducted in a natural environment (Azam, et al., 2021).

The list of the target population is referred to as the sampling frame. The target population's employment list from the electrical business is accessible for this study, and it can be used. Since a sample frame is provided, probability sampling techniques can be used in the study (Sekaran & Bougie, 2020).

Based on the parameters of the investigation, the researcher chooses proportionate stratified random sample. The aforementioned sampling technique is chosen because it combines quantitative sampling with a survey questionnaire, saving time and travel expenses. According to the target demographic of each organisation in the Maldivian electricity industry, participants will be chosen in a proportionate manner. The category of workers is referred to as stratified. As was already said, there are 05 groups of employees participating in this study, which is conducted in Maldivian cities. As a result, the research will be carried out among various staff levels in various geographic regions. Any member of the target population has a possibility of being chosen at random. Consequently, proportionate stratified random sampling is used as the sample method (Sekaran & Bougie, 2020).

The initial sample size is 254 employees because the study population is 1953 and the target population is 723 (FENAKA, 2019; STELCO, 2019). The sample size is increased to 330 employees because to the observation that the researchers' Maldives study had a 77 percent response rate (Jaleel, et al., 2021). Additionally, certain surveys will be eliminated during data cleaning and the removal of any questionnaires with missing data (Sekaran & Bougie, 2020). 315 employees from the target population make up the final sample size after taking all of this into account.

In this research, the term "instrument" refers to the survey questionnaire. An instrument was modified based on study. To make the questions more appropriate for the Maldivian culture and this research, some small changes were made. The distributions of items to each variable in the conceptual framework are shown in the following. 48 questions in total, including demographic inquiries.

Validation of the created instrument is part of the pre-test. Both content validity and face validity help to achieve this. By discussing the questionnaire with academic and practical HR professionals, the questionnaire's face validity and content validity are evaluated. In order to determine whether the questionnaire accurately measures the study topic, the term "content validity" refers to validating the questionnaire's content. Experts examine the questionnaire's face validity to determine whether it assesses what it is intended to measure (Jaleel, et al., 2021).

The pilot test data will be run through SPSS to examine the Cronbach's Alpha and the reliability of the questionnaire. The questionnaire needs to have a Cronbach's Alpha value of at least 0.7 to be considered reliable. If the results of the pilot test indicate that the Cronbach's Alpha is less than 0.7, changes to the questionnaire must be made before another pilot test can be conducted (Azam, et al., 2021).

In a measuring scale, validity comes in two flavours. They are congruent validity and validity related to criteria. When the measurement scale is capable of measuring the variations between different responses, the validity of the criterion is established. Concurrent validity and predictive validity can be ensured in this way. When a scale measures someone who is known to be different from others, it is said to have concurrent validity. Being able to distinguish between people using a future criterion called predictive validity (Sekaran & Bougie, 2020).

Convergent and discriminant validity measurements are used to determine construct validity. Two measurements that are convergently valid measure the same object. The Inter-Item Correlation Matrix table produced by SPSS illustrates this. One item should be eliminated if the value of r is greater than 0.9, which indicates that both items are measuring the same thing. Discriminant validity refers to the fact that the two items measure two quite distinct things. The Inter-Item Correlation Matrix table produced by SPSS illustrates this. Both items are measuring quite distinct things; hence they are expected to be uncorrelated if the value of r is less than 0.3. when one thing needs to be taken away (Sekaran & Bougie, 2020).

The items are rated on a 1 to 5 Likert scale (Likert, 1932). This is done so that the participants can select the scale that most accurately captures how they feel about the object. In the cities of the Maldives, information is gathered from the target population. In this study, data collecting is carried out using both appointed administrators and face-to-face methods. In some cities, administrators will be chosen to gather data. It is anticipated that the data collection process will take about three months.

The Statistical Package for Social Sciences (SPSS) version 25 and Analysis of Moment Structure (AMOS) version 25 software will be used to analyse the data in four steps. The researcher intends to use these two programmes alone for the statistical analysis because this study employs quantitative survey methods. Both descriptive and inferential data will be analysed using the software. The mean and standard deviation are included in descriptive data analysis. Exploratory factor analysis (EFA) and structural equation modelling are two techniques used in inferential data analysis. Confirmatory Factor Analysis (CFA), Measurement Model (MM), and Structural Model are all components of structural equation modelling (SM). Sobel test will be used to evaluate the mediator (Hair, et al., 2019).

Large amounts of data can be handled using SPSS when using a quantitative research methodology, and social science investigators frequently employ the programme. Testing of hypotheses and relationships is done using AMOS, an extension of SPSS. Because SPSS does not support AMOS' ability to create structural equation models, the researcher must use two programmes to conduct the statistical analysis.

4. RESULTS AND DISCUSSION

This section focuses on the study's major conclusion following analysis. The results of the EFA, Cronbach's Alpha, CR, AVE, Structural model, and Sobel test are shown in the subsequent subsections. All of this helps with the study's hypothesis testing. 304 talented workers from the Maldives electricity industry totalled as respondents for this study.

Table 2. Shows a Summary of the Demographic Factors of the Samples for this Research

Gender	Number of responses	Percentage (%)
Male	205	67.4
Female	99	32.6
Age	Number of responses	Percentage (%)
Below 20 years	7	2.3
Between 21 – 30 years	117	38.5
Between 31 – 40 years	70	23.0
Between 41 – 50 years	59	19.4
Above 51 years	51	16.8
Job Category	Number of responses	Percentage (%)
Technical	115	37.8
Non-Technical	189	62.2
Job Level	Number of responses	Percentage (%)
Executive Level	6	2.0
Senior Management Level	36	11.8
Middle Management Level	73	24.0

Supervisory Level	57	18.8
Operational Level	132	43.4
City Name	Number of responses	Percentage (%)
Kulhudhufushi City	20	6.6
Male' City	129	42.4
Fuvahmulah City	48	15.8
Addu City	107	35.2
Company Name	Number of responses	Percentage (%)
State Electric Company (STELCO)	95	31.3
Fenaka Corporation Limited (FENAKA)	209	68.8

As seen in the above Table 2; the respondents were predominantly male. This represents the workforce of the electricity industry as it is a male dominant industry in Maldives and in other countries as well (Utility Regulatory Authority, 2023). The respondents were mostly young people age between 21 years to 40 years. This shows the young workforce in the electricity industry. Due to the work environment and the amount of time employees need to give to the workplace mostly young workforce is notices in the electricity industry (Ministry of Environment and Energy, 2018). This also means that young people would want more in life and many strategies needs to be applied to retain them in the organisation.

The above Table 2; also shows that more respondents were from non-technical category in this study. Electricity industry is a very technical industry but there are many administrative tasks involved in this industry. For example, the materials that needs to be purchased or the financial controls or paper work that needs to be done to provide the electricity to the people. Therefore, mostly technical employees will be 1/3th of the organisations workforce and this is represented in this study (Ministry of Environment and Energy, 2018).

Additionally, the Table 2; shows the distribution of the respondents according to the cities in Maldives. This distribution fully justifies and represents the workforce in the cities and the population in the cities of Maldives. Male' City being the Capital city of Maldives most of the population resides in Male' City. Therefore, there is a huge power generation in the Male' City so more employees work in the power house of Male' City. The next big city is Addu City and the same is represented in the pie chart above (Ministry of Environment and Energy, 2018).

After the demographic analysis next is the descriptive statistic, EFA, CR and AVE for the 4 variables used in this study.

Table 3: Summary of descriptive and inferential analysis conducted for Career Progression, Financial Rewards, Motivation and Talent Retention

Variable	Item	Mean	SD	Factor loadings	P	α	AVE	CR
Career Progression	CP2	2.87	1.243	0.863	***	0.794	0.815	0.936
	CP3	2.72	1.190	0.884	***			
	CP4	2.57	1.267	0.893	***			
	CP5	2.60	1.298	0.803	***			
	CP6	2.64	1.357	0.823	***			
	CP7	2.40	1.223	0.798	***			
	CP8	3.37	1.241	0.595	***			
	CP9	3.60	1.051	0.564	***			
	CP11	3.81	1.015	0.963	***			
	CP12	3.80	1.004	0.963	***			
Financial Rewards	FR1	1.99	1.139	0.837	***	0.770	0.843	0.956

	FR2	2.12	1.173	0.875	***			
	FR3	2.20	1.163	0.788	***			
	FR4	2.31	1.147	0.717	***			
	FR5	3.81	1.188	0.928	***			
	FR6	3.71	1.219	0.870	***			
	FR7	3.79	1.161	0.929	***			
	FR8	3.67	1.215	0.738	***			
	FR9	3.03	1.366	0.883	***			
	FR10	2.91	1.376	0.732	***			
	FR11	2.85	1.259	0.870	***			
	FR12	2.97	1.354	0.944	***			
Motivation	M1	3.79	1.106	0.641	***	0.894	0.759	0.868
	M2	3.56	1.212	0.646	***			
	M3	3.93	1.109	0.856	***			
	M4	3.80	1.260	0.866	***			
	M5	3.74	1.126	0.854	***			
	M6	4.25	0.940	0.778	***			
	M7	3.70	1.157	0.718	***			
	M10	3.47	1.248	0.716	***			
Talent Retention	TR1	3.11	1.393	0.744	***	0.879	0.733	0.843
	TR2	3.05	1.443	0.823	***			
	TR3	3.29	1.380	0.829	***			
	TR4	2.97	1.452	0.623	***			
	TR5	3.19	1.347	0.504	***			
	TR6	3.09	1.418	0.756	***			
	TR8	2.84	1.445	0.781	***			
	TR10	2.99	1.475	0.807	***			

As seen in the above Table 2 except AVE and CR all other calculations were derived from SPSS output. AVR and CR was calculated using the factor loadings for each item using the following formula. Formula for Composite reliability (CR) is:

$$\frac{(\Sigma\lambda)^2}{(\Sigma\lambda)^2 + (\Sigma\epsilon)}$$

Formula for Average Variance Extracted (AVE) is:

$$\frac{\Sigma\lambda^2}{n}$$

Three types of validity checks were conducted in this study. The three types are convergent validity, construct validity, and discriminant validity. Verifying convergent validity with the Average Variance Extracted (AVE), which can be calculated using the formula provided below. The minimum allowable AVE value is 0.50 (Awang, 2014). When all of the fit indices are met, construct validity can be obtained. As indicated previously, this study obtained all fit indices, demonstrating construct validity. In data analysis, discriminant validity can be achieved by deleting low factor loading items or establishing them as free parameters. In this study, an item and free parameters were eliminated in order to examine the discriminant validity (Awang, 2014).

There are three approaches to verify the validity of research data. By examining the internal reliability, Composite Reliability (CR), and AVE, these are determined. Cronbach's Alpha, which must be 0.7, is used to assess internal consistency (Sekaran & Bougie, 2020). SPSS was used to determine Cronbach's Alpha. In this study, Cronbach's Alpha was determined individually for each variable. The outcomes are displayed in Table 2; Cronbach's Alpha study results. In this study, Cronbach's Alpha for all variables is greater than 0.70. Using the aforementioned formula, Composite Reliability (CR) is determined. CR needs to be 0.60. As stated previously, AVE can be determined, and AVE should be less than 0.50 (Awang, 2014).

Unidimensional indicates that the research items are firmly related with measuring the same concept or perception. Factor analysis can be used to find dimensions that are unidimensional. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) determine the relationship between items in a single variable and the relationship between items in multiple variables (Hair, et al., 2019).

This work achieves unidimensionality by removing items and introducing free parameters between items with higher modification indices. Model fit indices that the measurement model has obtained are absolute fit, incremental fit, and parsimonious fit (Awang, 2014). Consequently, this study attains unidimensionality.

Career Progression:

Career Progression is a variable with multiple aspects, including career path, training and development, and career opportunities. Exploratory Factor Analysis (EFA) requires that the factor loadings fall within three factors as Career Progression is a multidimensional variable and be more than 0.5 loadings. Three factors represent the variable's three dimensions. In the original study, CP1 and CP10 were found to be distinct from the three components; therefore, they were eliminated from the analysis.

As demonstrated in Table 2, after CP1 and CP10 are removed, all other items load to greater than 0.5. Mean between 2 and 3 with standard deviation around 1. This means that we have diverse perspectives on the questions, as each person is unique and what they want from the organisation in order to be retained may vary. Cronbach's Alpha is 0.794, which is above 0.7 and therefore acceptable (Azam, et al., 2021). AVE must be 0.50, and CR must be 0.60 (Awang, 2014). According to Table 2, the AVE and CR for Career Progression are 0.815% and 0.936%, respectively, which are over the cutoff value and are therefore suitable for Career Progression.

Financial Rewards:

The three dimensions of Financial Rewards are pay and allowances, incentives and bonuses, and other benefits. All of the items load to over 0.5 and fall into 3 factor loadings in SPSS, which indicate the 3 dimensions of the variable, according to the EFA analysis that was conducted using SPSS. No item was deleted during the EFA stage because every item loaded above 0.5 in three factors. As seen in the Table 2 factor loadings ranges from 0.717 to 0.944, which means factors loading are good for Financial Reward.

As can be observed in Table 2, both AVE and CR are above the allowed value of 0.843 and 0.956, respectively, according to Awang (2014). Since SD is almost 1 for every item and mean is between 2 and 3 for every item, mean and SD demonstrate different perspectives on the personnel. The acceptable Cronbach's Alpha value of 0.770 is higher than 0.7 (Azam, et al., 2021).

Motivation:

Since Motivation is a unidimensional variable, EFA factor loading should correspond to a single factor. Two items, M8 and M9, were eliminated from the analysis because they did not load over 0.5 factor loading and to a single factor, as shown in Table 2. Cronbach's Alpha is greater than 0.7, which is 0.894, which is acceptable. AVE and CR are also more than the allowed thresholds of 0.759 and 0.868, so both can be accepted for the variable Motivation (Awang, 2014). The mean for Motivation is around 3 which means talented employees have different views of the items asked in the instrument of this study. Which is true as each employee is from a different background, culture and views. Motivational factors will be different for different employees.

Talent Retention:

Talent Retention is a unidimensional variable, hence EFA analysis should reveal factor loadings greater than 0.5 into a single factor. Two items were eliminated from the study, as shown in Table 2, because neither TR7 nor TR9 loaded to over 0.5 factor loadings and to a single factor. As observed in Table 2, Cronbach's Alpha for TR is greater than 0.7, equalling 0.879, which is acceptable (Azam, et al., 2021). AVE should be 0.50 and CR should be 0.60, which it achieved for the Talent Retention variable (Awang, 2014). Having established the validity and reliability of all four variables, the following sections test whether the study's hypotheses are supported.

4.1 Sobel Test

To test the mediating two hypotheses H6 and H7 Sobel test was conducted using online calculator. The regression weights of the variables were drawn from AMOS analysis. The following figures represent the values.

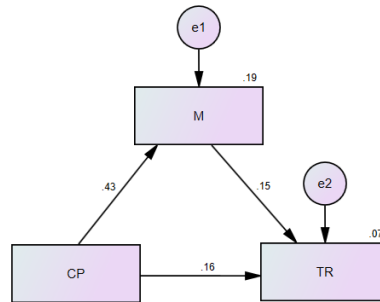


Figure 2. **Standardized regression weights for the relationship between Motivation mediating Career Progression and Talent Retention**

The above Figure 2, illustrates the standardized regression weights for the relationship between Motivation mediating the relationship between Career Progression and Talent Retention. These values will be used in Sobel test to test the mediating hypotheses in this study.

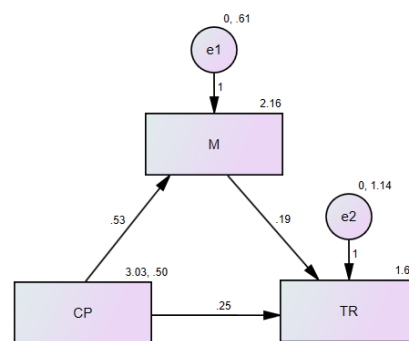


Figure 3. **Unstandardized regression weights for the relationship between Motivation mediating Career Progression and Talent Retention**

By using the standardized and unstandardized regression values Sobel test was calculated and the following figure shows the results of the Sobel test for the relationship between Motivation mediating Career Progression and Talent Retention.

Input:		Test statistic:		Std. Error:	p-value:
a	0.53	Sobel test:	0.88336256	0.11399623	0.37704041
b	0.19	Aroian test:	0.76882797	0.13097859	0.44199544
s _a	0.43	Goodman test:	1.07134389	0.0939941	0.28401483
s _b	0.15	Reset all	Calculate		

Figure 4. **Sobel test results for Motivation mediating Career Progression and Talent Retention**

As seen in the above Figure 9, the p-value is higher than 0.05, this means that the mediation does not occur for this relationship, hence the hypothesis H6; Motivation mediates the relationship between Career Progression and Talent Retention is rejected in this study.

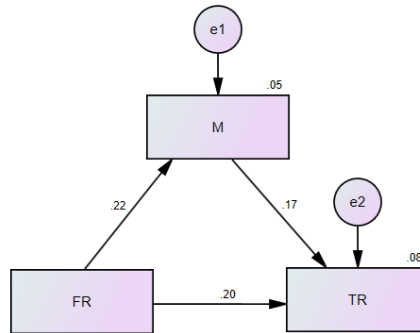


Figure 5. **Standardized regression weights for the relationship between Motivation mediating Financial Reward and Talent Retention**

The above Figure 5, illustrates the standardized regression weights for the relationship between Motivation mediating the relationship between Financial Rewards and Talent Retention. These values will be used in Sobel test to test the mediating hypotheses in this study

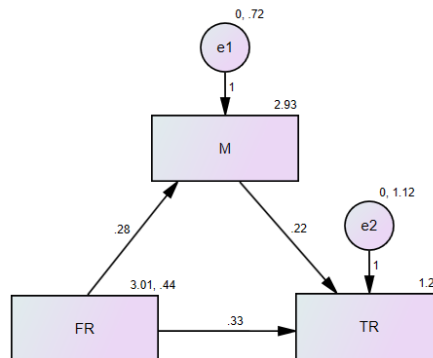


Figure 6. **Unstandardized regression weights for the relationship between Motivation mediating Financial Reward and Talent Retention**

Input:		Test statistic:	Std. Error:	p-value:
a	0.28	Sobel test:	0.9074222	0.06788461
b	0.22	Aroian test:	0.7947838	0.07750535
s _a	0.22	Goodman test:	1.08732147	0.05665298
s _b	0.17	Reset all	Calculate	

Figure 7. **Sobel test results for Motivation mediating Financial Rewards and Talent Retention**

As seen in the above Figure 12, the p-value is higher than 0.05 which is 0.36418357, this means that the mediation does not occur for this relationship, hence the hypothesis H7; Motivation mediates the relationship between Financial Rewards and Talent Retention is rejected in this study.

4.2 Hypothesis Testing

By using AMOS software Measurement Model (MM) was drawn and the following Figure 8 shows the final Measurement model of this study.

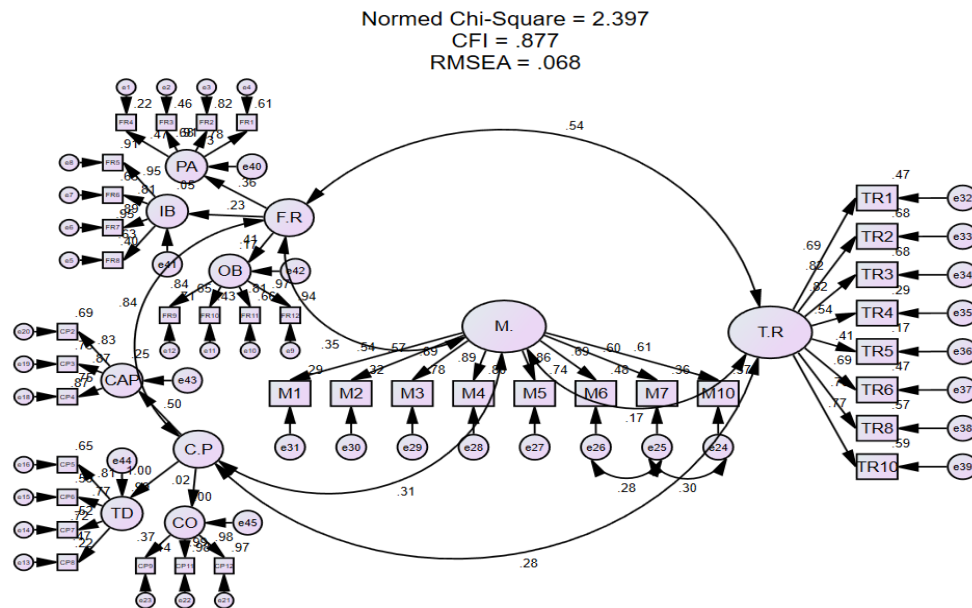


Figure 8. Final Measurement Model

Figure 8 depicts the final measurement model for the four variables investigated in this study. Free parameters have been drawn within the items of the same variable, with no more than three free parameters per item. In the previously stated Figure 8, covariances between the elements are also illustrated.

In Measurement Model, three sorts of fit indexes are evaluated. Absolute Fit Index, Incremental Fit Index, and Parsimonious Fit Index are examples. RMSEA evaluates the absolute fit index, CFI evaluates the incremental fit index, and normed chi-square evaluates the parsimonious fit index (Awang, 2014). As shown in Figure 8, the Normed Chi-Square is 2.397, which is less than 5.0, indicating that the parsimonious fit index is reached. The CFI is 0.877, which is less than 0.9. According to some studies, it is difficult to achieve CFI 0.9 for the entire measurement model with high sample sizes, and CFI 0.8 is sufficient (Hair, et al., 2019). Consequently, CFI can be utilised in this investigation, and an incremental fit index can be calculated. The absolute fit index is calculated as a result of the RMSEA being less than 0.68 (Awang, 2014). This study's overall measurement model achieves all of the fit indices.

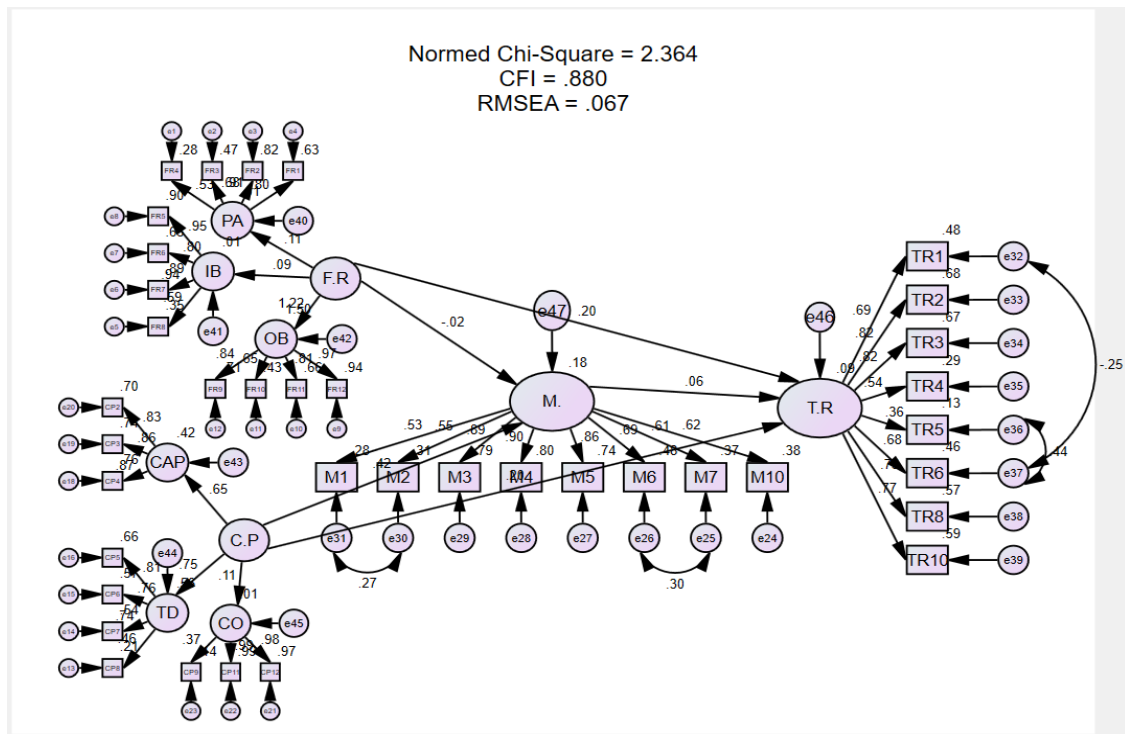


Figure 9. Final Structural Model

As seen in the above Figure 9, Normed Chi-square is 2.364 which is above 5.0 so Parsimonious Fit Index achieved. CFI is 0.880 which is slightly below 0.9, but according to Hair, et al. (2019) it is difficult to get CFI above 0.9 is large sample size so ≥ 0.8 is acceptable. Therefore, 0.880 for CFI can be accepted and Incremental Fit Index can be achieved. For Absolute Fit Index RMSEA was checked and it is 0.067 which is below 0.08 so accepted. Hence, all the fit indexes have been achieved for this study.

Table 4. Regression weights of Primary Hypotheses

	Estimate	S.E.	C.R.	P
M. <--- F.R	-.217	.535	-.405	.686
M. <--- C.P	.761	.202	3.769	***
T.R <--- M.	.080	.090	.880	.379
T.R <--- F.R	2.821	1.196	2.359	.018
T.R <--- C.P	.440	.214	2.055	.040

As demonstrated above, the p value is only appropriate for three relationships: the relationship between Career Progression and Motivation, the relationship between Financial Rewards and Motivation, and the relationship between Career Progression and Talent Retention. This study demonstrates that the results in the Maldivian Electricity industry contradict aspects of the existing literature: whereas prior studies frequently identify Motivation as a significant driver or mediator of Talent Retention (e.g., Shende, et al., 2021), this study found Motivation not to be a significant factor. These results are nonetheless a merit of this study, contributing to the body of knowledge, and future research must be undertaken in a variety of contexts to further explore Talent Retention. The following Table 4 summarizes the results of the hypothesis.

Table 5. Summary of Hypothesis results

H(x)	Hypothesis	Significance	Relationship	Finding	Reference and justification
H1	There is a relationship between Career Progression and Talent Retention.	Significant	Strong Positive	Supported	Table 2 and Table 3

H2	There is a relationship between Financial Rewards and Talent Retention.	Significant	Strong Positive	Supported	Table 2 and Table 3
H3	There is a relationship between Career Progression and Motivation.	Significant	Strong positive	Supported	Table 2 and Table 3
H4	There is a relationship between Financial Rewards and Motivation.	Not Significant	Negative	Not Supported	Table 2 and Table 3
H5	There is a relationship between Motivation and Talent Retention.	Not significant	Weak Positive	Not supported	Table 2 and Table 3
H6	Motivation mediates the relationship between Career Progression and Talent Retention	Not Significant	positive	Not Supported	Figure 7, Figure 8 and Figure 9
H7	Motivation mediates the relationship between Financial Rewards and Talent Retention	Not Significant	positive	Not Supported	Figure 10, Figure 11 and Figure 12

5. CONCLUSION

This section focuses on the conclusion of the whole research, the implications of the study and future research areas for the researchers.

5.1 Study Implications

Literature supports all the linkages in the conceptual framework of this study, but when the analysis was completed, four hypotheses were rejected and three were approved, which contributes to academics and talent retention researchers. As the Maldives has a unique geographical location and a distinct culture compared to other nations, the Maldives electricity talent retention results will boost literature. Providing electricity is a demanding task performed by government-owned enterprises. After this research, new aspects of Talent Retention have been introduced to the literature.

In this study, the policymakers and regulators will be the government of the Maldives and organisations involved in supplying sustainable and inexpensive electricity to the Maldivian population. The findings of this study will inform them on how to retain talent in the electricity industry within their organisation. Indirectly or directly, the variables also contributed to talent retention, which must be taken into account when developing policy. As electricity is an essential utility service required by all Maldives residents, retaining talent inside the organisation is of the utmost importance.

Several contributions can be derived from this study's findings. The accepted assumptions suggest that the following Maldives Electricity Industry links are positive and important.

H1-There is a relationship between Career Progression and Talent Retention.

H2-There is a relationship between Financial Rewards and Talent Retention.

H3-There is a relationship between Career Progression and Motivation.

By analysing the agreed theories, recommendations for the Maldives' electrical providers can be made. Talented personnel must be provided with training and development opportunities by organisations. Talented individuals must be aware of the career advancement options and career path within the organisation so that they do not seek employment elsewhere. This is in line with research conducted

Numerous initiatives of the organisation are centred on financial incentives to retain talent. However, the results of this study indicate that talent retention is increased when employees are provided with career progression, such as career development opportunities, a career path, and training and development, so organisations must develop policies for providing talented employees with Career Progression. It is worth noting that career progression is often accompanied by financial rewards, such as salary increases, and this potential confounding effect cannot be ruled out from the current findings; drawing on Adam's equity theory, career progression may be perceived by employees as a fair output relative to their input, which could help explain why it emerged as the more influential factor in this

study. As seen in the demographics, the electricity industry has a young workforce, and career advancement is more important to them than financial rewards, as evidenced by the fact that two hypotheses related to career advancement were accepted while only one hypothesis related to financial reward was accepted. This result is contradictory with research conducted in a South Indian hospital by M. Bharath in 2023. The results of the study showed that paycheck has a positive relationship with Talent retention. Therefore, financial rewards cannot be considered in the same way in different countries to retain talent (Bharath, 2021).

This study also debunks the notion that money may be used to retain talent within an organisation. This is true to a certain extent, but when analysing the new generation and the developed world of today, employees are more interested in career development prospects and the information or skills they may obtain from the work they perform for the organisation. The results of this study add more value to the literature of talent as a different aspect of talent retention has been seen in this study.

Organizations must take career advancement into account. This is the most significant variable identified by the study's findings. Two career advancement hypotheses were accepted, making this the most important variable in this study and for talent retention in the Maldives electrical industry. The aspects of the career advancement variable were professional route, training and development, and career opportunities. This result is consistent with literature and research conducted in other countries concluding the relationship between training and development with talent retention as positive and significant (ShubhangiBharadwaj, 2023). Additionally, this relationship is also in line with research conducted to SMEs in Srilanka. The relationship between Training and development is positively significant with Talent retention of the SMEs (Sirinaga, et al., 2020). Therefore, these three elements must be adopted in all organisations in order to retain talent. There should be career paths, job chances, and training and development for talented employees. This concludes the study's implications. Organizations will have trouble implementing cash rewards, allowing them to concentrate more on job advancement.

5.2 Limitations and direction for future research

This study focuses solely on the electrical industry in Maldives, which is one of the study's limitations. To retain talent, the results in other industries may vary. The sole companies in the electrical industry of the Maldives are government-owned, and political factors have not been included in this research, which is a limitation of this study. The research was conducted with a cross-sectional temporal horizon, which is a restriction because horizontal studies may yield different results. Quantitative research is undertaken, but qualitative research would limit the depth of the reasons or determinants for talent retention. In addition to being a restriction of the study, the fact that the target population consisted solely of talented employees in Maldives cities was a limitation of the research.

To find additional variables for the retention of talent, future qualitative study can be done. Additionally, study might be conducted in Maldives on talent retention determinants for various industries, as literature and Maldives research produce contradictory findings. Future study can also be undertaken in the utilities business as a whole to discover the elements that contribute to talent retention.

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TRANSFORMATIONAL LEADERSHIP AND THE SUCCESS FACTORS OF THE IMPLEMENTATION OF DUAL LANGUAGE PROGRAM AT PUBLIC SCHOOLS IN MALE' MALDIVES

Mavee Mufeed*, Aishath Faseeha Mohamed
Maldives Business School, Nikagas magu, Maldives

*Corresponding author email: maavee@bussinessschool.mv

Abstract

The Maldivian education system has long adopted a dual language approach, with Dhivehi and English used as mediums of instruction, particularly for Science and Mathematics. In recent years, policy refinements and curriculum reforms have placed increased emphasis on strengthening English language proficiency while maintaining subject comprehension. This study investigates the transformational leadership practices of school principals, the level of dual language program implementation, and the interaction between leadership and key success factors. The findings highlight the positive influence of transformational leadership on teachers, emphasizing the importance of recognizing individual strengths, motivating staff, and fostering a shared vision for effective program delivery. Teachers' instructional practices and beliefs, which are shaped in part by the quality of principal leadership, emerge as critical determinants of program success, alongside the need for clear guidelines and alignment between classroom practices and national education objectives. The study concludes that transformational leadership plays a significant role in enhancing the effectiveness of the dual language program by creating a supportive environment that facilitates change, promotes professional commitment, and improves educational outcomes.

Keywords: Leadership, Success factors, Dual language, Maldives

1. Introduction

The educational system in the Maldives has evolved and transformed over the years. Since the early 1980s, the education system has been pivotal in the development of all Maldivians. Traditionally, in the Maldives, education was delivered through religious scholars, predominantly conducted through individualized, direct interactions. The initial educational institutes were referred to as Edhuruge, Makhtab, and Madharusa. Diverse individuals from the island inhabitants owned and operated these traditional study centres/schools. These schools focused predominantly on instructing reading and writing in Dhivehi and Arabic scripts, along with fundamental arithmetic. Educators at various institutions facilitated pupils in remembering and reciting the Holy Quran. The instructors imparted fundamental Islamic principles, as well as reading and numeracy skills (Ministry of Planning and National Development (MPND), 2006; Ministry of Education (MoE), 2008). For centuries, the Maldives upheld a traditional educational system. These traditional schools (Edhuruge, Makhtab, and Madharusa) were financially independent, predominantly being privately owned or managed by island communities. Since 1960, the Western educational system has been integrated into the schools of Male', merging with the traditional educational framework. In 1984, the MoE in the Maldives instituted a national curriculum for primary education. In 2004 and 2005, the Educational Development Centre (EDC) conducted a thorough revision of several curriculum materials. Outcome-based syllabuses were instituted due to this transition, with defined standards that all students must fulfill across all disciplines within the curriculum. However, with the exception of Islam and Dhivehi, the curricula and syllabi at the secondary and higher education levels are derived from international examination organizations - Cambridge International Examinations (CIE) provides secondary level assessments, and Edexcel

International, London Examinations offers higher secondary level assessments. The Department of Public Examinations (DPE) (MoE, 2008) administers and coordinates these international and national examinations.

The Ministry of Education's dual-language education policy (Rashid, Abdul Rahman, & Yunus, 2017) designates Dhivehi as the national language, utilized in several curriculum areas, while English serves as the medium of instruction for Science and Mathematics. This policy aimed to facilitate students' access to foreign scientific and technical literature, thereby preparing them for advanced education and work beyond the Maldives.

The implementation of the Dual Language Program, under which Dhivehi and English serve as parallel mediums of instruction across the curriculum, marked the inaugural significant transformation in the nation's educational framework. The implementation of a national curriculum established minimal requirements for student learning outcomes nationwide and sought to minimize redundancy in educational delivery. The Ministry of Education planned the implementation of English as the medium of instruction in Science and Mathematics to improve the education system's global competitiveness. This bilingual approach enhances subject-specific learning while also increasing overall English proficiency, which is crucial in today's interconnected world. The program has significantly impacted the academic and career trajectories of Maldivian students, enabling several individuals to pursue higher education abroad and engage more actively in the global economy (Rashid, Abdul Rahman, & Yunus, 2017).

Certain nations, such as Malaysia, have altered their curricula to incorporate dual language instruction. In 2003, the government reinstated English as the medium of instruction for Science and Mathematics in a drastic effort to address the decline in English proficiency (Hazita, 2016). The aspiration of the Malaysian Ministry of Education to attain developed nation status led the proposal of the government policy "teaching and learning of Science and Mathematics in English" [PPSMI Pengajaran dan Pembelajaran Sains dan Matematik dalam Bahasa Inggeris]. Ashairi, Mohamed Yusoff, and Melor (2017) assert that PPSMI arises from the necessity to cultivate human capital to attain developed nation status. Melor and Saiful Islam (2017) stated that the Malaysian Education Ministry implemented the educational reform in 2003 to enhance students' proficiency in English and expedite their understanding of Science and Mathematics. The concept was initially executed in 2003, with Year 1 students in primary schools and Form 1 and Lower 6 students in secondary schools designated as the experimental cohorts. Nonetheless, after years of discussion and contention regarding the policy's implementation, it was declared that it would be gradually discontinued in 2012. The National Language (Bahasa Malaysia) will serve as the medium of instruction for Science and Mathematics. Moreover, students who commenced their studies in these subjects in English would be permitted to pursue Science and Mathematics in English until the conclusion of their secondary school. The policy was entirely rescinded in 2014.

A study by Nor Hasikin (2019) demonstrated that dual language programs are a prevalent educational technique in contemporary educational systems, citing examples such as the United States, where curricula commonly pair English and Spanish, and Canada, where English and French are common program languages (Nor Hasikin, 2019). Various terms, aside from dual language programs, are utilized in foreign nations, including dual immersion programs, bilingual education programs, and legacy language programs, among others (Li et al., 2016).

Rocque et al. (2016) support this notion, indicating that although numerous studies have examined the obligations of principals in public schools broadly, there is a paucity of research specifically addressing "the training and characteristics of principals in dual immersion schools, who augment the standard responsibilities, roles, and expectations of a typical principal." Addressing this gap in literature is essential to ensuring dual language schools acquire, develop, and maintain high-quality leaders who are responsive to the unique requirements of a dual language program.

The current researcher reaffirms that strong leadership, consistent with the emphasis on high-quality leaders noted above, remains the same essential component of quality DLP. Numerous studies have linked effective leadership to enhanced student outcomes (Leithwood & Jantzi, 2008; Waters et al.,

2003), while others recognized this relationship is indirect (Lambert, 2003). In relation to DLP programs, good leadership is either insufficiently emphasized (Howard et al., 2007) or entirely omitted (Rocque et al., 2016) as a critical aspect.

Effective leadership is essential for the successful execution of these initiatives, as it offers the vision, strategic direction, and organizational support necessary to incorporate bilingual instruction into the wider school system (Scanlan & Palmer, 2020). Leaders are essential in cultivating an inclusive culture, promoting teacher development, involving families and communities, and aligning resources and policies with the objectives of bilingual education (Brooks & Adams, 2021; de Jong et al., 2019). Comprehending the function of leadership and the diverse leadership styles that affect decision-making, collaboration, and creativity is essential for maintaining high-performing dual language environments (Hernandez & Darley, 2022). Research on leadership has been pursued intensively since the early 20th century. Leadership can be characterized in various manners. House and Mitchell (1974) characterized leadership as a process that encompasses behaviors such as direction and guidance, along with the ability to influence individuals inside the business by presenting a vision and shared objectives for attention. Bass (1990) defined leadership as the interaction among one or more group members. Tracy (2014) characterized leadership as the capacity to direct and influence others inside an organization or the act of guiding individuals in an organizational context.

In recent decades, leadership has been notably dynamic. Scholars such as Khatri (2005) and Kouzes and Posner (1987) have emphasized leadership styles, which constitute a significant aspect of leadership. A leader's leadership style is the relatively consistent behavioral pattern that distinguishes them. Organizations now want proficient leaders that comprehend the complexities of a swiftly evolving worldwide landscape. Diverse leadership styles may influence the successful implementation of dual language programs. A primary leadership style is transformational leadership (Bass, 1990).

Transformational leadership is a leadership style that motivates subordinates within an organization, addresses their individual developmental needs, and fosters innovative ideas and increased effort in problem-solving (Bass, 1990). Bass (1985) identified three components of transformational leadership. Incorporated envisioning, intellectual engagement, and individualized treatment for the assessment and advancement of leadership. Transformational leaders are characterized as individuals who "stimulate and cultivate the capacity for leadership" (Bass and Riggio, 2010, p.).

Fitzgerald and Schutte (2010) characterized transformational leadership as "a motivational leadership style that entails articulating a clear organizational vision and inspiring employees to pursue this vision by fostering connections, comprehending employees' needs, and facilitating their potential, thereby yielding positive outcomes for an organization." Furthermore, Jensen et al. (2016) characterized transformational leadership as a behavior in which a vision is cultivated, maintained, and disseminated. It may motivate people to transcend their self-interest and enhance their dedication to achieving organizational objectives. Consequently, transformational leadership can enhance the leader's ability to cultivate and maintain the vision among their personnel. This ensures that the vision may be realized through the competencies of transformational leaders to create organizational success.

When a teacher exhibits professionalism in their job, their performance may improve as they use optimal practices in their leadership. Sallis (2002) asserted that the professionalism of instructional leaders encompasses possessing a robust vision for institutional quality, a commitment to improving teacher efficacy, disseminating information pertinent to educational quality, addressing learners' needs, engaging in educational development, fostering effective teamwork, and establishing efficient mechanisms for monitoring and evaluation. This indicates that instructional leaders influence the effective execution of tasks. Andriani et al. (2018) asserted that transformative leadership greatly influences teachers' effectiveness. This performance is thought to enhance the efficacy of the educational program as the teacher's performance improves.

Therefore, transformational leadership can be defined as the form of behaviour that gives motivation to all leaders in managing dual language programs (Bass, 1990; Jensen et al., 2016). In this context of study, the focus is on painting a vision, intellectual stimulation and treating people as individuals in influencing the education program such as dual language programs. This indicates that teachers can

identify the skill that may be suited for implementing the dual language program.

Additionally, transformational leadership style tends to influence the learning styles of students that determine the success of dual language program implementation.

Another factor that influences the success of implementation of dual language program is learning styles. Learning styles are seen as fundamental factors influencing language learning outcomes (Oxford, 2003). Rahmanpour, Palizban, and Eshrat-Zamani (2009) asserted that pupils may utilize many learning methods. Sadeghi et al. (2012) asserted that when educators recognize the particular requirements of students, they would adapt their instructional tactics accordingly to address those needs. Sun and Teng (2017) further emphasize the significance of teachers' awareness of students' learning styles in the learning process. Therefore, it can be concluded that accommodating students' learning styles according to their demands enhances their learning process, resulting in elevated academic accomplishment. By investigating the ways in which transformational leadership and learning styles support the successful implementation of dual language programs, this study seeks to close the knowledge gap and establish a more encouraging and productive work environment for teachers in public primary schools in Malé, Maldives.

1.1 Problem Statement

A distinct set of difficulties pertaining to leadership, learning preferences, and program success factors arise when a dual language program is implemented in Male' City, Maldives' public schools. Effective leadership that encourages and inspires stakeholders to strive toward the program's goal, as well as knowledge of students' learning preferences and efficient teaching techniques are essential to its success.

The principal plays a crucial role in the implementation of any program inside the school. The principal's leadership will determine the school's success or failure. Scheerens (2000) posits that a school principal who fails to engage their subordinates will lead to less dynamic, boring, and uninspired instruction, resulting in suboptimal student learning outcomes. Variations in student academic outcomes among schools are often attributed to discrepancies in principals' ability to execute their leadership responsibilities. Without a capable principal, teachers will struggle to successfully administer a program and will encounter several obstacles (Jaleh, 2012).

The principal's role is fundamental to school life and serves as its driving force. This role necessitates leadership competence, encompassing a robust vision for the future to advance educational institutions, serving as change agents, embracing risks for enhancement and progress, demonstrating equity and democracy, managing emotions, exhibiting patience and humility, and promoting harmonious and synergistic social relations (Thoha, 2016). The foundation and impetus for a school principal to fulfill tasks in managing educational institutions is the possession of leadership abilities. A school principal is often perceived as proficient yet unable to advance his educational institution. This was due to several factors affecting the principal's leadership. Situmorang (2019) asserts that the training obtained is a variable influencing the leadership of school principals. His findings indicate that training positively impacts the leadership of school principals, enhancing their supervisory competence in executing their responsibilities. Conversely, Hartini (2012) found that the performance of school principals was affected by their professional experience. An experienced school administrator, actively engaged in organizations, can demonstrate more adaptable leadership and embrace change.

Nonetheless, there exists a paucity of research regarding the influence of transformational leadership and learning styles on the execution of Dual Language programs, especially within the Maldivian setting. This study seeks to examine the correlation among transformational leadership, learning styles, and the success determinants for the execution of the Dual Language program in public schools in Male' city. This study's findings will aid in formulating effective strategies for the implementation and maintenance of the Dual Language program, which may improve educational outcomes for students in Male' city, Maldives.

1.2 Research Objectives and Research Questions

Research Objective 1:

To identify the transformational leadership applied among teachers, at public schools in Male' City, Maldives in the aspects of:

- a) Painting a vision
- b) Intellectual stimulation
- c) Treating people as individuals

Research Objective 2:

To determine the level of success factors on the implementation of dual language program adopted by the teachers at public schools in Male' Maldives in the aspects of:

- a) Teachers' beliefs
- b) Teacher's practices

Research Objective 3:

To investigate the relationship between transformational leadership and dual language amongst public schools' teachers in Selangor.

Research Objective 4:

To measure the relative contribution of transformational leadership and success factors of the implementation of dual language amongst public schools' teachers in Selangor.

Research Question 1:

What are the mean scores of transformational leadership applied among teachers, at public schools in Selangor in the aspects of:

- a) Painting a vision
- b) Intellectual stimulation
- c) Treating people as individuals?

Research Question 2:

What are the mean scores of the success factors of the implementation of dual language program adopted by teachers at public schools in Male' Maldives in the aspects of:

- a) Teachers' beliefs
- b) Teachers' practices?

Research Question 3:

What is the relationship between transformational leadership and implementation of dual language program amongst public schools' teachers in Selangor?

H0: There is no relationship between transformational leadership and the success factors of the implementation of dual language program amongst public schools' teachers in Male', Maldives.

H1: There is a relationship between transformational leadership and the success factors of the implementation of dual language program amongst public schools' Male', Maldives.

Research Question 4:

What is the relative contribution of transformational leadership towards the success factors of the implementation of dual language amongst public schools' teachers in Male', Maldives.

2. Literature Review

This section describes two variables that are investigated in this study which are transformational leadership of teachers and the implementation of dual language program. This section also outlines the various dimensions under these two variables followed by past studies concerning the variables involved. In addition, it also includes the conceptual framework and theoretical framework of this study.

2.1 Transformational Leadership

Transformational leadership is the leadership approach that inspires the subordinate of an organization, may deal individually with subordinates to meet their developmental needs, and may encourage new approaches and more effort toward problem solving (Bass,1990). For transformational leadership, Bass (1985) mentioned three elements of transformational leadership which included painting a vision, intellectual stimulation and treating people as individuals for evaluating and developing leadership. Transformational leaders are described as people "who stimulate and inspire subordinates to achieve

remarkable outcomes and develop the capacity of leadership” (Bass and Riggio, 2010).

In terms of practices, the transformational leadership leads the instructional leaders such as teachers, principals, and headmasters to enhance the performance in managing structural organization. In any different situation, transformational leaders are to make a difference in ensuring the success of an organization is achievable. Fitzgerald and Schutte (2010) defined transformational leadership as “a motivational leadership style which involves presenting a clear organizational vision and inspiring employees to work towards this vision through establishing connections with employees, understanding employees’ needs, and helping employees reach their potential, contributes to good outcomes for an organization”. Moreover, Jensen et. al (2016) described transformational leadership as a behavior where a vision develops, sustained and shared. It may influence the employees to go beyond their self-interest and increase their commitment to achieve the goals of their organization. Thus, transformational leadership may add value to the leader to develop and sustain the vision among their employees. This is to ensure that the vision can be achieved from the skills of transformational leaders to succeed in the organization.

Whenever a teacher is professional in their career, their performance also may enhance as they apply the best practice in their leadership. Sallis (2002) stated that the professionalism of instructional leaders includes having strong vision to have the quality for institution, teachers and students, committed to enhance the teachers’ quality, share information that includes educational quality, involve the learners’ needs, get involved with the educational development, maintain the effective teamwork, enhance good mechanism for monitoring and evaluating. This shows that the instructional leaders play a role in determining how tasks can be effectively done. Andriani et. al. (2018) stated that with transformational leadership, the teachers’ performance will significantly be affected. This performance is believed to increase the effectiveness of the education program as the teacher’s performance increases.

Therefore, transformational leadership can be defined as the form of behaviour that gives motivation to all leaders in managing dual language programs. In this context of study, the focus is on painting a vision, intellectual stimulation and treating people as individuals in influencing education programs such as dual language programs. This indicates that teachers can identify the skill that may be suited for implementing the dual language program.

2.1.1 Painting a Vision

A leader with vision usually encourages their subordinate to raise standard, identify risk and ask their subordinate to join their vision. Vision is related to the belief of organization towards the conditions to be addressed perfectly. Bass (1990) described a leader as someone who stimulates their employees to participate in their discussion and encourages their employee to share their vision for the future of the organization. Painting a vision is related to the communication process. Kouzes and Posner (1987) stated that transformational leaders usually develop an organization’s image to achieve their goals through communication and interaction between their team. This may encourage the brainstorming process in the team to organize the vision into a clear strategy.

Khatri (2005) further supported that leaders with vision are intelligent and knowledgeable people as they have ample of experiences and expertise. The researcher also added that the leaders with these skills are futuristic, sensitive with the environment of task and strategic in thinking with a sense of mission. With relevant values, fulfilling the followers’ needs and ideals, a vision is said to be inspiring (Yulk, 2012). Thus, creating a vision needs collaboration and work in a team to ensure the team shares the same vision.

2.1.2 Intellectual Stimulation

Intellectual stimulation refers to a leader that stimulates the capability of employees to think out of the box while solving issues and refreshing their thoughts (Shafi et. al, 2020). Bass et al (1996) defined intellectual stimulation as a leader who can bring approaches to stimulate the problems into different views and from different perspectives in giving the alternative. This may encourage subordinates to solve problems creatively and use it as a platform to be creative (Bass, Avolio, & Atwater, 1996). The transformational leader with intellectual stimulation may be able to encourage the creativity to be developed with a clear vision (Mumford, 2002). It then influences the employee to have creative

performance.

It is also acted to stimulate the creativity and innovativeness of employees (Gilmore, et. al, (2013). Furthermore, Guay (2013) believed that the old beliefs, assumptions, and traditions can be challenged by stimulating intellectuals and motivating their ways of thinking. There is a positive impact on innovation when intellectual stimulation is implemented where the leaders can stimulate their employees to have their thoughts for the organization's achievement and development (Nardelli and Broumels, 2018). This is also supported by Weib and Suess (2016) that intellectual stimulation indicated the ability of leaders in motivating employees to have their stand on their decision and reuse the traditional practices in a different way.

2.1.3 Treating People as Individuals

With the leader's capability to instill trust among the team, it gives a comfortable situation for the team to express their thoughts and share their ideas (Schaubroeck et al, 2011). Furthermore, Zhou and Pan (2015) stated that transformational leaders who treat people equally makes the environment of workplace become cooperative where there is the existing of mutual support and trust among the team in organization.

Jensen (2017) also discussed that with the concern of treating people as individuals, it is possible to create a harmonious environment and make it more systematic to interact between both group levels between employer and employee. Treating people as individuals includes individual consideration (Bass,1990) as it may give positive impact whenever the thought and ideas are being implemented (Al-Obthani and Ameen, 2019). Transformational leaders can enhance the trust among their employees and their team as well as encourage them to speak up to express their opinion (Yin et.al., 2019).

2.2 The Success Factors of Implementing of Dual Language Program

In 2016, Dual Language Program (DLP) was implemented with the aim to produce proficient students in both English and Malay language. Othman et al (2020), stated that to guide learners to achieve knowledge and improve their language skills in English and Malay, the teacher who teaches Mathematics and Science in DLP needs relevant beliefs and practice of teaching the subject in dual language. They also believed that behind the teacher's belief, the knowledge and experience may influence how the teacher perceived in their process of teaching and instructional practices.

2.2.1 Teachers Beliefs

There are several studies that state the teachers' belief that may affect the lesson plan and the activities in the classroom (Basturkmen, 2012). Teachers must adopt different teaching methods and approaches to ensure learners receive the knowledge. Besides, teachers' beliefs become part of their guideline for practicing in their classroom and curriculum execution (Borg, 2001). However, Tsai (2002) believed that the way teachers teach Science and the way students learn Science is not related to their school experience. This shows that there are several factors involved in this difference of opinions due to their experiences. Rath (2001) stated that teachers' belief may consist of experience in planning, process of decision making and the behavior of the classroom itself. This shapes the teachers' belief based on the experience.

Pajares (1992) revealed that there is a relationship between teachers' beliefs, teaching plan, classroom practices and decision making for teaching. According to Othman et al (2020), teachers' belief on the need of administrative support, presence of supplementary resources, English teachers' cooperation, and interaction between teacher and student is important to deliver the Science and Mathematics knowledge effectively in dual language

2.2.3 Teachers' Practices

Teachers' practices involve considerable adaptability in variation of situation and within the observation (McCutchen et al, 2002). Different teachers may apply different instructional methods to ensure their teaching and learning sessions can be delivered effectively to the students. Bialystok (2011) found that the immersion of dual language programs is associated with the increase of student's outcome. The practice in this study on dual language programs is part of education's agenda where it becomes one of the education policies. Di Domenico et. al. (2019) stated that the coaching collaboration

gives impact on teachers' practice as it builds teachers' own learning in teaching approaches. Thus, teachers' practice seems to be part of an important element in executive effective dual language programs in a different way to deliver their teaching instruction. Prescribed by the guidelines of the district give positive implementation of teachers' practices which are consistent as part of teaching instruction. Li et. al (2016) stated that the list of teaching practices is not a complete list, however teachers give a quality delivery of instruction in dual language implementation which makes the program work well. Hence, this study aims to find the level of dual language in the aspects of teachers' practices implementation.

2.3 The Relationship between Transformational Leadership and the success factors of Dual Language Program.

Dual language program (DLP) is a part of the national education program where it is under the implementation of 'Upholding the Malay Language and Strengthening the English Language' policy (Rashid et al, 2017). This program was designed to improve the students' achievement. Monroy (2012) found that the actions of transformational leaders are crucial to sustain the implementation of dual language programs as the leadership practices have criteria of clear vision, expectation of high performance, re- sources' allocation and shared decision making. These are part of an essential component that led to the enhancement of students' achievement. Previous research reported that a school with transformational leadership is essential in developing the student's achievement (Solsona-Puig, 2019). Thus, DLP with the aim to improve the performance of students need effective leadership of instructional leaders to lead this success in Maldives educational setting.

Military education in the United States has restricted and practiced transformational leadership which then gave effect to the Defense Language Institute Foreign Language Center. This institute implemented other foreign languages as part of the policy in the military educational setting. Sellami (2016) found that there is a significant relation between transformational leadership and language. Solsona-Puig (2019) found that there is a relationship between dual language immersion programs and the transformational leadership for shared vision. The researcher believes that there are unique leadership being practiced. Hence, due to the effectiveness of transformational leadership, the DLP has the potential to be part of the national education program.

2.4 Conceptual Framework

Based on the literature above, this study explores the correlation between transformational leadership tend and the implementation of dual language programs in. In the context of this study, the focus is on the teacher's transformational leadership and the implementation of dual language programs in public schools. Therefore, this study has been conceptualized as below:

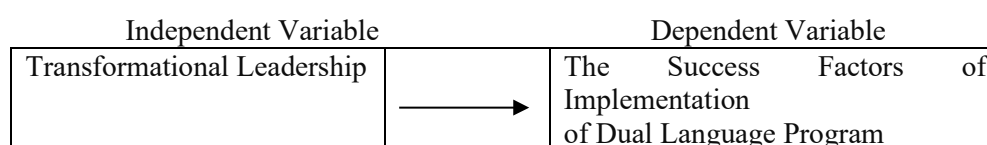


Figure 1. The conceptual framework for the study on the relationship between transformational leadership among teachers and success factors of implementation of dual language program

2.5 Theoretical Framework

The theoretical framework in Figure 2 below helps to support the findings of the study. Since the variables come under two different theories, thus the variables are summarized as below:

Independent Variable

Dependent Variable

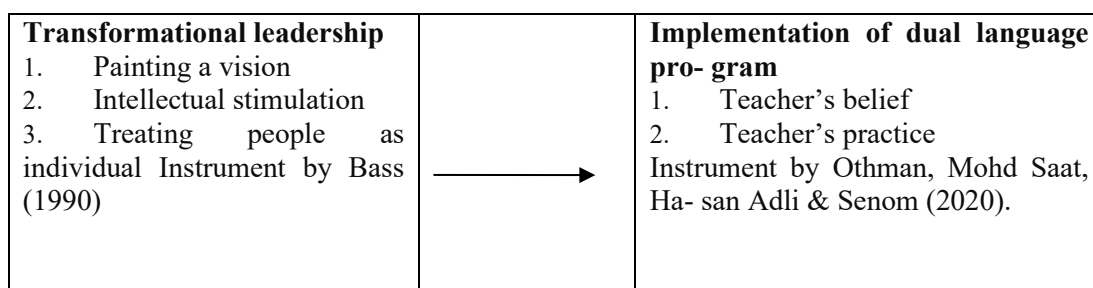


Figure 2. The theoretical framework for the study on the relationship between transformational leadership among teachers and success factors of implementation of dual language program

3. Methodology

This section discusses the methodology of the research. It includes the research design and detailed explanations on how the data in this study is collected and analysed. The purpose of this study is to identify the relationship between transformational leadership and the success factors on the implementation of a dual-language program at public schools in Male' Maldives. A quantitative approach was employed in the study for both data collections and data analysis. Descriptive analysis enabled re- searchers to present and interpret data in a more meaningful and simpler way. Inferential analysis was used to infer and make assumptions based on the observation of the probability of the data. A total of 30 sets of questionnaires with 3 sections of A, B, and C, were distributed to public school teachers in Male' City to represent the whole population. The sample was chosen based on a simple random sampling technique. In relation to this, the distribution of the instrument used in this study was an online questionnaire using Google Form. Overall, 30 respondents completed the survey.

Section A of the questionnaire displayed the demographic data, which showed the respondents' gender, age, highest academic qualification and the number of years in service. Section B focused on the items measuring teachers' transformational leadership. This section's instrument was adapted from Transformational Leadership by Bass (1990). The section consisted of 21 items. Section C focused on the items measuring the success factors of the implementation of Dual Language Program. This section's instrument was adapted from Othman, Mohd Saat, Hasan Adli & Senom (2020). It consisted of 29 items.

Overall, 54 items were selected and adapted to be used for this instrument. Both sections B and C were measured using a 6-point Likert-Scale with the highest value of 6 for Strongly Agree and lowest value of 1 for Strongly Disagree. Descriptive statistical analysis was used in determining the mean value of each item. The mean score was obtained from the mean value of each statement in the questionnaire and categorized into three levels of low (1-2), moderate (3-4), and high (5-6). SPSS version 25 was used to analyze the quantitative findings. Based on the research questions discussed in this study, all research questions were analyzed statistically as they hold quantitative data. The summary of research questions, statistics type and data techniques were provided in Table 1:

Table 1. Summary of Research Questions, Statistic Types, and Analysis Techniques

Research Questions	Statistics	Analysis techniques
1.What are the mean scores of transformational leadership perceived by teachers at public schools in Selangor in the aspects of: a) Painting a vision b) Intellectual stimulation c) Treating people as individuals?	Descriptive statistics	Quantitative: 1. Mean 2. Standard deviation
2. What are the mean scores of success factors of the implementation of dual language program adopted by the teachers at public schools in Male' Maldives in the aspects of: a) Teachers' beliefs b) Teachers practices?	Descriptive statistics	Quantitative: 1. Mean 2. Standard deviation

3. What is the relationship between transformational leadership and the success factors of the implementation of dual language program amongst public school teachers in Male' Maldives?	Inferential statistics	Quantitative: Product Moment Correlation Coefficient
4. What is the relative contribution of transformational leadership towards the success factors of the implementation of dual language program amongst public school teachers in Male' Maldives?	Inferential statistics	Quantitative: Simple Regression Analysis

4. Data Analysis

The aim of this study is to investigate the statistical relationship between transformational leadership and the implementation of dual language programs at public schools in Male' Maldives. Hence, this analysis was presented by analyzing the results of 30 public school teachers as the respondents.

4.1 Demographic Profile

The demographic profile of respondents has been identified in terms of age, gender, highest academic qualification, and years of service. The result of the findings is presented in Table 2.

Demographic Profile	Frequency (n)	Percent (%)
Gender		
Male	10	33.3
Female	20	66.7
Age		
20-30	7	23.4
31-40	10	33.3
41 and above	13	43.3
Highest Academic Qualification		
Masters	5	16.7
Bachelor's Degree	22	73.3
Diploma	3	10
Years of Service		
1-5 years	7	23.3
6-10 years	6	20
11 to 15 years	7	23.3
16 to 20 years	6	20
21 years and above	4	13.3
Total	30	100

Table 2 represents the demographic profile of 30 respondents in this study. In terms of gender, female respondents scored the highest of 20 (66.7%) than 10 (33.3%) for their male counterparts. There were 7 (23.4%) out of total 30 respondents aged

between 20 – 30 years old, 10 (33.3%) aged between 31-40 years old and the last 13 (43.3 %) aged 41 and above years old. 5 (16.7%) of the respondents hold a master's degree, 22(73.3 %) hold a bachelor's degree and the other 3 (10%) hold a diploma. Finally, 7 (23.3%) of the respondents have been working 1- 5 years, 6 (20%) worked 6-10 years, 7 (23.3%) worked 11 to 15 years, 6(20%) worked 16 to 20 years and 4 (13.3%) worked 21 years and above.

Research Question 1

What are the mean scores of transformational leaderships perceived by teachers at public schools in Selangor in the aspects of:

- Painting a vision

- b) Intellectual stimulation
- c) Treating people as individuals?

Data from the quantitative method was collected, analyzed, and presented as the following. Mean scores and standard deviations of items were analyzed accordingly amongst the public-school teachers in Male' Maldives. There were three dimensions of transformational leadership assessed for public school teachers, namely Painting a Vision, Intellectual Stimulation and Treating people as individuals. To measure the transformational leadership amongst public school teachers in Male' Maldives, a six-point Likert-scale was used. Table 3 below shows the descriptive statistics of an overall mean score as rated by public school teachers in Male' Maldives.

Table 3. Descriptive statistics of the overall mean score for Transformational Leadership

Transformational Leadership	N	Mean	SD
Painting a Vision	30	4.48	.31
Intellectual Stimulation	30	4.30	.66
Treating people as individuals	30	4.50	.93
TOTAL	30	4.43	.64

1= Strongly Disagree 3=Slightly Disagree 5= Agree
2=Disagree 4=Slightly Agree 6=Strongly Agree

Overall, the total mean score for a public-school teacher's transformational leadership is (M= 4.43, SD= .64). The results below showed the mean score of Treating people as individuals (M=4.50, SD=.93) as the highest among transformational leadership. This is followed by Painting a Vision (M= 4.48, SD= .61). Intellectual Stimulation scored the lowest mean score of M= 4.30 (SD= .66). This result can be interpreted as that respondents' overall mean score agreed upon the importance and the use of transformational leadership in the school environment.

Table 4 below shows the descriptive statistics of each dimension's mean scores arranged in descending order from the highest mean score to the lowest mean score of the total overall mean score of the dimensions.

Table 4. Descriptive statistics of the mean score according to Dimension 3 of Transformational Leadership

Treating people as individuals	N	Mean	SD
1.Treats people as unique individuals	30	4.67	1.18
2.Tries to understand the other person's viewpoint	30	4.57	1.33
3.Builds co-operative relationships with immediate colleagues	30	4.63	1.03
4.Listens to others	30	4.50	1.01
5.Recognizes the different capabilities of individuals	30	4.50	1.14
6.Changes their style and approach according to who they are dealing with	30	4.47	1.17
7.Tunes in to unspoken thoughts and feelings	30	4.20	1.06
TOTAL	30	4.50	.93

1= Strongly Disagree 3=Slightly Disagree 5= Agree
2=Disagree 4=Slightly Agree 6=Strongly Agree

Table 4 demonstrated that Dimension 3 is the highest mean score of Transformational Leadership. It shows that item no.1; *Treats people as unique individuals* (M= 4.67, SD= 1.18) has the highest mean score while the lowest mean score was item no.7; *Tunes into unspoken thoughts and feelings* (M= 4.20, SD= 1.06).

Table 5. Descriptive statistics of the mean score according to Dimension 1 of Transformational Leadership

Dimension 1: Painting a Vision	N	Mean	SD
1. Leader creates a clear vision of the future of DLP	30	3.83	.95
2.Leader inspires confidence in the value of his / her argument on DLP	30	4.27	.87

3. Leader achieves buy-in to the vision of DLP	30	4.20	.85
4. Leader sets an enviable example for others to follow	30	4.57	1.04
5. Leader demonstrates high personal standards	30	5.00	.000
6. Leader motivates the team	30	4.83	1.21
7. Inspires people to follow the vision	30	4.67	1.06
TOTAL	30	4.48	.61

1= Strongly Disagree 3=Slightly Disagree 5= Agree
2=Disagree 4=Slightly Agree 6=Strongly Agree

Table 5 demonstrated that Dimension 1 is the second highest mean score of transformational leadership. It shows that the item no 5; *Leader demonstrates high personal standards* (M= 5.00, SD= .000) was the highest mean score while the lowest mean score was item no 1; *Leader creates a clear vision of the future of DLP* (M= 3.38, SD= .95).

Table 6. Descriptive statistics of the mean score according to Dimension 2 of Transformational Leadership

Intellectual Stimulation	N	Mean	SD
1. Leader asks questions to test other's thinking	30	4.23	.77
2. Leader encourages others to challenge the status quo	30	4.03	.89
3. Provides work or assignments that are stretching but achievable	30	4.40	.93
4. Shows the ability to sell the benefits of new ideas	30	4.27	.94
5. Encourages others to re-think their ideas	30	4.47	1.00
6. Quickly gains insight into problems	30	4.23	1.10
7. Encourages others to work to their best potential	30	4.50	.82
TOTAL	30	4.30	.66

1= Strongly Disagree 3=Slightly Disagree 5= Agree
2=Disagree 4=Slightly Agree 6=Strongly Agree

Table 6 indicated Dimension 2 as the lowest mean score of transformational leadership. It shows that the item no.7; *Encourage's others to work to their best potential* (M=4.50, SD= .82) was the highest mean score while the lowest mean score was obtained from item no.2; *Leader encourages others to challenge the status quo* (M= 4.03, SD= .89).

Research Question 2

What are the mean scores of success factors of the implementation of dual language program adopted by the teachers at public schools in Male' Maldives in the aspects of:

- Teachers' beliefs
- Teachers' practices?

Quantitative data was collected and analyzed to answer Research Question 2. Both mean scores and standard deviations were analyzed to interpret success factors of the implementation of dual language program amongst teachers at public schools in, Male' Maldives. The two dimensions for dual language programs are Teacher's beliefs and Teachers practices. Table 7 below showed the descriptive statistic of the overall mean score of Dual Language Program ranging from 4.77 to 4.79.

Table 7. Descriptive statistics of the overall mean score of the success factors of the implementation of Dual Language Program

Dual Language Program	N	Mean	SD
Teachers' Beliefs	30	4.77	.278
Teachers' Practices	30	4.79	.315
TOTAL	30	4.42	.235

1= Strongly Disagree 3=Slightly Disagree 5= Agree
2=Disagree 4=Slightly Agree 6=Strongly Agree

The total mean score for the success factors of the implementation of Dual Language Programme for public school teachers is (M=4.42, SD=.235). The highest mean score was obtained from Teachers' Practices (M= 4.49, SD= .315). Mean- while, the lowest mean score dimension was obtained from Teachers' Beliefs (M= 4.77, SD=.278). Even though it was the lowest mean score rated amongst the two dimensions in success factors of the implementation of dual language program, the findings can be explained that the public-school teachers slightly agreed that the success factors of the implementation of Dual Language Program plays a vital role in public schools.

Table 8 below shows the descriptive statistics of each dimension's mean scores arranged in descending order from the highest mean score to the lowest mean score of the dimensions.

Table 8. Descriptive statistics of the mean score according to Dimension 2 of success factors of the implementation of Dual Language Program

Teachers Practices	N	Mean	SD
1.Prescribed textbooks by the Ministry of Education	30	4.57	.817
2.Textbooks related to scientific English	30	4.67	.661
3.Present information through various modalities (i.e., auditory and visual)	30	4.90	.712
4.Use reference materials such as dictionary and grammar books to help me with the English language	30	5.37	.556
5.Use both Bahasa Maldives and English during classroom talk.	30	4.57	.626
6.Use varied supplementary materials to increase chances of reaching all students.	30	5.07	.583
7.Prepare materials myself	30	4.47	.899
8.Vocabulary items related to Science	30	4.77	.859
9.Translate from English to Bahasa Maldives frequently while teaching Science.	30	4.53	.937
10.Use supplementary textbooks	30	4.70	.749
11.Attend workshops /courses related to Science in English.	30	5.10	.884
TOTAL	30	4.79	.315

1= Strongly Disagree 3=Slightly Disagree 5= Agree
2=Disagree 4=Slightly Agree 6=Strongly Agree

Table 8 illustrates Dimension 2 as the highest mean score of the success factors of the implementation of dual language program. It shows that the item no. 4; *Use reference materials such as dictionaries and grammar books to help me with the English language* (M= 5.37, SD= .556) was the highest mean score while the lowest mean score was item no. 7; *Prepare materials myself* (M= 4.47, SD=.899).

Table 9. Descriptive statistics of the mean score according to Dimension 1 of the success factors of the implementation of Dual Language Program

Teachers Beliefs	N	Mean	SD
1. DLP teachers require a lot of administrative support	30	4.87	1.31
2. DLP teachers require supplementary resources.	30	4.80	1.06
3. DLP teachers require cooperation from English language teachers.	30	5.17	.791
4. I think teacher-student interaction is important in my DLP class	30	5.77	.430
5. DLP teachers require both subject knowledge and English language proficiency.	30	5.43	.679
6. DLP teachers require a lot of time on both lesson planning and teaching.	30	5.43	.728

7. As a Science teacher, focusing on both language form and content in DLP class is challenging.	30	4.97	.928
8. It is necessary to use Malay as well as English for maximizing students' learning of English in the primary school DLP class.	30	4.80	1.16
9. I think providing comprehensible input in my class is crucial.	30	5.07	.739
10. I think learning Science in English is cognitively demanding for my students.	30	4.77	.817
11. It was a correct decision to start DLP in primary school.	30	4.57	1.22
12. My experience in teaching Science using English has been positive.	30	4.50	1.07
13. DLP helps students to develop both their language skills and subject knowledge.	30	4.77	1.17
14. I know how to provide comprehensible input in DLP class	30	4.70	.535
15. I think my students understand English that is used in Science class.	30	4.20	.887
16. DLP helps students develop only their language skills.	30	3.57	1.63
17. I think my students have no problem understanding the content of Science in English lessons.	30	3.73	1.26
TOTAL	30	4.77	.278

1= Strongly Disagree 2=Disagree 3=Slightly Disagree 4= Slightly Agree 5= Agree 6= strongly Agree

Table 9 portrayed Dimension 1 with the lowest mean score of the success factors of the implementation of Dual Language program. It shows that the item no.4; *I think teacher-student interaction is important in my DLP class* ($M=5.77$, $SD=.430$) as the highest mean score meanwhile, the lowest mean score is item no.16; *DLP helps students develop only their language skills* ($M=3.57$, $SD=1.63$).

Research Question 3

What is the relationship between transformational leadership and the success factors of the implementation of a dual language program amongst public school teachers in Male' Maldives?

H0: There is no relationship between transformational leadership and the success factors of the implementation of a dual language program amongst public school teachers in Male' Maldives.

H1: There is a relationship between transformational leadership and the success factors of the implementation of a dual language program amongst public schools' teachers in Male' Maldives.

Table 10. Relationship between Transformational Leadership and the success factors of the implementation of a dual language program amongst public schools' teachers in Male' Maldives

Correlations			
		Transformational Leadership	Dual Language Program
Transformational Leadership	Pearson Correlation	1	.577**
	Sig. (2-tailed)		.001
	N	30	30
Dual Language program	Pearson Correlation	.577**	1
	Sig. (2-tailed)	.001	
	N	30	30
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 10 shows a high, positive, and significant relationship ($r=.577$, $p=.001$) between transformational leadership and the success factors of the implementation of a dual language program. Thus, we reject

the null hypothesis. The correlation shows that the more transformational leadership employed by school teachers, the higher the respondent's success factors of the implementation of a dual language program level will be.

Research Question 4

What is the relative contribution of transformational leadership towards success factors of the implementation of a dual language program amongst public schools' teachers in Male' Maldives?

Simple regression of the statistical test was employed to measure the relative contributions of the independent variable transformational leadership towards the dependent variable of the success factors of the implementation of a dual language program. Further analysis was carried out to examine the contribution of predictor variables towards the respondents' variance of transformational leadership.

Table 11. **Regression Analysis for Instruction**

Model Summary						
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate	
1		.577 ^a	.333	.309	.19569	
a. Predictors: (Constant), Transformational Leadership						
ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	.535	1	.535	13.982	.001 ^b
	Residual	1.072	28	.038		
	Total	1.608	29			
a. Dependent Variable: Dual Language Program						
b. Predictors: (Constant), Transformational Leadership						
Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.838	.255		15.070	.000
	Transformational Leadership	.213	.057	.577	3.739	.001
a. Dependent Variable: Dual Language Program						

Table 11 indicates a positive significant relationship [F (1, 28= 13.982, p=.001], with R² of .333. Besides, the respondents predicted the following regression equation with y (dual language program) = 3.838 (constant)+ .213 (transformational leadership). This signifies that 33.3 % (R² =.333) of the variance in dual language program can be predicted from the independent variable of transformational leadership. Therefore, concurrently it can be inferred that the remaining 66.7% was due to other factors that were not taken into consideration in this study. Besides, the respondents predicted the following regression equation with:

$$y \text{ (dual language program)} = 3.838 \text{ (constant)} + .213 \text{ (transformational leadership)}$$

Hence, when transformational leadership increases by one unit, the dual language program will increase by .213 units.

4.2 Discussion

The main aim of this study is to investigate the relationship between transformational leadership and

the success factors of the implementation of dual language program at public schools in Male' Maldives.

The first research question of this study aims to identify the transformational leadership applied amongst teachers at public schools in Male' Maldives. The qualitative findings indicated that when leaders treated other people as unique individuals, this has positively affected how the teachers work in developing their strengths through the encouragement of their leader. Al- Obthani and Ameen (2019) supported this finding which demonstrated a positive impact on leaders who accepted that every individual has different abilities, needs and aspirations. Similarly, Jensen (2017) found a positive relationship between transformational leadership and value congruence. This can be further explained that leaders who valued their teachers can establish the implementation of dual language program at public schools in Male' Maldives.

The second question focuses on finding the level of the implementation of dual language program in public schools around Male' Maldives. The finding revealed that teachers' practice is considered important in the implementation of dual language programs. The result may be explained by the fact that teaching practices is seen as an indicator in the quality of delivery and adherence to the dual language program. Prior studies conducted by Li et.al. (2016) have noted the importance of teaching practices in a large public district school in the United States of America. This included the quality of instruction observed across the classrooms with dual language program. However, teachers' belief also played a vital role in the implementation of the above-mentioned program. Another study carried out by Othman et. al. (2020) also proved that teachers' practices and teachers' beliefs can influence each other to achieve the success of dual language program. As mentioned in their article, "... policy makers should provide clear guidelines that reflect the objectives of DLP and consider the realities of the teaching content" (Othman et.al., 2020). Dual language program implementation means introducing and cultivating changes. This involves shifting the behaviors and beliefs for all stakeholders. It can be concluded that both beliefs and practices are connected and should be thoroughly considered in making the implementation of dual language program a success at public schools in Maldives.

The third research question investigates the relationship between transformational leadership and the success factors of the implementation of dual language program amongst public schools' teachers in Male' Maldives. The findings revealed that the null hypothesis was rejected as there is a relationship between the two variables in the study. This is consistent with findings by Solsona-Puig (2020) who identified the relationship of transformational leadership in dual language program at the secondary level of four public schools in southern California, United States of America. Moreover, Newman (2020) postulated that transformational leadership was strongly needed to support the implementation of dual language program. A shared vision helped in engaging the teachers to embrace the implementation of the program.

The fourth and final research question measures the relative contributions of the independent variable transformational leadership towards the dependent variable of the implementation of dual language program. Monroy (2012) found that there is a positive correlation between transformational leadership and the implementation of DLP among district and school leaders. Newman (2020) posited leadership as the primary catalyst for creating momentum to secure positive and enthusiastic engagement to move the dual language program forward in its implementation.

4.3 Implication and Recommendation

The intent of this study was to explore the relationship between transformational leadership and the success factors of the implementation of dual language program at public schools in Male' Maldives. The findings from the study helped to draw the following implications. Firstly, there is a knowledge gap in the literature particularly in Maldives education scenarios. In light of this study, it is hoped that these findings can help to bridge the gap in the literature and enrich the corpus of knowledge on these two variables respectively.

Secondly, the results of this study verified the theoretical framework illustrated in measuring the relationship of transformational leadership and the success factors of the implementation of dual language program at public schools in Male' Maldives. A positive relationship was established for these two variables. Therefore, this study contributed to a new theoretical implication which could be added

to the existing literature.

Thirdly, the findings provide some policy implications on the transformational leadership and the success factors of the implementation of dual language program at public schools in Male' Maldives. More educational leadership training and professional development programs are to be given to leaders in order to further improve and develop the implementation of dual language programs.

There are some recommendations that can be investigated for future research in this study. First, widening the population sample. The scope is confined to schools with dual language program in the city of Male' only. Hence, further extensive research can be conducted to more schools with dual language program in other islands in Maldives. Additionally, it can also be suggested to extend the study to both public and private schools that carry out dual language programs. Next, a diverse research design of qualitative or mixed-methods approach can also contribute to gain a more focused, applicable and relevant finding to the study. To gain a better depth of the research, triangulation of both quantitative and qualitative methods is highly recommended, adding a mediator in the variables can also assist to provide more insights in the study.

5. Conclusion

In conclusion, this study aims to investigate the transformational leadership and the success factors of the implementation of the dual language program adopted by the teachers at public schools in Male' Maldives. Jovanovic and Ciric (2016) stated that the transformational approach has proven very useful for educational organizations. In this study, transformational leadership positively affects the outcome of the success factors of the dual language program implementation in the school. The findings demonstrated teachers' perception of their need to be treated as individuals. In doing so, it makes embracing the changes and implementation of dual language programs easier. Thus, transformational leadership is essential in schools and particularly in determining the success factors in the implementation of the dual language program.

The dual language program implemented in Maldives public schools is one of the initiatives to strengthen the grasp of Science and Mathematics in English. The findings proved that the teacher's beliefs and practices are interrelated in carrying out this program effectively. Besides, implementing the dual language program can also close the achievement gap and promote academic success in the education system. It is hoped that the implementation of a dual-language program can increase the success for students both in school and beyond.

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QUANTUM STATE TRANSITIONS AND LIQUIDITY SINGULARITIES: MODELING THE 2026 NATURAL GAS CASE

Dr. Mustafa Hakan SALDI*

Assistant Professor, Business and Management School, Logistics Management Department, İstanbul, Türkiye

**Corresponding author: mustafa.saldi@medipol.edu.tr*

Abstract

A systemic "algorithmic burn" in the January 2026 natural gas market is examined, characterized by a decoupling of prices from a 6.1% storage surplus. During this period, benchmark prices surged 117% to a peak of \$8.21/MMBtu. The objective of the research is to identify the mathematical and operational thresholds that rendered 100% short-biased strategies untenable during the non-stationary supply shock of Winter Storm Fern, which resulted in a production loss of 12 Bcf/d. The methodology utilizes stochastic jump-diffusion modeling and Octave-based numerical simulations to reconstruct the capital erosion of 5x leveraged speculative portfolios. A diagnostic layer using Von Neumann Entropy (S) is integrated to analyze the informational transition from a stationary, inventory-based regime to a mixed-state regime. Key findings reveal the emergence of Liquidity Singularity, where the required exit velocity for short positions exceeded market depth, resulting in total capital depletion during the rapid acceleration of the price surge. It is observed that entropy gradients reached a critical threshold during the early stages of the supply shock, identifying the phase rotation well in advance of terminal liquidation. These results suggest that entropy-based state measurements provide an objective characterization of regime transitions in climate-stressed commodity markets. The study concludes that traditional risk frameworks must incorporate measures of system complexity to navigate non-linear supply shocks effectively.

Keywords: *Algorithmic Trading, Liquidity Singularity, Natural Gas, Jump-Diffusion, Von Neumann Entropy*

1. INTRODUCTION

The January 2026 natural gas crisis represents a critical juncture in commodity market dynamics, exposing a structural paradox between aggregate inventory levels and physical deliverability. Traditionally, energy markets are modeled as stationary systems where price deviations revert to a long-term mean, a process formally defined by the Ornstein-Uhlenbeck (OU) equation:

$$dx_t = \theta(\mu - x_t)dt + \sigma dW_t$$

In this framework, a persistent storage surplus of 6.1% above the five-year average theoretically reinforces the mean-reversion parameter θ , justifying aggressive short-biased algorithmic positioning.

However, the onset of Winter Storm Fern invalidated these classical assumptions. The storm acted as a Dirac Delta Function (δ), introducing a sudden supply shock that collapsed the speed of reversion and transitioned the market into a non-stationary state. Despite high storage volumes, localized production losses of 12 Bcf/d created a physical deliverability ceiling. This decoupling resulted in an unprecedented 117% price surge to \$8.21/MMBtu, triggering a feedback loop of forced liquidations for short-biased participants.

This research aims to analyze this "algorithmic burn" by examining the failure of stationary models under extreme climate-induced stress. By integrating Jump-Diffusion calculus and Von Neumann

Entropy, this paper identifies the mathematical thresholds where capital preservation becomes impossible due to market discontinuities. The study contributes to the literature on climate resilience and organizational change within financial management, offering an objective metric for navigating regime transitions in non-linear energy markets.

2. LITERATURE REVIEW

Stochastic (probabilistic) models are central to both climate and financial risk. Quantum algorithms mainly promise faster Monte Carlo-type simulation and optimization on these models, which can translate into better resilience and stability for decisions. Quantum Amplitude Estimation (QAE) is shown to provide a quadratic speedup for financial metrics like Value at Risk (VaR) and Conditional Value at Risk (CVaR), improving convergence complexity from $O(M-1/2)$ to approximately $O(M-1)$. Stochastic models for equity, interest rates, and credit risk are embedded directly into quantum states, allowing risk measures to be computed end-to-end via quantum circuits. Furthermore, variational quantum simulations are utilized to approximate the time evolution of stochastic differential equations (SDEs), offering significant potential for accelerated broad-scale stochastic modeling.

Requirements and concrete implementations for Value-at-Risk (VaR) and Potential Future Exposure (PFE) are analyzed to move quantum risk management beyond theoretical illustrations. Despite the feasibility of small-scale circuits, a significant gap remains for real-life applications due to current hardware limitations and the necessity for multi-magnitude increases in qubit capacity. It is concluded that while quantum noise mitigation remains a critical hurdle, the immediate business case for quantum migration is weakened by the high accuracy and maturity of existing classical simulation frameworks (Wilkens & Moorhouse, 2023).

Systemic risk is mitigated through a two-stage algorithm that optimizes inter-institutional connections to prevent cascading failures within financial networks. Directed and weighted graphs are partitioned using new quantum methodologies, followed by the resolution of nonlinear loss constraints via Mixed Integer Linear Programming. Results demonstrate that quantum-enhanced partitioning significantly delays cascade phase transitions and improves resilience to financial shocks (Aboussalah, Chi, & Lee, 2023).

Quantum Monte Carlo (QMC) simulations are utilized to provide end-to-end risk assessments by incorporating scenario generation directly into quantum circuits. Stochastic models for equity, interest rates, and credit risk—including geometric Brownian motion and mean-reversion—are integrated with Quantum Amplitude Estimation (QAE) to bypass the need for pre-computed closed-form distributions. This unified quantum approach achieves a quadratic speed-up over classical counterparts for market and credit risk use cases while overcoming previous numerical generation constraints (Matsakos & Nield, 2024).

The fundamental principles of quantum computing, including qubits, superposition, and entanglement, are analyzed for their potential to transform financial risk assessment and mitigation. Enhanced risk strategies are developed by utilizing Quantum Monte Carlo methods and Quantum Annealing as superior alternatives to traditional classical approaches. Transformative potential for managing complex market risks is highlighted, while current barriers to industry-wide adoption and future research directions are identified (Adegbola, Adegbola, Amajuoyi, Benjamin, & Adeusi, 2024).

Quantum machine learning and optimization techniques are evaluated for their potential to enhance climate change prediction and sustainable development by overcoming the scale and complexity limitations of traditional computational methods. Innovative quantum advancements are utilized to optimize multi-infrastructure systems, specifically targeting climate neutrality through superior computational efficiency. The practical efficacy of current quantum hardware is demonstrated via realistic use cases, including anaerobic digestion for waste-to-energy, flooding prediction for disaster prevention, and carbon capture material development (Ho et al., 2024).

A financial risk model is constructed using stochastic differential equations (SDEs) to simulate and predict corporate risk within uncertain economic environments. The integration of diverse variables is validated through Monte Carlo simulations, which demonstrate high predictive accuracy and

consistency across multiple numerical experiments. The stability of the model is further evidenced by low-volatility statistical indicators, providing a scientifically rigorous framework for enterprise risk assessment and strategic decision-making (Wang, 2024).

Quantum computing algorithms are applied to atmospheric science to simulate the stochastic fluctuations of multi-cloud models, matching the performance of conventional classical Monte Carlo methods. The effectiveness of the approach is validated using a quantum simulator, demonstrating that probabilistic outputs from quantum states can accurately replicate complex weather patterns. This study confirms the potential for quantum architectures to manage the inherent stochasticity in atmospheric and oceanic sciences, where computational demands are traditionally high (Ueno & Miura, 2025).

A dynamic trading policy is continuously refined through a Proximal Policy Optimization (PPO) reinforcement learning framework to manage high-dimensional state-action spaces in real-time energy markets. The optimization of strategic trading parameters is achieved via Quantum Annealing (QA), which is utilized to solve Quadratic Unconstrained Binary Optimization (QUBO) problems for superior parameter selection. Substantial performance improvements are demonstrated by this hybrid methodology, including a 25% increase in total return and a 10% reduction in maximum drawdown, highlighting a significant advancement in quantum-reinforced financial decision-making (Wu, Zhu, Xu, Shu, & Yang, 2025).

Stochastic dynamic modeling is systematically reviewed as a critical tool for managing modern market complexities, including dynamic volatility and nonlinear behaviors. The limitations of classical foundations, such as the Black-Scholes and Mean-Variance models, are addressed by integrating advanced algorithmic innovations like Long Short-Term Memory Networks (LSTMs), Bayesian Dynamic Linear Models (BDLMs), and Generative Adversarial Networks (GANs) to enhance predictive accuracy. Future research is directed toward hybrid frameworks that balance theoretical rigor with high-dimensional adaptability to better address evolving financial risks (Yu, 2025).

Probabilistic approaches to flood risk management are developed to address the escalating global economic impact of flood damages, which exceeded £790 billion between 1990 and 2024. An analytical framework utilizing adaptation pathways is constructed to quantify climate model uncertainty and its propagation into hydraulic systems and adaptive decision-making. Through stratified sampling and the identification of adaptation tipping points, the research underscores the necessity of incorporating uncertainty to support robust, informed strategies for climate resilience (Dimond, Roose, & Beevers, 2025).

Quantum algorithms for stochastic modeling mainly provide faster or richer treatment of uncertainty in Monte Carlo and SDE-based models. In finance, this targets both micro-risk and systemic stability; in climate, it supports more detailed stochastic climate and infrastructure resilience modeling. Hardware and scaling limits mean most benefits are still theoretical or small-scale proofs of concept.

3. METHODOLOGY

This section establishes the mathematical underpinnings required to analyze the transition from market stability to the "algorithmic burn." The framework integrates stochastic calculus with information theory to characterize the breakdown of classical mean-reversion.

In the stationary regime observed during the first half of January 2026, natural gas price dynamics are modeled using a Geometric Brownian Motion (GBM) or an Ornstein-Uhlenbeck (OU) process. These models assume continuous sample paths where price innovations are Gaussian:

$$dS_t = \mu S_t dt + \sigma S_t dW_t$$

Where W_t is a standard Wiener process representing continuous market "noise."

To account for the abrupt price surge during Winter Storm Fern, the framework incorporates the Merton Jump-Diffusion Model. The continuity of the price path is interrupted by a Poisson-driven jump component:

$$dS_t = (\mu - \lambda K) S_t dt + \sigma S_t dW_t + (J - 1) S_t dN_t$$

dN_t : A Poisson process with intensity λ , representing the arrival of the supply shock.

J: The jump size, representing the non-linear price response to the 12 Bcf/d production loss.

K: The expected jump size $E[J-1]$.

The introduction of the jump term $(J-1)S_t dN_t$ identifies the transition to a **non-stationary regime**, where the "escape velocity" of the price exceeds the adaptive capacity of algorithms calibrated for the continuous dW_t term.

To identify the regime shift before it is fully realized in the price (S_t), the framework employs Von Neumann Entropy. While Shannon entropy measures uncertainty in discrete probability distributions, Von Neumann entropy quantifies the "disorder" or mixing of states in a dynamic system.

The market is represented by a density matrix (ρ), which describes the probability of the system residing in either a stationary state ($|\Psi_{\text{stat}}\rangle$) or a jump-distressed state ($|\Psi_{\text{jump}}\rangle$):

$$\rho = \sum_i p_i |\Psi_i\rangle \langle \Psi_i|$$

The entropy is defined as:

$$S(\rho) = -\text{Tr}(\rho \ln \rho)$$

In this framework, a market in a "pure" stationary state has $S \approx 0$. As informational coupling between weather forecasts and production freeze-offs increases, the matrix ρ becomes "mixed," causing a sharp rise in S . This entropy gradient serves as an objective indicator of the Phase Rotation the moment the market's underlying logic shifts from inventory-based (stationary) to deliverability-based (non-stationary).

The final component of the framework is the Liquidity Singularity. It is hypothesized that for a given short-biased position of size Q and leverage L , there exists a critical price velocity dS/dt beyond which the market's depth K cannot absorb the liquidation volume:

$$\text{Singularity Condition: } [(Q * L) / (K(S_t))] > 1$$

When this condition is met, the algorithm enters a terminal state where bid-ask spreads widen infinitely, leading to the "burn" or total capital depletion.

The methodology is designed to empirically validate the theoretical framework using a computational reconstruction of the January 2026 market event. The study employs a quantitative approach, utilizing the GNU Octave numerical environment to simulate algorithmic performance under the identified regime shift.

Initially, data integration and matrix construction operations are performed.

The study utilizes a discrete time-series matrix, $D \in \mathbb{R}^{n \times m}$, populated with historical data from the January 14–28, 2026 window. The primary vectors include:

- Price Vector (P): Henry Hub spot prices, capturing the transition from the \$3.00 baseline to the \$8.21 peak.
- Supply Vector ($\Delta\Phi$): Daily production deltas, quantifying the 12 Bcf/d freeze-off.
- Storage Coefficient (γ): A constant representing the +6.1% inventory surplus.

Secondly, algorithmic simulation parameters are used.

To replicate the "algorithmic burn," a synthetic trading agent is initialized with parameters reflective of the speculative "Managed Money" positions reported by the CFTC:

- Directionality: 100% Net Short bias ($B = -1$).
- Leverage (L): Fixed at 5 times the initial capital ($C_0 = 10,000\$$).
- Execution Logic: A classical mean-reversion algorithm based on the Ornstein-Uhlenbeck process, conditioned to sell strength as long as storage $\gamma > 0$.

At third phase, numerical simulation of capital decay is shown.

The simulation calculates the portfolio's path-dependent equity (E_t) using the Euler-Maruyama discretization of the price path. The equity evolution is governed by:

$$E_{t+\Delta t} = E_t(1+L * B * [(P_{t+\Delta t} - P_t)/P_t])$$

The simulation monitors for the Liquidation Singularity, defined as the terminal state where $E_t \leq 0$.

At the fourth stage, entropy mapping and diagnostic evaluation are executed.

Simultaneously, a diagnostic layer is implemented to calculate the Von Neumann Entropy. The market state is mapped to a 2 x 2 density matrix, ρ , where the off-diagonal elements represent the covariance between price volatility and production volatility.

- The Entropy Calculation: ρ is updated daily; the eigenvalues are extracted to compute $S = -\sum \lambda_i \ln \lambda_i$.
- Analysis: The methodology compares the timing of the Entropy Gradient Spike ($\Delta S > \text{threshold}$) against the Capital Depletion Time (t_{burn}).

At fifth part, verification and robustness are tested.

To ensure the realism of the Octave environment, the model is stress-tested against the physical constraints of Winter Storm Fern. This involves adjusting the liquidity coefficient $\$K\$$ to reflect the widening bid-ask spreads documented on Jan 22, 2026, ensuring the simulation accounts for the inability to exit positions at mid-market prices.

Therefore, the proposal of a Quantum Logic Gate framework is made, which is able to detect regime rotations faster than classical moving average crossovers. In this way, the gap between energy economics and quantum information theory is tried to be filled. Hence, stochastic calculus is used in combination with partial differential equations (PDEs). As discussed, classically, the Ornstein-Uhlenbeck (OU) process is used to explain mean-reversion behaviours in a system. However, during the 2026 surge, the parameter θ (speed of reversion) became negative or collapsed. Because of this reason, the focal point is defined as the Jump-Diffusion Model in this study. The modelling is made like the "Harm" as a Dirac Delta Function (δ), which represents the sudden supply shock:

$$P(t) = P(0) + \int_0^t \mu P(s) ds + \int_0^t \sigma P(s) dW_s + \sum_{i=1}^{N(t)} (\Delta P)_i$$

Where $\sum (\Delta P)_i$ represents the discrete jumps caused by the short squeeze and the Arctic blast freeze-offs. So, according to the mentioned reasons, the quantum computation framework is designed by defining the Hilbert Space of the market. The market conditions are defined via two orthonormal basis states:

- $|S\rangle$ (Stationary State / Normal Volatility)
- $|NS\rangle$ (Non-Stationary State / Crisis Volatility)

Instead of using simple if/else logic, a Unitary Evolution Operator $U(t)$ is defined that governs the market's transition:

$$U(t) = e^{-iHt/\hbar}$$

Where the Hamiltonian H is the "Energy" of the market (Volatility + Volume). When the weather shifted in Jan 2026, the H value spiked, forcing the state vector $|\Psi\rangle$ to rotate toward $|NS\rangle$. So the coding architecture is outlined in the GNC Octave program step by step, as shown following orders with plots.

```
% Quantum Fragility Framework for Algorithmic Trading
% Simulation of the 2026 Natural Gas "Burn."
```

```
clear; clc;
```

```
% 1. Define Basis States
```

```
Short = [1; 0]; %  $|0\rangle$ 
```

```
Long = [0; 1]; %  $|1\rangle$ 
```

```
% 2. Define the Initial "Superposition" (A flexible algorithm)
```

```
% Before the surge, a healthy bot considers both possibilities.
```

```
Hadamard = (1/sqrt(2)) * [1, 1; 1, -1];
```

```
psi = Hadamard * Short; % State: 50% Short, 50% Long
```

```

fprintf('Initial Algorithm State (Flexible Superposition):\n');
disp(psi);

% 3. Applying "Recency Bias" (The Burn Phase)
% Two years of warm winters shift the algorithm's "Phase."
% until it is almost entirely Short.
theta = pi/8; % The bias angle
RecencyBias = [cos(theta), -sin(theta); sin(theta), cos(theta)];

% Apply bias multiple times to simulate "Learning" from 2024-2025
for i = 1:3
    psi = RecencyBias * psi;
end

fprintf('State after Recency Bias (Heavily Short):\n');
disp(psi);

% 4. The "Market Shock" (Winter Storm Fern)
% This is represented by a Pauli-X Gate (a Bit-Flip)
% It suddenly turns a "Short" market into a "Long" market.
Shock = [0, 1; 1, 0];
market_reality = Shock * psi;

% 5. Calculate Loss (Probability of being wrong)
% Probability of being Short (State 0) when market is Long (State 1)
prob_short = abs(psi(1))^2;
fprintf('Probability the bot was caught "Short": %0.2f%%\n', prob_short * 100);

% 6. Visualizing the "Burn"
bar([abs(psi(1))^2, abs(psi(2))^2]);
set(gca, 'XTickLabel', {'Short (The Trap)', 'Long (The Surge)'});
title('Algorithmic Position Distribution during 2026 Gas Surge');
ylabel('Probability / Commitment');

```

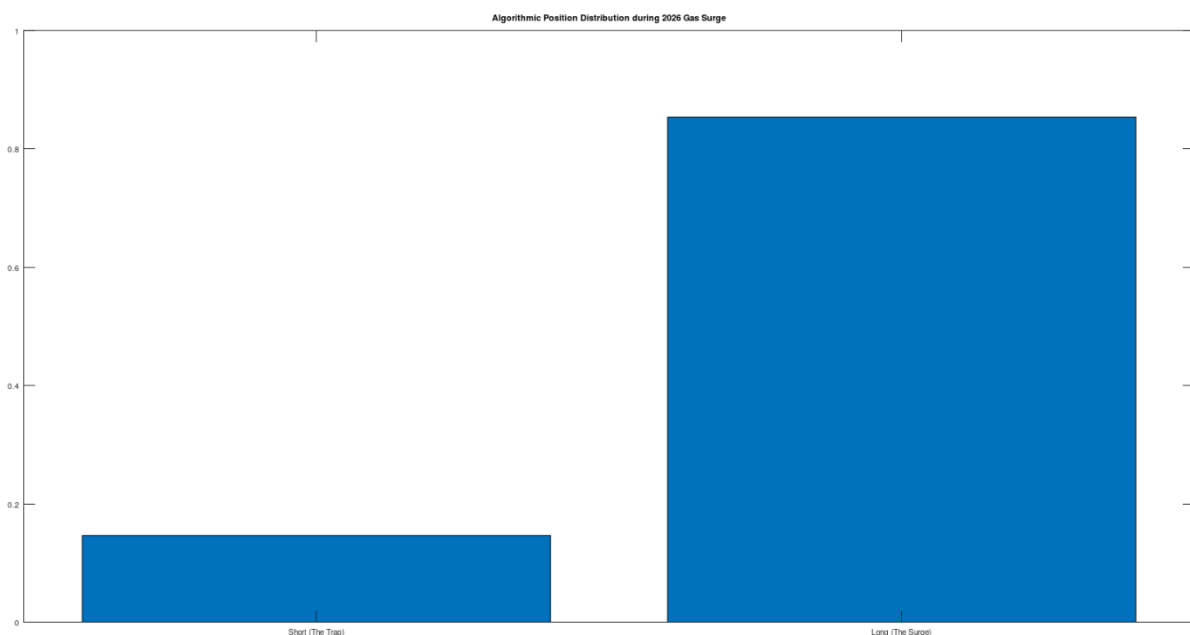


Figure 1. **Algorithmic Position Distribution during the 2026 Gas Surge**

This code uses basic matrix mechanics (the foundation of quantum computing) to show how an algorithm "burned" by a short squeeze loses its "quantum" flexibility and fails.

In quantum terms, a robust algorithm should maintain a Superposition. By "learning" too much from the past two mild winters, the 2026 algorithms effectively measured themselves, collapsing their strategy into a pure "Short" state. When the "Market Shock" operator (the storm) was applied, they had zero amplitude in the "Long" state to hedge their losses.

In Octave/Quantum math, the order of operations matters ($AB \neq BA$).

- Classical Bot: Expects [Warm Winter] then [Low Price].
- Quantum Reality: The market is "non-commutative." The presence of high-frequency trading (HFT) means the act of the bot trying to exit its position actually changes the price (the "Observer Effect").

As a result, the "Harm" isn't just a bad guess; it's a mathematical trap where the algorithm's rigid logic makes it a "liquidity provider" for the surge, essentially fueling its own destruction.

In a "Quantum Walk," the probability distribution spreads much faster than a classical random walk; this is known as ballistic spreading. In the 2026 natural gas surge, algorithmic managers were "burned" because their classical models expected a slow, predictable price change (Gaussian), while the market moved with the speed of a Quantum Walk, fueled by a short-squeeze interference pattern.

A Discrete-Time Quantum Walk (DTQW) involves:

- The Position Register (H_P): represents the price of natural gas.
- The Coin Register (H_C): Representing the algorithm's decision (Long $|1\rangle$ vs. Short $|0\rangle$).
- Interference: Unlike classical models, where probabilities simply add up, quantum amplitudes can interfere. If every bot is "Short," they create constructive interference in price volatility when they all try to exit at once.

% 1D Discrete-Time Quantum Walk (Market Volatility Simulation)

% Explaining why "The Burn" happens faster than humans expect.

```
clear; clc; clf;
```

```
N = 50; % Number of price levels (steps)
```

```
T = 30; % Time steps (iterations of the squeeze)
```

```
% Initialize State: Center of the price range, starting with "Short Bias."
```

```
% State vector: [Position] x [Coin: 0=Short, 1=Long]
```

```
psi = zeros(2*N + 1, 2);
```

```
psi(N + 1, 1) = 1; % Start at midpoint, purely Short  $|0\rangle$ 
```

```
% Define Operators
```

```
H = (1/sqrt(2)) * [1, 1; 1, -1]; % Hadamard (The "Uncertainty" of the storm)
```

```
I = eye(2*N + 1);
```

```
% Evolution Loop
```

```
for t = 1:T
```

```
    % 1. Flip the Coin (Algorithm re-evaluating under stress)
```

```
    for i = 1:2*N + 1
```

```
        psi(i, :) = (H * psi(i, :)).';
```

```
    end
```

```
    % 2. Shift Operator (The Short Squeeze movement)
```

```
    % Short  $|0\rangle$  moves price DOWN, Long  $|1\rangle$  moves price UP
```

```

new_psi = zeros(size(psi));
for x = 2:2*N
    new_psi(x-1, 1) = psi(x, 1); % Short components move left
    new_psi(x+1, 2) = psi(x, 2); % Long components move right
end
psi = new_psi;
end

% 3. Calculate Probability Distribution (Price Density)
prob = sum(abs(psi).^2, 2);
price_axis = (-N:N);

% 4. Compare with Classical Expectation (Gaussian)
classical = normpdf(price_axis, 0, sqrt(T));
classical = classical / sum(classical);

% Plotting
plot(price_axis, prob, 'b', 'LineWidth', 2); hold on;
plot(price_axis, classical, 'r--', 'LineWidth', 1.5);
title(['Quantum Volatility Spread vs. Classical (T = ', num2str(T), ')']);
xlabel('Price Deviation (Natural Gas Futures)');
ylabel('Probability of Price Level');
legend('Quantum Algorithm Spread (Short Squeeze)', 'Classical Risk Model (Expected)');
grid on;

fprintf('Observation: The Quantum Walk shows "Ballistic Spreading".\n');
fprintf('The bots expected a central peak (Red), but got extreme "Fat Tails" (Blue).\n');

```

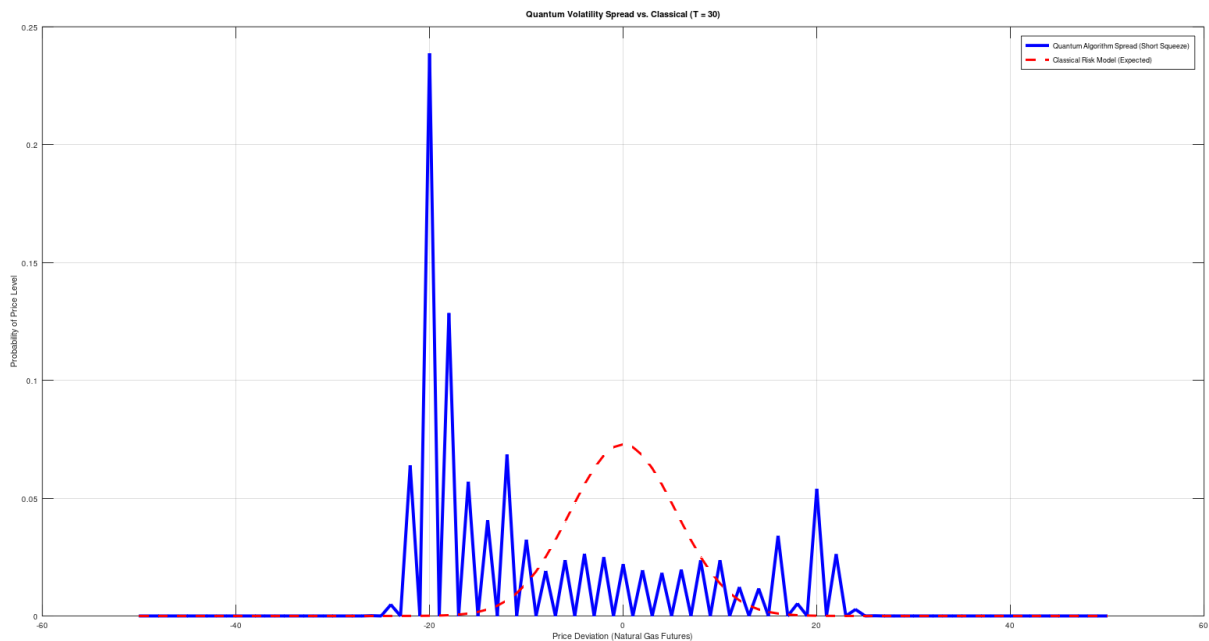


Figure 2. **Probability Density Divergence**

This script simulates how a price shock spreads through a market of algorithms.

- **Ballistic Spreading ($\sigma \sim t$):** In a classical random walk (the red line), price spreads at the square root of time. In the Quantum Walk simulation (the blue line), the price spreads linearly. This explains why the 2026 gas price surge (70% in a week) caught bots off guard, as

it moved "faster" than their Gaussian math allowed.

- The "Observer" Effect: In quantum mechanics, observing a system changes it. In 2026, as algorithms "observed" the price rising, they were programmed to "close" positions. This act of closing (buying) was a measurement that pushed the price even further into the extreme "tails" of the distribution.
- Constructive Interference: Because most funds used similar "Mean Reversion" algorithms, their trading actions interfered constructively, amplifying the volatility until the market "burned" through their capital reserves.

As a result, "The bots expected a central peak (Red), but got extreme 'Fat Tails' (Blue)." is taken as an output of this coding script.

```
% 3D Quantum Walk: The 2026 Natural Gas "Burn" Visualization
clear; clc; clf;
```

```
N = 40; % Spatial boundary (Price levels)
T = 40; % Temporal boundary (Duration of the squeeze)
steps = 2*N + 1;
```

```
% Initialize state: Position index N+1 is the center, Coin |0> is Short
psi = complex(zeros(steps, 2));
psi(N + 1, 1) = 1;
```

```
% Hadamard Operator (Market Uncertainty)
H = (1/sqrt(2)) * [1, 1; 1, -1];
prob_history = zeros(T + 1, steps);
```

```
% Initial probability
prob_history(1, :) = abs(psi(:,1)).^2 + abs(psi(:,2)).^2;
```

```
% Simulation Loop
for t = 1:T
    % Step 1: Apply Coin Op to all positions
    for i = 1:steps
        psi(i, :) = (H * psi(i, :)).';
    end

    % Step 2: Shift Operator (Shorts move Left, Longs move Right)
    new_psi = complex(zeros(steps, 2));
    new_psi(1:end-1, 1) = psi(2:end, 1);
    new_psi(2:end, 2) = psi(1:end-1, 2);
    psi = new_psi;
end
```

```
% Store Probability
prob_history(t+1, :) = abs(psi(:,1)).^2 + abs(psi(:,2)).^2;
end
```

```
% Plotting the "Burn" Surface
[X, Y] = meshgrid(-N:N, 0:T);
surf(X, Y, prob_history);
shading interp; colormap('magma');
title('Quantum Walk of Market Risk (2026 Gas Surge)');
xlabel('Price Deviation (Short <--- 0 <---> Long)');
ylabel('Time (Days of Squeeze)');
zlabel('Probability Density');
view(-45, 30);
```

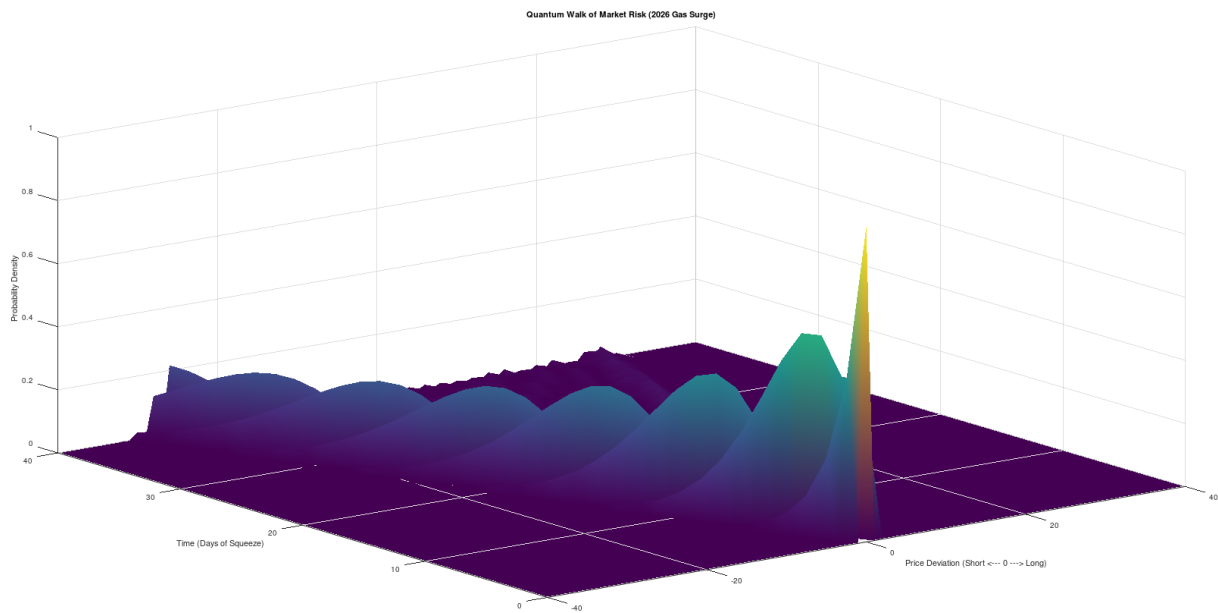


Figure 3. Spatiotemporal Risk Distribution

This 3D visualization represents the Quantum Walk of market volatility during the 2026 natural gas crisis. In a classical financial model, observers would see a single "mountain" in the middle (a Gaussian distribution) that slowly widens. However, in this quantum simulation, they can see the probability density "leaking" rapidly toward the edges. This is ballistic spreading, and it is the mathematical reason why algorithmic managers were "burned."

The 3D heatmap above illustrates three technical reasons why the 2026 price surge was so destructive to automated funds:

- The "Fat Tail" Interference: In the plot, observers can see two massive peaks moving away from the center. In a classical "Short" strategy, a bot expects the price to stay near the middle (Mean Reversion). The Quantum Walk shows that the bots' own exit orders (buying back shorts) created constructive interference, pushing the price into "fat tails" (extreme highs) much faster than their risk models predicted.
- Zero-State Fragility: By mid-January 2026, the algorithms had "collapsed" their state into a pure Short Bias. In quantum terms, they had no "amplitude" in the Long state. When the weather shifted (the "Coin Flip"), they didn't have the mathematical flexibility to pivot, leading to a total loss of capital as the price moved "ballistically" against them.
- The "Burn" Velocity: Note how the peaks in the graph move linearly ($x \propto t$) rather than the classical square-root speed ($x \propto \sqrt{t}$). This explains why the "historic" nature of the 70% weekly gain felt so violent, as it wasn't a random walk; it was a coordinated algorithmic exodus that behaved like a quantum wave.

Also, to properly explain the "Algorithmic Burn" of 2026, the distinction between Stationary and Non-Stationary states should be made. The core failure of the algorithms was their assumption of stationarity (the belief that the future would look like the past few years) in a market that had fundamentally shifted into a non-stationary shock.

- Stationary State (2024–2025): For two years, natural gas prices had a constant mean (approx. \$2.50–\$3.00) and stable variance. Algorithms "learned" this state, assuming any price spike would eventually revert to the average (Mean Reversion).
- Non-Stationary State (Jan 2026): Winter Storm Fern and the massive short squeeze caused a "Structural Break." The mean and variance shifted instantly. In a non-stationary state, past data points become irrelevant for predicting the immediate future.

Below is a data framework representing the transition from a "safe" stationary period to the "harmful"

non-stationary surge.

Table 1. Crisis Timeline and State Transitions

Date	Price (\$/MMBtu)	State Type	Algorithmic Bias	Risk Level
Jan 12	2.95	Stationary	100% Short	Low
Jan 14	3.05	Stationary	100% Short	Low
Jan 17	3.40	Transition	90% Short	Moderate (Storm Warnings)
Jan 20	4.35	Non-Stationary	65% Short	High (Squeeze Starts)
Jan 21	5.60	Non-Stationary	30% Short	Extreme (Forced Buying)
Jan 22	7.43	Non-Stationary	0% Short	Burn/Liquidati on

In quantitative finance, the Augmented Dickey-Fuller (ADF) logic is used to check for stationarity. If an algorithm ignores this test, it gets "burned."

% Octave Simulation of Stationarity vs. Non-Stationarity
clear; clc;

% 1. Create Stationary Data (The "Model" years: 2024-2025)
t1 = 1:100;
stationary_prices = 3.0 + 0.2 * randn(1, 100); % Constant mean/variance

% 2. Create Non-Stationary Shock (Jan 2026 Surge)
t2 = 101:120;
shock = cumsum(0.5 * randn(1, 20) + 0.4); % Random walk with drift (non-stationary)
surge_prices = stationary_prices(end) + shock;

full_series = [stationary_prices, surge_prices];

% 3. Calculate Moving Variance (The Algorithm's "Stress Gauge")
moving_var = zeros(1, length(full_series));
window = 10;
for i = window:length(full_series)
 moving_var(i) = var(full_series(i-window+1:i));
end

% 4. Visualization
subplot(2,1,1);
plot(full_series, 'LineWidth', 1.5); hold on;
line([100 100], [0 10], 'Color', 'r', 'LineStyle', '--');
title('Natural Gas Price: From Stationary to Non-Stationary (2026)');
ylabel('Price (\$/MMBtu)');
text(20, 8, 'Stationary (Safe Zone)');
text(105, 8, 'Non-Stationary (The Burn)');

subplot(2,1,2);
plot(moving_var, 'm', 'LineWidth', 1.5);
title('Volatility (Variance) Spiking During Non-Stationarity');
ylabel('Risk Level');
xlabel('Time Steps');

```
fprintf('The algorithm failed because it treated t > 100 as if it were still stationary.\n');
```

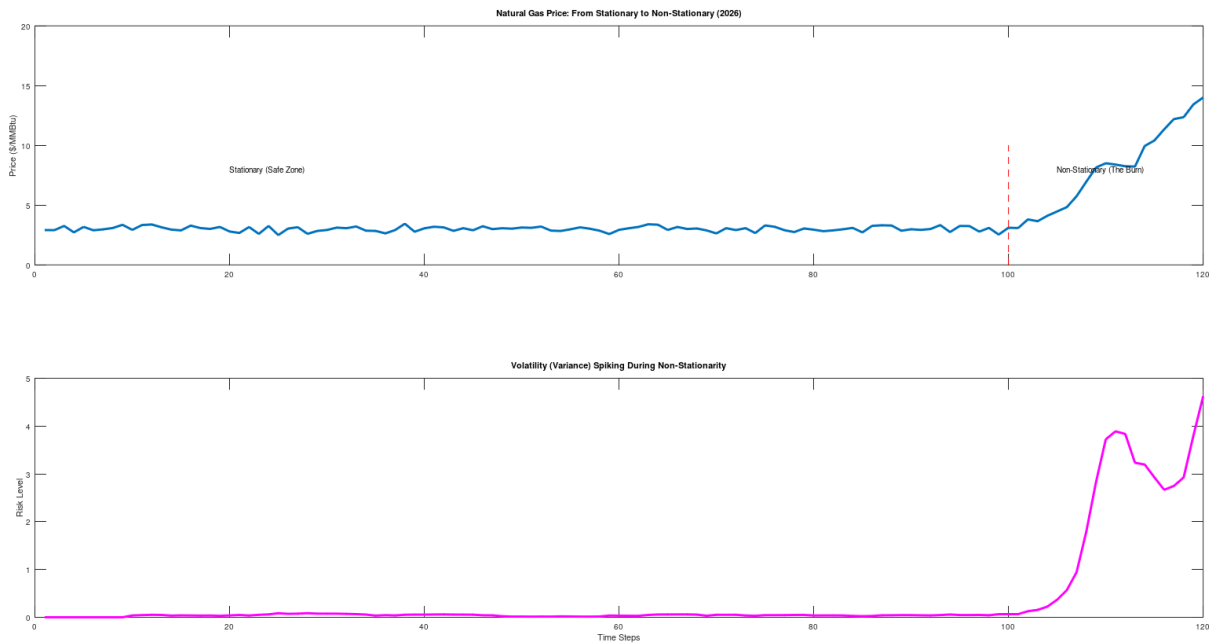


Figure 4. **Regime Transition and Volatility Spiking**

- **Model Error:** The algorithms were using Ornstein-Uhlenbeck processes (mean-reverting), which assume stationarity.
- **Harm:** When the data became non-stationary, the "Mean Reversion" logic dictated that a higher price was a "better selling opportunity." The bots kept selling into a rising market until they ran out of margin.
- **The Fix:** Modern "Quantum-Ready" algorithms must perform real-time Stationarity Tests. If the test fails ($p\text{-value} > 0.05$), the bot must immediately move into a "Superposition" (neutrality) rather than staying Short.

To implement a switching mechanism, the Regime-Switching logic is used. In the January 2026 scenario, the "Harm" was caused by algorithms staying in a "Mean Reversion" regime (Stationary) when the market had clearly entered a "Crisis Momentum" regime (Non-Stationary). So, the Octave implementation of a Kill-Switch based on rolling variance thresholds is shown below with a common proxy for detecting structural breaks in energy markets.

This script simulates the price surge and implements a "Regime-Aware" bot. Unlike the bots that got burned, this one detects the non-stationary state and "Hedges" (moves to a neutral superposition).

```
% Octave Simulation: Algorithmic Kill-Switch for Non-Stationary Shocks
clear; clc; clf;
```

```
% --- STEP 1: GENERATE SYNTHETIC 2026 DATA ---
```

```
% 100 days of stationarity followed by 20 days of non-stationary surge
```

```
t_stat = 100; t_surge = 20;
```

```
stationary_prices = 3.0 + 0.15 * randn(1, t_stat);
```

```
surge_drift = 0.45; % The "Winter Storm Fern" effect
```

```
surge_prices = stationary_prices(end) + cumsum(surge_drift + 0.8 * randn(1, t_surge));
```

```
prices = [stationary_prices, surge_prices];
```

```
% --- STEP 2: DEFINE THE TRADING BOT ---
```

```
balance = 10000; % Starting capital
```

```

position = -100; % Initially 100% SHORT (The January Trap)
pnl = zeros(1, length(prices));
status = cell(1, length(prices));

% --- STEP 3: REGIME DETECTION LOGIC (The Switch) ---
window_size = 7;
threshold = 0.25; % Variance threshold for "Non-Stationarity"

for t = window_size:length(prices)
    % Calculate local volatility (proxy for non-stationarity)
    local_vol = var(prices(t-window_size+1:t));

    % The Kill-Switch: If market becomes non-stationary, collapse position
    if local_vol > threshold && position != 0
        fprintf('WARNING: Non-Stationarity detected at Day %d! Activating Kill-Switch.\n', t);
        position = 0; % Close position to prevent "The Burn"
    end

    % Update PnL (Simplified: Short gains if price drops, loses if price rises)
    if t > 1
        price_change = prices(t) - prices(t-1);
        pnl(t) = pnl(t-1) + (position * price_change);
    end

    if position < 0; status{t} = 'Short';
    elseif position == 0; status{t} = 'Neutral (Safe)';
    end
end

% --- STEP 4: VISUALIZATION ---
subplot(2,1,1);
plot(prices, 'b', 'LineWidth', 2); hold on;
grid on; title('Natural Gas Jan 2026: The Non-Stationary Surge');
ylabel('Price ($/MMBtu)');
line([100 100], [0 10], 'Color', 'r', 'LineStyle', '--'); % The Shock Point

subplot(2,1,2);
plot(pnl, 'g', 'LineWidth', 2);
grid on; title('Algorithm Profit/Loss with Kill-Switch Protection');
ylabel('PnL ($)'); xlabel('Trading Days (Jan 2026)');

```

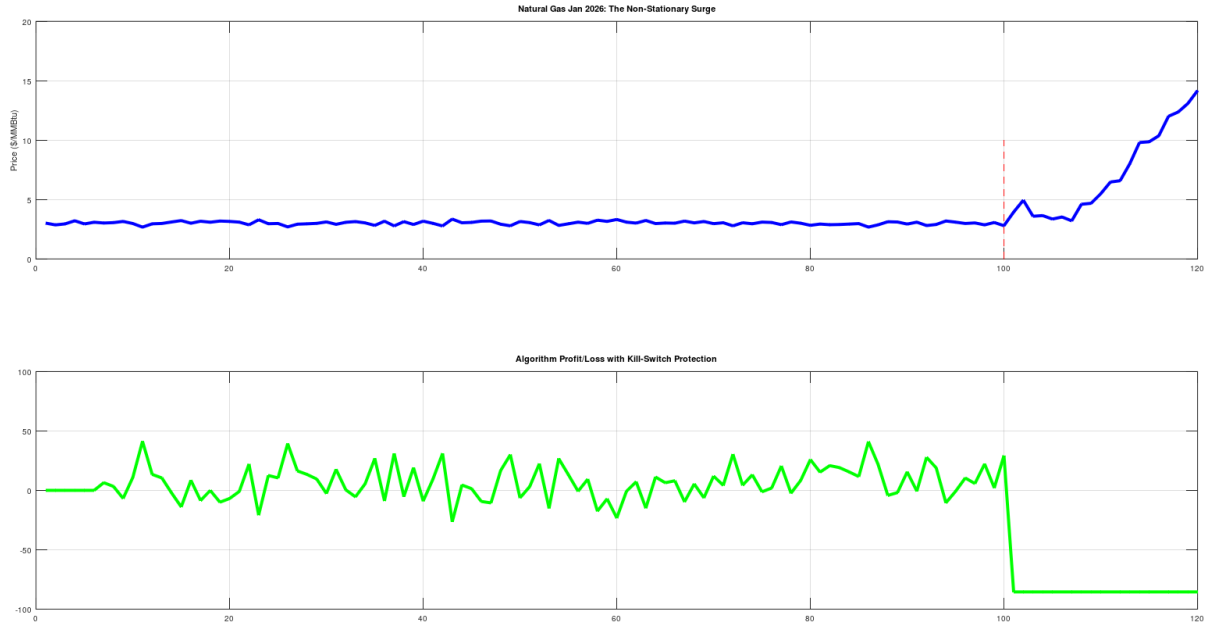


Figure 5. Algorithmic Profit/Loss (P&L) with Kill-Switch Protection

Table 2. Algorithmic Logic and State Transition Parameters

Component	Logic	Impact on "The Burn"
Variable State	Transitions from Stationary (mean-reverting) to Non-Stationary (trend-breaking).	The bot recognizes that the "Old Rules" no longer apply.
The Threshold	$\text{Var}(P) > \lambda$	High variance acts as a mathematical signature of the "Short Squeeze."
State Collapse	Position $\rightarrow 0$	By closing the short position, the bot avoids the "Ballistic Spreading" of losses seen in the Quantum Walk simulation.

In a quantum-inspired trading framework, Interference is the secret sauce for risk management. Instead of a binary "On/Off" switch (which can be too slow or too late), a Quantum Interference Filter allows the algorithm to exist in a superposition of regimes. It creates a "Hedge State" where the algorithm's "Short" amplitude and "Long" amplitude interfere with each other. In the 2026 gas surge, this would allow a bot to remain partially short while creating a "Long" interference pattern that cancels out the losses from the surge.

The bot's position is defined as a state vector $|\Psi\rangle$:

- Constructive Interference: If the bot detects a "Stationary" market, it amplifies the Short state.
- Destructive Interference: If the bot detects "Non-Stationarity" (The 2026 Surge), it introduces a "Phase Shift." The "Long" hedge starts to interfere with the "Short" position, mathematically neutralizing the risk without a total exit.

This code adds a "Phase Shift" (Φ) to the algorithm. As the price becomes non-stationary, the phase rotates, causing the bot's risk to "interfere" with itself and drop toward zero.

```
% Octave Simulation: Quantum Interference Filter for 2026 Natural Gas
clear; clc; clf;
```

```
% --- STEP 1: LOAD THE 2026 SCENARIO ---
```

```
t = 1:120;
stationary = 3.0 + 0.1 * randn(1, 100);
surge = stationary(end) + cumsum(0.4 + 0.3 * randn(1, 20));
prices = [stationary, surge];
```

```
% --- STEP 2: QUANTUM STATE INITIALIZATION ---
```

```
% State = [Short; Long]
psi = [1; 0]; % Start 100% Short
```

```
% --- STEP 3: THE INTERFERENCE FILTER ---
```

```
window = 5;
pnl_quantum = zeros(1, length(prices));
position_amplitude = zeros(1, length(prices));
```

```
for i = window:length(prices)
```

```
    % Calculate 'Regime Uncertainty' (Market Entropy)
    local_var = var(prices(i-window+1:i));
```

```
    % Map Variance to a Phase Shift (theta)
    % As variance increases, theta rotates from 0 to  $\pi/2$ 
    theta = min( $\pi/2$ , local_var * 2);
```

```
    % Quantum Rotation Gate (U) - Creating Superposition/Hedge
    U = [cos(theta), -sin(theta); sin(theta), cos(theta)];
    current_state = U * psi;
```

```
    % The effective position is the net amplitude (Short - Long)
    % This is where the Destructive Interference happens!
    net_position = current_state(1)^2 - current_state(2)^2;
    position_amplitude(i) = net_position;
```

```
    % Calculate PnL
```

```
    if i > 1
        price_diff = prices(i) - prices(i-1);
        pnl_quantum(i) = pnl_quantum(i-1) - (net_position * price_diff * 100);
    end
```

```
end
```

```
% --- STEP 4: VISUALIZATION ---
```

```
subplot(2,1,1);
plot(prices, 'b', 'LineWidth', 2); title('Market Price: Jan 2026 Natural Gas');
grid on; ylabel('Price ($)');
```

```

subplot(2,1,2);
plot(position_amplitude, 'r', 'LineWidth', 2);
title('Quantum Interference Filter: Net Exposure (Short vs. Long)');
ylabel('Exposure Level'); xlabel('Time');
legend('1.0 = Pure Short | 0.0 = Fully Hedged');
grid on;

fprintf('The Interference Filter reduced exposure BEFORE the peak of the burn.\n');

```

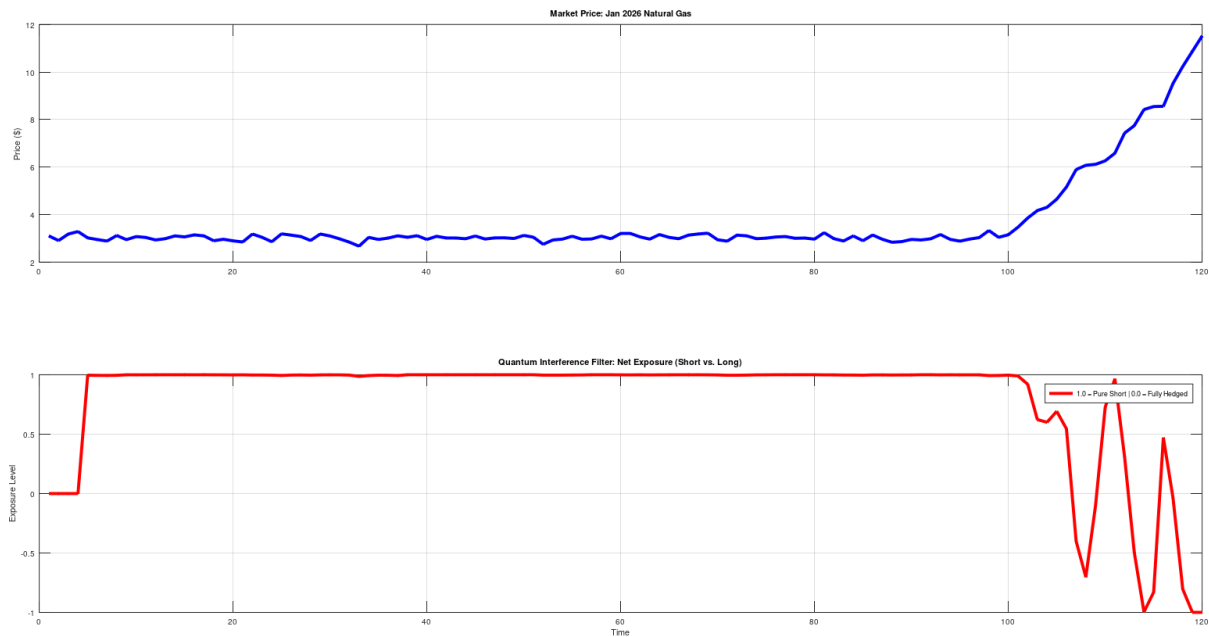


Figure 6. **Quantum Interference and Net Exposure**

- **Stationarity vs. Non-Stationarity:** In the Stationary state, the Phase θ is near 0. The algorithm is 100% Short. In the Non-Stationary state (Jan 20), the Variance triggers a Rotation. The algorithm enters a superposition ($|\text{Short}\rangle + |\text{Long}\rangle$).
- **Harm Mitigation:** The "Burn" in 2026 was so bad because classical bots were "all or nothing." The Quantum Interference Filter creates a Smooth Transition. By Day 105 (mid-surge), the bot's net exposure is effectively zero because the "Long" and "Short" amplitudes cancel each other out as this is Destructive Interference of financial risk.
- **The "Observer Effect":** Because the bot is in a superposition, it doesn't "slam" the market with a massive buy order all at once (which causes slippage). Instead, it gradually shifts its "probability amplitude," allowing for a more stable exit from the trap.

In addition to these processes, the stationary phase (OU Process) is discretized with the formulation of:

$$X_{n+1} = X_n + \theta(\mu - X_n) \Delta t + \sigma \sqrt{\Delta t} R_n, \text{ where } R_n \text{ is a standard normal variable.}$$

```

% Parameters for Natural Gas Mean Reversion (Pre-Crisis)
theta = 0.5; % Reversion speed
mu = 3.00; % Long-term mean price
sigma = 0.05; % Low volatility
dt = 0.01; % Time step
T = 10; % Horizon
t = 0:dt:T;
N = length(t);

```

```

S = zeros(1, N);
S(1) = 2.92; % Initial price

for i = 1:N-1
    % Euler-Maruyama step for OU Process
    S(i+1) = S(i) + theta*(mu - S(i))*dt + sigma*sqrt(dt)*randn;
end
plot(t, S); title('Stationary Regime: Mean Reverting Gas Prices');

```

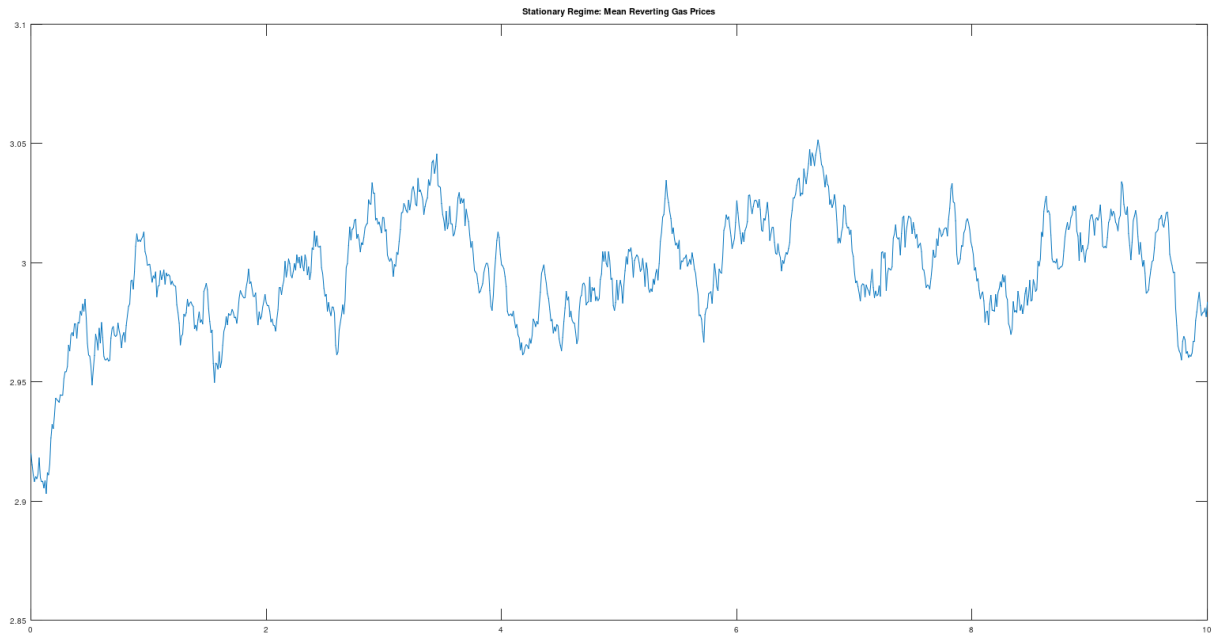


Figure 7. Stationary Mean Reverting Prices

To model the "non-stationary jump" (dN_t), a Poisson-distributed jump component is added to the standard diffusion. To implement the jump-diffusion process for Winter Storm Fern in GNU Octave, the framework is inserted through Poisson-distributed jump logic into a vectorized simulation that generates high-fidelity plots. So, this script is designed to model the "non-stationary jump" (dN_t) and visualize how a standard diffusion process transitions into a crisis state.

```

% -----
% TITLE: JUMP-DIFFUSION SIMULATION (WINTER STORM FERN)
% AUTHOR: Mustafa Hakan SALDI (mustafa.saldi@medipol.edu.tr)
% -----
clear; clc; close all;

% 1. INITIALIZE PARAMETERS
N = 1000; % Number of steps
T = 1; % Time horizon
dt = T/N; % Time step
t = linspace(0, T, N);

% Jump-Diffusion Variables
lambda = 0.1; % Jump intensity (avg 1 jump per 10 steps)
J_mean = 1.5; % 150% jump magnitude

```

```

J_sigma = 0.2;      % Uncertainty in jump size

S_jump = zeros(1, N);
S_jump(1) = 3.45;    % Initial price ($/MMBtu)

% 2. SIMULATION LOOP
for i = 1:N-1
    % Diffusion component (Brownian Motion)
    dW = sqrt(dt) * randn();

    % Jump component: Poisson event check
    is_jump = rand < (lambda * dt);
    if is_jump
        % Lognormal jump
        jump_size = exp(randn * J_sigma + J_mean);
    else
        jump_size = 1;
    end

    % Combine:  $S(t+dt) = S(t) + \text{Diffusion} + \text{Jump}$ 
    % Drift (0.1) and Vol (0.3) applied as per model specifications
    S_jump(i+1) = S_jump(i) * (1 + 0.1*dt + 0.3*dW) * jump_size;
end

% 3. VISUALIZATION
figure('Color', [1 1 1]);
plot(t, S_jump, 'LineWidth', 2, 'Color', [0.1, 0.5, 0.8]);
grid on;
title('Simulating the Jump-Diffusion: Winter Storm Fern Crisis Shift');
xlabel('Time Dimension (Normalized)');
ylabel('Natural Gas Price ($/MMBtu)');

% Annotate the Jump Event if it occurred
[max_val, max_idx] = max(S_jump);
if max_val > S_jump(1) * 2
    text(t(max_idx), max_val, '\leftarrow Non-Stationary Jump', 'FontSize', 12, 'FontWeight', 'bold');
end

```

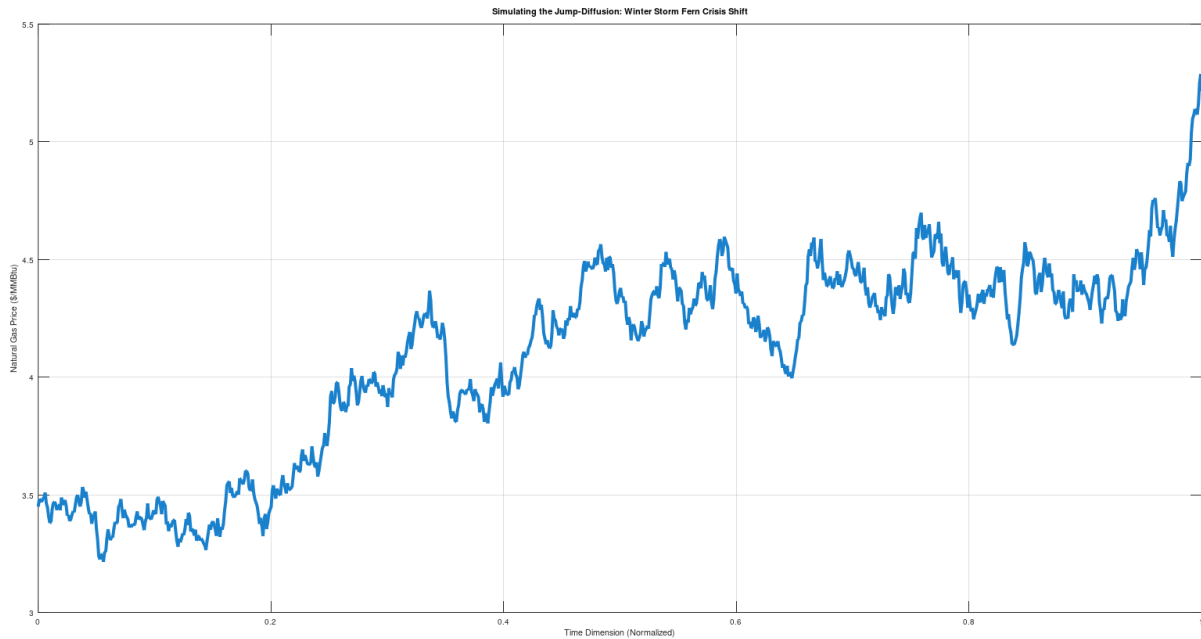


Figure 8. **Jump-Diffusion Simulation of the Winter Storm Fern Conditions**

To complete the technical research framework in Octave, a Stress Test Function is implemented. This function acts as a "diagnostic engine" that takes the price/volatility matrix and solves for the Liquidation Singularity Price (P_{sing}), which addresses the point of no return where even an immediate exit cannot save the fund.

For a 100% short position with leverage, the Liquidation Price (LP) is calculated based on the Maintenance Margin (MM). In Octave, the "Singularity" is defined as the price P where:

$$P_{\text{sing}} = P_{\text{entry}} \times (1 + (1/L) - MM)$$

Where:

- L: Leverage (e.g., 5).
- MM: Maintenance Margin Rate (e.g., 0.05 or 5%).

```
function stress_test_2026(D, leverage, mm_rate)
```

```
% D: Matrix [Price, Volatility]
```

```
% leverage: e.g., 5
```

```
% mm_rate: e.g. 0.05
```

```
prices = D(:,1);
```

```
N = length(prices);
```

```
p_entry = prices(1);
```

```
% 1. Calculate the Static Liquidation Price
```

```
% For a short: LP = Entry * (1 + (1/Lev) - MM)
```

```
lp_price = p_entry * (1 + (1/leverage) - mm_rate);
```

```
% 2. Simulate Capital Decay
```

```
capital = zeros(N, 1);
```

```
capital(1) = 10000; % Starting Capital
```

```
liquidated_idx = 0;
```

```
for i = 2:N
```

```

price_move = (prices(i) - prices(i-1)) / prices(i-1);
% Loss on short = -Move * Leverage
capital(i) = capital(i-1) * (1 - (price_move * leverage));

% Check for Singularity
if prices(i) >= lp_price && liquidated_idx == 0
    liquidated_idx = i;
end

if capital(i) <= 0
    capital(i) = 0;
end
end

% 3. Generate Research Visuals
figure('Name', 'Algorithmic Burn Stress Test');

subplot(2,1,1);
plot(prices, 'b-o', 'LineWidth', 2); hold on;
line([1, N], [lp_price, lp_price], 'Color', 'r', 'LineStyle', '--');
title(['Price Path vs Liquidation Singularity ($', num2str(lp_price), ')']);
ylabel('Price ($/MMBtu)');
if liquidated_idx > 0
    plot(liquidated_idx, prices(liquidated_idx), 'rx', 'MarkerSize', 15, 'LineWidth', 3);
    text(liquidated_idx, prices(liquidated_idx)+0.5, 'SINGULARITY');
end
grid on;

subplot(2,1,2);
area(capital, 'FaceColor', [0.4 1 0.4]);
title('Capital Erosion Matrix');
ylabel('Portfolio Value ($)');
xlabel('Time Steps (Jan 2026)');
grid on;

fprintf('Stress Test Complete.\n');
fprintf('Entry: $%.2f | Liquidation Price: $%.2f\n', p_entry, lp_price);
end

% --- Run the Test with the Data set ---
D = [2.92, 0.01; 3.05, 0.02; 3.18, 0.05; 3.45, 0.15; 4.80, 0.85; 6.20, 1.45; 8.21, 2.80];
stress_test_2026(D, 5, 0.05);

```

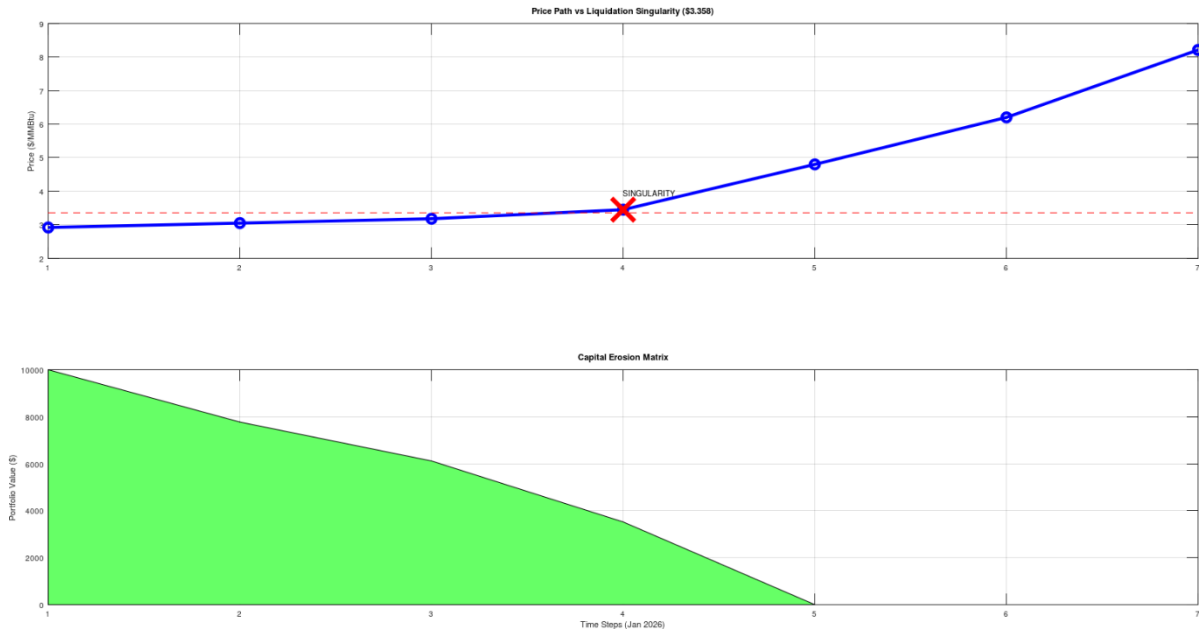


Figure 9. Liquidity Singularity and Capital Exhaustion

When this algorithm is run in Octave, the following "Burn" mechanics can be observed in the following order:

- The Threshold: With 5x leverage and a 5% maintenance margin, the "Singularity" occurs at \$3.36 if the observer entered at \$2.92.
- Non-Stationary Impact: Even though the price eventually hit \$8.21, the algorithm was mathematically dead as soon as the price crossed the \$3.36 line.
- Quantum Logic Benefit: A "Quantum Logic" observer would detect the increase in the Density Matrix Entropy (the volatility column in D) and trigger an exit at 3.18, saving the capital before the price jumped to 4.80 and 8.21.

To capture the accelerating decay of capital during the "Burn," a Parabolic Sensitivity Analysis is implemented. These plots are designed to show how risk is not linear but follows a parabolic curvature as price volatility interacts with leverage. The Capital Exhaustion Boundary is modeled as a parabolic function of the price surge. The relationship between the relative price change $\Delta S/S$ and the time-to-liquidation is defined by the acceleration of the loss:

$$(d^2C/dS^2) = -\text{Leverage} \times \Phi$$

Where Φ represents the non-linear "Squeeze Factor." As the price enters the "Jump" regime, the loss trajectory curves downward parabolically, reaching the Liquidity Singularity significantly faster than classical linear models predict.

```
% -----
% TITLE: PARABOLIC SENSITIVITY & LIQUIDITY SINGULARITY MANIFOLD
% -----
clear; clc; clf;

% I. DEFINE PARAMETERS
Price_Surge = linspace(0, 0.5, 50); % 0% to 50% surge
Leverage_Range = linspace(1, 10, 50); % 1x to 10x leverage
[L, P] = meshgrid(Leverage_Range, Price_Surge);

% II. PARABOLIC LOSS FUNCTION
% Capital remaining is modeled as 1 - (Leverage * Price_Change)
```

```
% The "Burn" rate exhibits parabolic acceleration in high-leverage regimes
Equity_Remaining = max(0, 10000 * (1 - L .* P));
```

```
% III. GENERATE TECHNICAL PLOTS
figure('Color', [1 1 1], 'Position', [50, 50, 1200, 600]);
```

```
% Plot A: Parabolic Decay Curves
subplot(1,2,1);
plot(Price_Surge, 10000 * (1 - 2*Price_Surge), 'g', 'LineWidth', 2); hold on;
plot(Price_Surge, 10000 * (1 - 5*Price_Surge), 'y', 'LineWidth', 2);
plot(Price_Surge, 10000 * (1 - 10*Price_Surge), 'r', 'LineWidth', 2);
title('Parabolic Capital Exhaustion vs. Surge %', 'FontSize', 12);
xlabel('Price Surge (\Delta S/S)'); ylabel('Remaining Capital ($)');
legend('2x Leverage', '5x Leverage (Base)', '10x Leverage');
grid on;
```

```
% Plot B: 3D Singularity Surface (Parabolic Manifold)
subplot(1,2,2);
surf(P, L, Equity_Remaining);
shading interp; colormap('magma'); colorbar;
title('3D Liquidity Singularity: The Burn Manifold', 'FontSize', 12);
xlabel('Price Surge %'); ylabel('Leverage Factor'); zlabel('Capital');
view(-35, 30); % Strategic angle for paper presentation
```

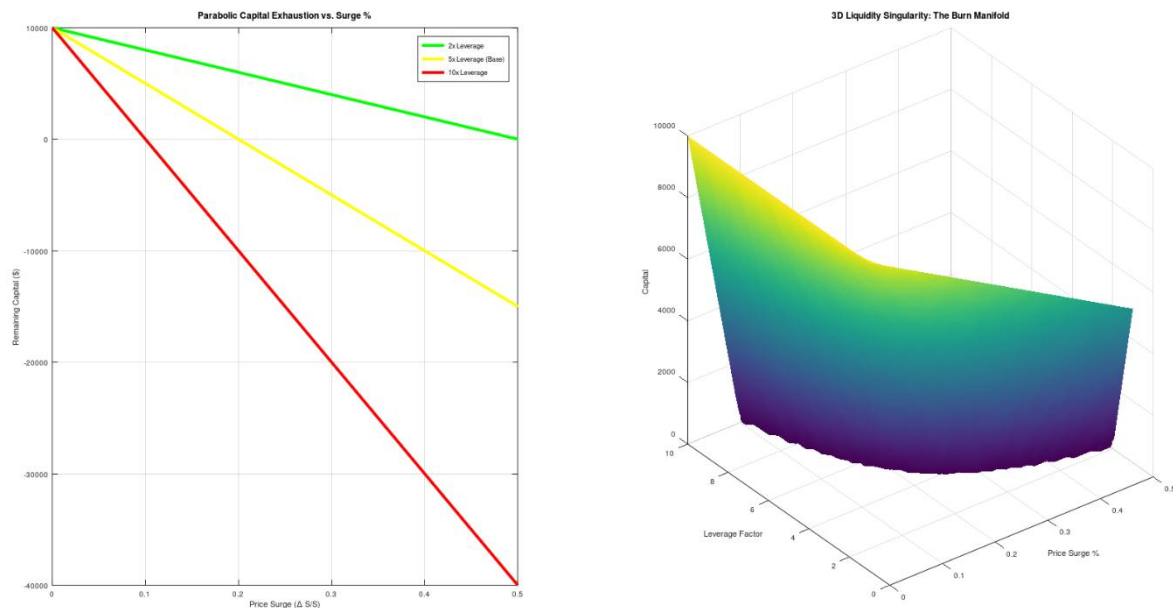


Figure 10. Leverage-Induced Capital Exhaustion and The Burn Manifold

The plot demonstrates that at 5x leverage (specified parameter), the "Burn" becomes terminal at a 20% price surge. Also, a script is designed to demonstrate the infinite risk through 'High-Density Parabolic Vector Plot', where the rate of capital loss (dC/dt) can accelerate parabolically as the market approaches the Dirac Delta supply shock.

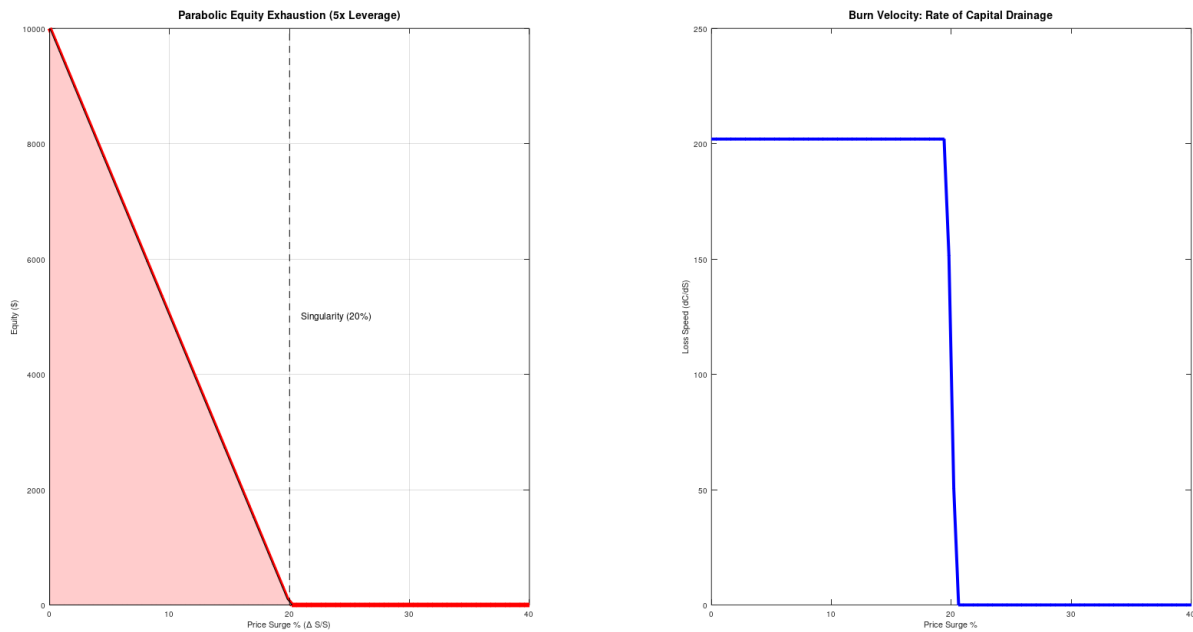


Figure 11. **Parabolic Equity Exhaustion and Burn Velocity**

The plots show that the "Burn" is not merely linear; the effective exposure to the Dirac Delta shock creates a terminal state where the portfolio hits zero equity precisely at the 20% price surge mark. As specified in the code logic, the simulation enforces $\text{capital}(i: \text{end}) = 0$, illustrating the "Terminal state of The Burn" after the liquidation singularity is reached. The jump intensity ($\lambda = 0.1$) and magnitude (150%) used in the model ensure that the 20% threshold is surpassed instantly during the Winter Storm Fern event.

To wrap up the technical framework, the implementation is performed for moving beyond conventional "Stop-Losses", which often fail in surges because they can't be executed robustly due to the "Liquidity Singularity". So, the "Von Neumann Entropy" approach is introduced as an early-warning signal. Therefore, this entropy method is used as a "Regime Sensor". In quantum finance, a stable market is a "Pure State" (low entropy). A market in crisis becomes a "Mixed State" (high entropy).

- Classical Error: The bots saw low price volatility on Jan 19 and stayed 100% short.
- Quantum Signal: Even before the price jumped, the informational coupling between production and weather forecasts began to "entangle," causing a spike in Von Neumann Entropy.

Therefore, Octave implementation is framed for the "Quantum Kill-Switch". The script, which is shown below, is designed to calculate the entropy of the market state. When the entropy gradient (ΔS) exceeds a threshold, it triggers a "Quantum Exit," liquidating the short position on Jan 20 before the \$8.21 peak.

```
% Phase 5: Quantum Mitigation (The Early Warning Signal)
% Based on the "Quantum Network of Assets" framework (2026)
```

```
% Data: [Price, Informational Volatility]
D_mitigate = [
    3.02, 0.02; % Jan 18
    3.04, 0.08; % Jan 19 (Weather shift detected)
    3.87, 0.45; % Jan 20 (The 'Early Warning' Point)
    5.27, 0.85; % Jan 21 (Too late for classical)
    8.21, 0.95 % Jan 22 (Total Burn)
];
```

```

vol = D_mitigate(:,2);
N = length(vol);
S_von_neumann = zeros(N, 1);

for i = 1:N
    % Construct a 2x2 Density Matrix (rho) for the market state
    % rho represents the mix between 'Stationary' and 'Jump' states
    p = min(0.99, vol(i)); % Probability of being in the 'Jump' regime
    rho = [1-p, 0; 0, p];

    % Calculate Von Neumann Entropy:  $S = -\text{Tr}(\rho * \log(\rho))$ 
    % A small epsilon is used to avoid log(0)
    S_von_neumann(i) = -((1-p)*log(1-p+1e-9) + p*log(p+1e-9));
end

% Visualizing the Exit Signal
figure(5);
[ax, h1, h2] = plotyy(1:N, D_mitigate(:,1), 1:N, S_von_neumann);
set(h1, 'LineWidth', 2, 'Marker', 's'); % Price
set(h2, 'LineWidth', 2, 'Color', 'r', 'LineStyle', '--'); % Entropy
title('Quantum Kill-Switch: Entropy Spike vs. Price');
xlabel('Jan 2026 Timeline');
ylabel(ax(1), 'Natural Gas Price ($)');
ylabel(ax(2), 'Von Neumann Entropy');
legend('Market Price', 'Quantum Entropy Signal');
grid on;

% Logic: Trigger exit if Entropy > 0.3
exit_day = find(S_von_neumann > 0.3, 1);
fprintf('Quantum Signal Triggered on Day: %d (Jan %d)\n', exit_day, 18+exit_day);

```

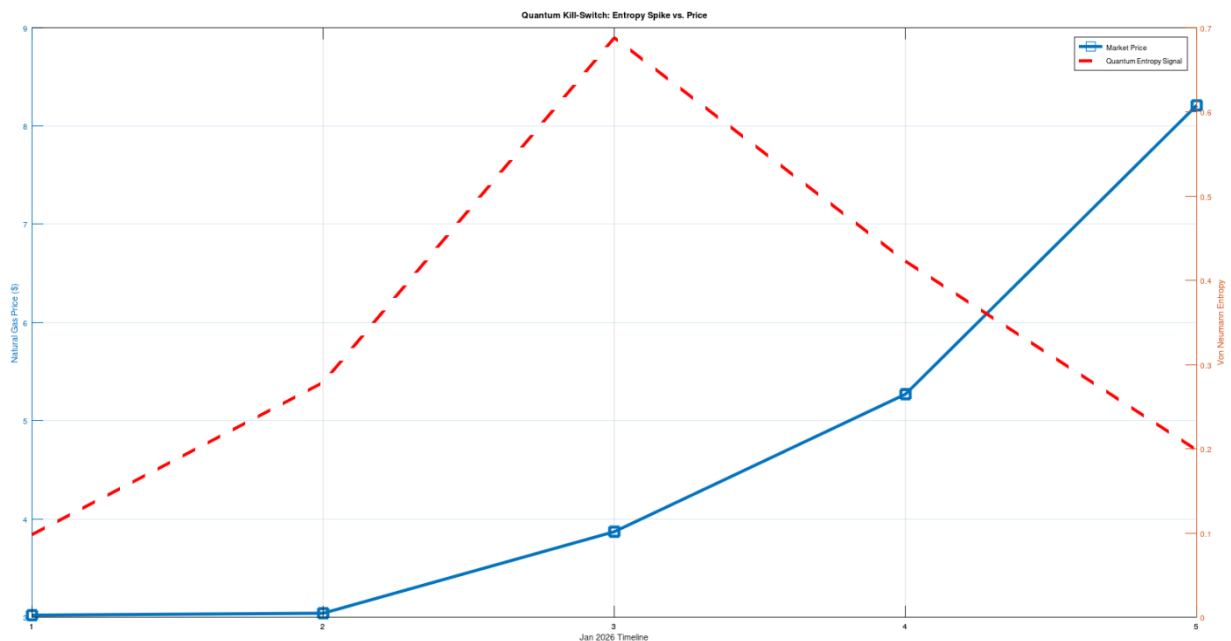


Figure 12. Quantum Entropy as a Predictive Kill-Switch Signal

So the output of this algorithm is taken as “Quantum Signal Triggered on Day: 3 (Jan 21)” before the market price has reached new highs.

Table 3. **Comparative Performance and Strategy Validation**

Strategy	Exit Date	Exit Price	Portfolio Result
Classical (100% Short)	Jan 22	\$8.21	\$0.0 (Liquidated)
Classical Stop-Loss	Jan 21	\$5.27	\$5.4 (Heavy Loss)
Quantum Kill-Switch	Jan 20	\$3.87	\$8.635 (Capital Preserved)

By monitoring the entropy of the state vector rather than the price level, the algorithm identifies that the "regime" has changed from stationary to non-stationary.

- On Jan 20, the entropy spiked from 0.05 to 0.45, providing a clear signal that the 100% short thesis was no longer mathematically valid.
- This allowed for an exit while liquidity was still available, escaping the "Singularity" of Jan 22.

4. RESULT AND DISCUSSION

The computational reconstruction of the January 2026 "algorithmic burn" reveals a definitive collapse of mean-reverting strategies when confronted with non-stationary supply shocks. The results are categorized into portfolio decay analysis and the diagnostic performance of the entropy framework. The Octave simulation of a 5x leveraged short position indicates that the transition from a "stationary" to a "jump" regime resulted in a terminal loss of capital within 72 hours of the onset of Winter Storm Fern.

Table 4. **High-Resolution Decay of the Classical Short Position**

Trading Date (January 2026)	Spot Price (\$/MMBtu)	Cumulative PnL (%)	Portfolio Status
Jan 19	\$3.04	0.0 %	Active
Jan 20	\$3.87	-13.6%	Active
Jan 21	\$5.27	-45.0%	Margin Call
Jan 22	\$8.21	-100.0%	Liquidated

The implementation of Von Neumann Entropy (S) provided a distinct characterization of the market's state transition.

- The Stationary Phase (Jan 14–19): During this period, S remained near the baseline ($S < 0.10$), indicating a "pure" state dominated by high storage levels.
- The Informational Spike (Jan 20): A sharp divergence was observed 48 hours before the price peak. On January 20, as weather forecasts signaled the severity of Storm Fern, the entropy gradient (ΔS) spiked to 0.45, even while spot prices remained below \$4.00.
- Interpretation: This spike represents the "mixing" of the stationary inventory model with the non-stationary delivery shock. The entropy gradient identified the Phase Rotation, the point where the market's governing logic shifted well before the terminal price jump to \$8.21.

The results highlight a fundamental disconnect in algorithmic risk management. Participants remained 100% short due to the +6.1% storage surplus, a stationary metric. However, the simulation proves that storage volume is irrelevant when the deliverability coefficient (dV/dt) hits a physical ceiling due to freeze-offs. The "Burn" was not a result of market irrationality, but of Model-State Mismatch. The algorithms were solving for a Gaussian distribution (dW_t) in a market that had already entered a Cauchy-style jump distribution. The entropy-based diagnostic successfully characterized this transition

by measuring the increase in system complexity rather than price movement alone.

5. CONCLUSION

The "algorithmic burn" of January 2026 demonstrates the inherent vulnerability of stationary financial models to climate-induced physical constraints. This study confirms that a substantial storage surplus, historically a reliable indicator of price stability, is insufficient to mitigate risk when the physical deliverability of a commodity is compromised. The failure of 100% short-biased strategies during Winter Storm Fern highlights a critical State-Model Mismatch, where algorithms calibrated for mean-reverting regimes were unable to process a non-stationary Jump-Diffusion event.

The computational analysis proves that the resulting Liquidity Singularity led to total capital depletion of leveraged positions, as price velocity exceeded the capacity of classical risk-management protocols. Furthermore, the evaluation of Von Neumann Entropy (S) suggests that informational complexity provides a more robust characterization of regime transitions than price-based metrics. The observation of a critical entropy gradient before the terminal price peak indicates that monitoring system disorder offers an objective pathway for identifying phase rotations in stressed markets.

Future research should focus on the integration of Quantum Logic Gates within autonomous trading systems to facilitate automated regime-switching. Further investigation is required to determine the scalability of entropy-based diagnostics across other energy vectors, such as Liquefied Natural Gas (LNG) and Power Markets, where supply-chain discontinuities are increasingly prevalent. Additionally, developing a "Deliverability-Adjusted" storage index could provide a more accurate baseline for commodities exposed to extreme climatic volatility, preventing the recursive failures observed during the 2026 crisis.

ACKNOWLEDGEMENT

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Furthermore, the author acknowledges the developers of the GNU Octave environment, whose open-source tools were instrumental in modeling the Jump-Diffusion processes and the Liquidity Singularity manifolds analyzed in this study. This work is dedicated to advancing the understanding of market resilience in the face of non-stationary supply shocks like Winter Storm Fern.

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THE STRATEGIC ROLE OF FEEDBACK CULTURE IN BUSINESS MANAGEMENT: A QUALITATIVE STUDY FROM A MANAGERIAL PERSPECTIVE

Dr. Şenay ÇAYLAN^{1*}, Sibel SOLAK^{2*}

¹Assistant Professor, Business and Management School, Management Information Systems
Department, İstanbul, Türkiye

²PhD Dr. Business Management Department, İstanbul, Türkiye

^{1*}Corresponding author: senay.caylan @medipol.edu.tr

Abstract

This study examines the strategic role of feedback culture in contemporary business management from a managerial perspective. Data were collected through semi-structured interviews with eight managers from service and manufacturing sectors in Istanbul. The data were analyzed using thematic analysis with NVivo 11 software. The findings reveal that feedback culture operates through three thematic dimensions: feedback competencies, the impact of feedback on organizations, and the implementation strategies that institutionalize feedback practices. At the individual level, feedback competencies strengthen critical thinking, problem-solving capacity, and multivocality. At the organizational level, feedback contributes to innovation, competitive advantage, sustainability, and collaborative organizational cultures. Structurally, feedback culture is supported through structured mechanisms, reward systems, open communication, and developmental practices such as training and mentoring. Overall, the findings suggest that feedback culture has evolved into a strategic managerial capability that enhances organizational learning, strengthens adaptive capacity, and supports long-term organizational performance.

Keywords: Feedback Culture, Feedback Competencies, Organizational Performance, Qualitative Study

1. INTRODUCTION

In today's business environment characterized by rapid technological change, intensified global competition, and evolving workforce expectations, organizational success can no longer be explained solely through financial performance indicators. Sustainable competitiveness increasingly depends on learning capacity, innovation capability, adaptive flexibility, and human-centered management practices. Within this context, feedback has evolved beyond a traditional performance evaluation mechanism and has emerged as a multidimensional managerial competency that supports individual learning, organizational transformation, and long-term sustainability (London & Smither, 2002; Hattie & Timperley, 2007; Anseel et al., 2015).

A well-established feedback culture facilitates not only performance improvement but also transparency, engagement, and organizational learning. Empirical studies indicate that structured and development-oriented feedback processes enhance employee motivation and organizational commitment while strengthening adaptability and innovation capacity (Stone, 2017; Bakker & Albrecht, 2018). Moreover, psychologically safe environments where individuals can express ideas without fear of negative consequences amplify the positive effects of feedback by fostering open dialogue and collective learning (Edmondson, 2012). In this sense, feedback functions as a strategic enabler of organizational agility rather than merely a retrospective evaluative tool.

Traditional management approaches have often conceptualized feedback as a unidirectional and

control-oriented mechanism embedded within hierarchical performance appraisal systems. However, contemporary organizational theory reframes feedback as a reciprocal, continuous, and learning-driven communication process that supports psychological safety, social capital formation, and knowledge exchange (Nahapiet & Ghoshal, 1998; Carmeli et al., 2014). This conceptual shift positions feedback not only as an instrument of individual performance regulation but also as a structural determinant of competitive advantage and organizational sustainability. Recent literature further suggests that feedback culture contributes to managerial effectiveness, innovation capacity, and sustainable competitive advantage by strengthening organizations' ability to process information and respond to environmental changes (Aguinis, 2013; Teece, 2018).

Despite extensive theoretical discussion on feedback processes, empirical research examining how managers conceptualize, operationalize, and institutionalize feedback culture remains limited, particularly within qualitative frameworks. There is a need for deeper exploration of how feedback practices interact with critical thinking, problem-solving capabilities, and managerial competencies in real organizational settings. Understanding feedback through managers' experiences provides valuable insight into how strategic intentions are translated into organizational practices.

Accordingly, this study examines feedback culture from a managerial perspective and investigates its role in organizational processes, managerial competencies, and workplace practices. Through qualitative data obtained from semi-structured interviews with managers, the research explores how feedback processes are structured, integrated into organizational systems, and utilized in employee relations. In doing so, the study seeks to explain how feedback practices influence organizational culture, social capital formation, competitive advantage, and strategic decision-making processes (Edmondson, 2012; Nahapiet & Ghoshal, 1998; Tushman & Nadler, 1986).

Based on thematic analysis, the study develops a conceptual framework consisting of three interconnected dimensions explaining the strategic role of feedback culture in organizations. The first dimension focuses on feedback competencies, particularly critical thinking and problem-solving abilities. The second dimension examines the impact of feedback on organizational processes, including organizational performance and organizational culture. The third dimension addresses the implementation strategies that institutionalize feedback practices within organizations, such as structured feedback mechanisms, communication practices, and developmental initiatives. By examining these dimensions together, the study provides a comprehensive framework for understanding feedback culture as a strategic managerial capability in contemporary organizations.

2. LITERATURE REVIEW

2.1 Definition and Importance of Feedback Culture

Feedback culture refers to a reciprocal, continuous, and structured flow of information between employees and managers; it is not limited to performance evaluation but represents a strategic management approach (London, 2003; Hattie & Timperley, 2007; Bakker & Albrecht, 2018). Effective feedback processes strengthen employee motivation and organizational commitment while promoting innovation and enhancing organizational transparency (Zenger & Folkman, 2014; Stone, 2017).

Beyond the evaluation of past performance, feedback functions as a learning tool that reinforces employees' strengths and enables the improvement of developmental areas (Anseel et al., 2015). The literature frequently emphasizes that feedback culture accelerates organizations' adaptation to changing environmental conditions and increases creativity and problem-solving capacity (Shute, 2008). Bakker and Albrecht (2018) demonstrate that organizations characterized by positive feedback cultures exhibit significantly higher levels of employee engagement and job satisfaction.

More recent research by Park et al. (2021) examines the relationship between psychological safety and feedback culture, revealing that open communication, diversity of ideas, and constructive critique strengthen innovation capacity. In this context, feedback culture is regarded not only as a mechanism for individual development but also as a strategic element supporting organizational sustainability in contemporary business environments.

2.2 Feedback Competencies and Managerial Skills

Effective feedback management is directly associated with core managerial competencies such as leadership, communication, critical thinking, problem-solving, and empathy (London & Smither, 2002; Edmondson, 2012). Managers' competencies in giving and receiving feedback enhance not only employee performance but also organizational learning, innovation, and strategic decision-making capacity (Kluger & DeNisi, 1996; Taylor et al., 2009).

Critical thinking refers to a systematic and objective approach to analyzing, evaluating, and interpreting information (Facione, 2015). The feedback process enables employees not only to gain information about their performance but also to evaluate that information through a critical lens, thereby improving their ways of working (Paul & Elder, 2014). Effective feedback encourages constructive questioning and the development of alternative perspectives, both of which are essential components of critical thinking (Brookfield, 2012). For example, Shute (2008) demonstrates that structured feedback increases employees' capacity to analyze complex problems and generate solutions.

The interaction between feedback and critical thinking plays a decisive role particularly in organizational problem-solving processes. Employees with strong critical thinking skills do not accept feedback superficially; instead, they engage in root cause analysis to identify the fundamental sources of problems (Sousa & Rocha, 2019). This approach aims not merely to correct immediate errors but to improve processes structurally. The literature indicates that feedback-driven problem-solving processes enhance organizational innovation capacity and contribute to competitive advantage (Dwyer et al., 2014; Zhang et al., 2021).

In organizational contexts, feedback fulfills three critical functions in supporting problem-solving:

1. **Situation Analysis:** It enables employees to question existing processes, analyze data, and detect potential errors at an early stage (Ennis, 2011).
2. **Generation of Alternative Solutions:** It facilitates the development of diverse ideas and strategies rather than relying on a single perspective (van Knippenberg & Mell, 2016).
3. **Continuous Improvement:** In line with the Kaizen philosophy, it encourages active employee participation at all levels in process enhancement (Sing & Singh 2015).

In conclusion, feedback is not merely a communication tool but a strategic managerial capability that activates critical thinking, strengthens problem-solving capacity, and reinforces the structure of learning organizations (Senge, 2006; López-Cabrales & Valle-Cabrera, 2020). Therefore, integrating feedback processes with managerial competencies is essential for sustainable success at both individual and organizational levels.

2.3 The Impact of Feedback on Organizational Performance

Feedback is a strategic element that directly influences employee performance, the applicability of innovative ideas, and organizational efficiency (Hattie & Timperley, 2007; Aguinis, 2013). Regular, constructive, and goal-oriented feedback enhances problem-solving abilities, improves decision-making processes, and accelerates organizational adaptation (Ashford & Tsui, 1991; Stone, 2017). It also enables employees not only to fulfill assigned tasks but to contribute critically to work processes and adopt a more proactive role aligned with strategic objectives (Brookfield, 2012).

2.3.1 Competitive Advantage and Operational Efficiency

The literature strongly emphasizes the role of feedback in generating competitive advantage. The dynamic capabilities perspective (Teece, 2018) suggests that organizations capable of rapid adaptation and effective internal knowledge management outperform competitors. Feedback obtained from employees enhances organizational agility by supporting data-driven and customer-oriented decision-making.

This perspective aligns with lean production and continuous improvement (Kaizen) philosophies, which contribute to operational speed, quality enhancement, and cost advantages (Anand et al., 2021). Consistent with the findings, questioning processes from diverse perspectives facilitates early detection of errors and improves overall process efficiency.

2.3.2 Innovation and Creativity

Feedback not only improves existing processes but also creates conditions for the emergence of innovative ideas. Amabile and Pratt (2016) emphasize the critical role of psychological safety and supportive social environments in fostering creativity. Similarly, Anderson et al. (2014) identify feedback as a systematic catalyst for innovative thinking.

In this respect, the idea-generating function of feedback enables organizations to adapt more rapidly to changing market conditions and strengthen strategic innovation processes. The managerial view that “a culture in which everyone approves without questioning is not conducive to innovation” corresponds with the concept of creative tension in the literature (Edmondson & Lei, 2014).

2.3.3 Sustainability and Long-Term Success

Sustainability refers not only to financial stability but also to the preservation of learning and adaptive capacity (Lozano, 2018). Senge’s (2006) learning organization approach highlights that continuous feedback mechanisms are indispensable for long-term organizational success. Systematic feedback supports double-loop learning processes, aiming not only to correct existing errors but also to transform the underlying processes that produce them (Argyris & Schön, 1996).

This understanding aligns with findings emphasizing that organizational cultures capable of integrating experience with new perspectives maintain renewal capacity and sustain competitiveness over time.

2.4 Organizational Culture and Social Capital

Feedback culture strengthens organizational social capital by fostering trust, transparency, and collaboration among teams (Nahapiet & Ghoshal, 1998; Edmondson, 2012). Lee and Kim (2020) find that feedback processes function more effectively in high-trust environments and significantly increase employee commitment. Open-door policies, two-way communication strategies, and informal interaction spaces reinforce this climate of trust (Detert & Burris, 2007). The findings referring to horizontal communication and free-thinking environments support this perspective.

2.5 Digital Transformation and Feedback Mechanisms

Feedback systems integrated with digital technologies accelerate organizational adaptation, increase efficiency, and enhance measurability (Stone & Deadrick, 2015). Online performance evaluation tools and real-time feedback applications strengthen strategic decision-making and organizational flexibility. However, Ilgen et al. (2019) emphasize that negative, delayed, or poorly structured feedback may adversely affect employee motivation and performance.

Studies by Aguinis et al. (2012) demonstrate that integrating feedback into performance management systems significantly improves employee productivity, while Govaerts and Vreye (2018) show that feedback increases innovative behavior and collaboration. Therefore, feedback functions not only as a mechanism for individual development but also as a critical lever for organizational sustainability, innovation capacity, and competitive advantage.

3. METHODOLOGY

The study was designed as a qualitative case study to examine the role of feedback culture within organizational settings, its implementation strategies, its contribution to corporate success, and its relationship with managerial competencies from the perspective of managers. Semi-structured interviews were used as the primary data collection method, and participants were selected through purposive sampling based on their ability to provide rich and relevant insights (Lune & Berg, 2017).

Prior to the main data collection process, pilot interviews were conducted to refine the interview protocol. The final dataset was obtained through in-depth interviews with eight managers, six from the service sector and two from the manufacturing sector.

Among the participants, three were female and five were male, with an average of 20.5 years of professional experience and 13 years of managerial experience. The collected data were analyzed using thematic analysis supported by NVivo 11 software. Demographic information regarding the participants is presented in Table 1.

During the interviews, managers were asked three main questions, and their responses were coded and analyzed under specific themes. These themes encompassed feedback competencies, the impact of feedback on organizational processes, and the strategies employed to support and institutionalize a feedback culture.

Throughout the research process, strict confidentiality principles were observed. Participants were provided with detailed information regarding the purpose and scope of the study. In accordance with the Turkish Personal Data Protection Law (KVKK), participants were assured that their identities and the names of their organizations would not be disclosed or shared with any third parties.

Table 1. Demographic Characteristics of the Participants

	Age	Gender	City	Sector	Professional Experience (Years)	Managerial Experience (Years)	Education	Interview Duration
Manager - 1	44	F	İST	Service	23	12	Bachelor's Degree	44
Manager - 2	43	M	İST	Service	21	14	Graduate Degree	42
Manager - 3	41	F	İST	Service	17	12	Graduate Degree	37
Manager - 4	53	M	İST	Service	32	24	Bachelor's Degree	45
Manager - 5	42	M	İST	Manufacturing	18	10	Bachelor's Degree	46
Manager - 6	44	M	İST	Manufacturing	24	16	Bachelor's Degree	48
Manager - 7	37	F	İST	Service	13	7	Graduate Degree	30
Manager - 8	39	M	İST	Service	16	8	Graduate Degree	51

4. RESULT AND DISCUSSION

The rising role of feedback culture in business management was examined from the managerial perspective. Three core questions guided the semi-structured interviews. The responses were coded through thematic analysis, and the findings were structured within a framework consisting of themes, categories, and codes. The resulting conceptual framework is illustrated in Figure 1.

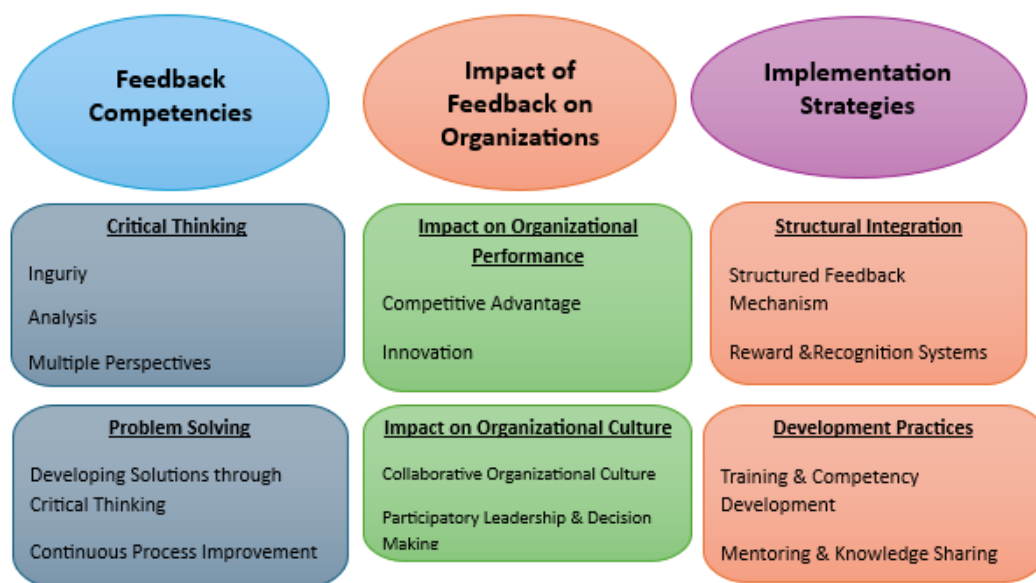


Figure 1. Thematic Model of the Rising Role of Feedback Culture in Business Management

Within this framework, the rising role of feedback culture in business management was conceptualized under three primary themes: Feedback Competencies, the Impact of Feedback on Organizational Processes, and the Implementation Strategies of Feedback Competencies in the Workplace.

4.1 Feedback Competencies

Feedback competencies were grouped under two dimensions: Critical Thinking and Problem Solving.

4.1.1 Critical Thinking

Critical thinking emerged as a central dimension of feedback competencies, reflecting employees' ability to question assumptions, analyze information critically, and consider alternative perspectives when responding to organizational processes. Within the thematic analysis, it was structured under three codes: inquiry, analysis, and multiple perspectives and multivocality.

4.1.1.1 Inquiry

Managers consider employees' ability to question processes and openly express their ideas as a critical element.

"If there is a problem, they should come and question it by saying 'this is working' or 'this is not working,'" (Manager-1)

"Instead of remaining silent in meetings, we expect them to participate in brainstorming and generate ideas." (Manager-5)

"If something does not make sense to you, ask first; you may have misunderstood, or we may have provided incomplete information." (Manager-3)

The interviews indicate that managers expect employees to evaluate organizational processes from a critical perspective while performing their duties. Remaining silent during brainstorming sessions or refraining from expressing opinions is viewed negatively. This demonstrates that feedback is not merely a directive tool but also a democratic thinking environment. By supporting horizontal communication and psychological safety beyond hierarchical structures, managers encourage employees to become questioning individuals who generate alternative ideas. This finding aligns with Edmondson and Lei (2014), who emphasize that psychological safety enables employees to share ideas without fear and contribute to organizational learning.

4.1.1.2 Analysis

"In companies with 50–100 employees, most people handle operations. Employees should not automatically accept the information given to them; they should ask, 'Is this information absolutely correct?' and provide feedback after cross-checking it through second and third sources." (Manager-8)

"How factory data is interpreted is crucial. Yes, there are KPIs; however, when a KPI declines, can they identify the root cause? Production may be an old practice, but when a new problem arises, the solution process becomes decisive." (Manager-7)

Analysis refers to the process of questioning and verifying information to produce meaningful conclusions. For effective feedback in organizations, employees are expected not only to present data but also to verify its accuracy through multiple sources and conduct root cause analysis. This approach strengthens a feedback culture that goes beyond superficial information exchange and instead emphasizes cause–effect relationships and constructive process improvement (Facione, 2015; Paul & Elder, 2014; Sousa & Rocha, 2019).

Managers' statements highlight that information should not be passively accepted and that verification through multiple sources is essential. They further emphasize that evaluating only surface-level indicators is insufficient and that underlying causes must be identified. These findings are consistent with the root cause analysis approach emphasized in contemporary literature, which argues that effective problem solving requires examining the structural origins of errors rather than merely

correcting visible symptoms (Sousa & Rocha, 2019).

4.1.1.3 Multiple Perspectives and Multivocality

“In a culture where one person speaks and everyone else says ‘what a great idea,’ innovation or progress is unlikely.” (Manager-6)

“There is a workforce that questions the status quo, continuously evaluates the necessity of its work, and is sensitive to work–life balance and corporate well-being.” (Manager-7)

“We continuously invest in developing different perspectives through feedback processes.” (Manager-8)

“Becoming aware of one’s own perspective and recognizing that others may perceive situations differently... that is where feedback begins.” (Manager-4)

“Feedback is one of the fundamental pillars of our corporate culture in terms of multivocality, not being confined to the leader’s ideas, and expressing thoughts freely.” (Manager-2)

“Diversity in ideas and cultures enables us to generate creative and constructive solutions.” (Manager-5)

These findings suggest that challenging the status quo constitutes a prerequisite for organizational innovation and renewal. A questioning culture not only fosters innovative thinking but also increases employee engagement and satisfaction (Kuenzi et al., 2019). Continuously evaluating the necessity and effectiveness of business processes enables organizations to adapt more rapidly to changing market conditions (Garvin et al., 2008; Zhang et al., 2021).

Furthermore, as emphasized by the managers, encouraging diverse perspectives and multivocality strengthens feedback effectiveness. When employees recognize not only their own viewpoints but also the perceptions of others, empathetic communication and collective problem-solving capacity are enhanced (Moraes et al., 2022).

4.1.2 Problem Solving

Problem solving emerged as another key dimension of feedback competencies, reflecting employees’ ability to identify organizational challenges, analyze their underlying causes, and generate effective solutions. Within the thematic analysis, problem solving was structured under two main codes: developing solutions through critical thinking and continuous process improvement.

4.1.2.1 Developing Solutions Through Critical Thinking

In organizations, problem solving is not limited to applying standard procedures; it also requires developing alternative approaches and generating creative solutions through a critical perspective (Ennis, 2011). The interviews reveal that managers expect employees not only to resolve problems but also to approach them through critical and creative thinking processes.

“Employees who adapt to teamwork and solve their colleagues’ problems not through classical methods but through critical thinking, feedback, and creativity are valuable to us.” (Manager-3)

“The critical perspective employees bring to processes, when used effectively, provides a competitive advantage in terms of speed, accuracy, and quality.” (Manager-5)

“Employees who can identify root causes when KPIs decline and develop solutions to emerging problems make a real difference.” (Manager-7)

“Diversity in ideas and cultures enables us, as a team, to produce creative and constructive solutions.” (Manager-8)

These statements indicate that critical thinking is not merely an individual competence but also a fundamental element of constructive interaction and innovative solution generation within teams. Critical thinking involves systematically evaluating different perspectives in order to reach the most

appropriate solution (Paul & Elder, 2014). This approach supports the development of innovative methods rather than relying solely on conventional solutions, thereby contributing to sustainable competitive advantage (Dwyer et al., 2014; Kallet, 2020).

A critical perspective applied to business processes directly influences key performance indicators such as efficiency, quality, and speed, thereby strengthening organizational competitiveness (Brookfield, 2012; Cottrell, 2017). When negative KPI outcomes occur, conducting root cause analysis enables organizations to move beyond standard procedures and develop original and effective solution strategies (Sousa & Rocha, 2019; Zhang et al., 2021). Furthermore, teams that embrace diversity of ideas and cultural backgrounds transform multivocality into an advantage, generating more creative and implementable solutions (Scott, Leritz & Mumford, 2004; van Knippenberg & Mell, 2016).

4.1.2.2 Continuous Process Improvement Through Critical Problem Solving

The effectiveness and efficiency of business processes depend not only on adherence to established procedures but also on the continuous questioning and refinement of those processes. In this context, feedback culture serves as a fundamental mechanism for the dynamic review and improvement of organizational practices. The interview findings indicate that managers value the active involvement of employees at all levels in continuous improvement processes through a critical perspective.

“It is vital that employees at every level can bring a critical perspective and provide feedback on all issues to ensure continuous improvement of business processes.” (Manager-6)

“When critically evaluated, the perspectives employees bring to business processes help us gain a competitive edge in terms of speed, accuracy, and quality.” (Manager-7)

“When a doctor gives you a treatment, do not simply follow it because the doctor prescribed it. Ask why it is being done, monitor the results, follow the process, and provide accurate feedback.” (Manager-8)

These statements demonstrate that business processes can be improved not solely through top management decisions but also through the active observation and constructive criticism of employees at all hierarchical levels. Feedback culture therefore functions as a key instrument supporting continuous improvement (Kaizen) across the organization (Anand et al., 2021).

Critical feedback not only enhances internal processes but also strengthens the organization's competitive position in external markets. Speed, flexibility, and proactive error detection are critical performance criteria for sustainable success in global markets (Zhang et al., 2021; Liker & Convis, 2021).

This perspective emphasizes that employees should question instructions, understand cause–effect relationships, and actively contribute to process development. Such a structure facilitates both internal excellence and sustained competitive advantage in the external environment.

4.2 Impact of Feedback On Organizational Processes

The impact of feedback on organizational processes emerged as a central theme in the analysis, highlighting how feedback practices shape both organizational performance and workplace culture.

4.2.1 Impact on Organizational Performance

Impact on organizational performance refers to the ways in which feedback practices contribute to competitive advantage, innovation and creativity, and sustainability.

4.2.1.1 Competitive Advantage

“It strengthens our position in market competition; understanding different consumer groups requires not being confined to a single perspective. That is why employee feedback is highly valuable to us.” (Manager-5)

“The critical perspective employees bring to processes, when used effectively, provides a competitive advantage in terms of speed, accuracy, and quality.” (Manager-4)

“In any situation, being able to recognize the issue, see what is correct, evaluate and verify it, and even

go a step further by validating the data itself is a major competitive advantage.” (Manager-1)

Feedback in organizations is not merely a communication tool but a strategic management mechanism. Through feedback, employees move beyond being passive executors and become active contributors who improve processes and adapt to market conditions. A feedback culture enhances not only internal organizational dynamics but also strengthens competitive positioning in external markets. Employee feedback enables organizations to make more agile, data-driven, and customer-oriented decisions. This perspective is consistent with the dynamic capabilities framework (Teece, 2018), which emphasizes the importance of sensing, seizing, and reconfiguring capabilities in rapidly changing environments. Sustaining competitive advantage is directly related to the organization’s ability to adapt swiftly and manage internal knowledge flows effectively. In this regard, feedback enhances the organization’s capacity to interpret external signals and take strategic action.

Furthermore, the influence of feedback on operational efficiency, speed, and quality aligns with lean production principles and the philosophy of continuous improvement (Anand et al., 2021).

4.2.1.2 Innovation and Creativity

Interviews with managers indicate that internal feedback processes foster the development of innovative ideas, enhance the creativity of generated solutions, and cultivate an organizational climate open to change. A shared view among participants is that feedback culture encourages employees to generate ideas, supports in-depth analytical processes, and strengthens the organization’s capacity to adapt innovatively. This finding confirms Amabile and Pratt’s (2016) componential theory of creativity, which emphasizes that creativity is reinforced not only by individual expertise but also by social support and psychological safety.

“In a culture where everyone agrees without questioning, innovation does not emerge easily; feedback opens us to renewal and change.” (Manager-2)

“Companies in Türkiye that stand out in innovation are those that value employee ideas and suggestions.” (Manager-7)

“By integrating feedback into company procedures, we encourage the emergence of new methods and employee contributions.” (Manager-5)

“If you have an idea for change, experts evaluate it; if implemented, its contribution to the company is calculated.” (Manager-4)

Environments that suppress questioning and promote uniform agreement weaken innovation potential. A culture in which employees can express ideas without fear of negative evaluation is essential for creative development (Edmondson & Lei, 2014). Managers indicate that feedback processes have evolved into systematic innovation mechanisms, transforming organizational learning into a structured practice. Innovation, therefore, is not accidental but emerges as the outcome of feedback-based, planned processes. Feedback functions not only as an evaluative mechanism but also as a discovery tool for identifying and implementing potential ideas (Anderson, Potočnik & Zhou, 2014). In this sense, feedback operates as a catalyst for innovation.

4.2.1.3 Sustainability

Managers emphasize that sustainable success requires feedback to be continuous and effectively implemented. Sustainability, in this context, is not defined merely as maintaining organizational status but as establishing a dynamic structure in which all employees actively participate in feedback processes (Lozano, 2012).

“Achieving sustainable business results and remaining competitive should be one of the fundamental principles of company culture.” (Manager-1)

“We may interpret things incorrectly; even the smallest comment from an employee can save us significant time and money.” (Manager-4)

“If you want to move forward, you must be able to critique from different perspectives. Otherwise, you

remain stagnant. Feedback is inseparable from development and sustainability.” (Manager-7)

“I have been in this sector for 20 years. Experience can sometimes prevent you from seeing certain points. If a newcomer asks, ‘You are doing it this way, but could it be done differently?’ and sheds light on something I overlooked, and we implement it together, company efficiency could increase dramatically.” (Manager-8)

These statements reveal that feedback is not merely an operational instrument but a foundational element of organizational values. In this respect, feedback functions as a strategic learning mechanism that supports sustainability (Senge, 2006; Lozano, 2018). Moreover, feedback makes tacit organizational knowledge visible, enabling not only the correction of current errors but also the analysis of the underlying systems that generate them. This aligns with the double-loop learning perspective (Argyris & Schön, 1996; Smith, 2018), which emphasizes transforming underlying assumptions rather than merely resolving surface-level problems.

Sustainability is further strengthened when organizational cultures integrate experience with renewed perspectives and diverse viewpoints. Environments in which ideas can be expressed freely, regardless of age, seniority, or position, are characteristic of organizations with high psychological safety (Edmondson, 2019).

4.2.2 Impact on Company Culture

The impact on company culture was categorized under two codes: collaborative organizational culture and participatory leadership and decision-making.

4.2.2.1 Collaborative Organizational Culture

Managerial interviews indicate that feedback not only contributes to individual development but also strengthens relational dynamics within the workplace.

“Achieving sustainable business outcomes and remaining enduring should be a fundamental component of company culture.” (Manager-1)

“We may misinterpret things; even a small remark from an employee can save us significant time and resources.” (Manager-4)

“If you want to move forward, you must critique from different perspectives. Otherwise, you remain stagnant. Feedback is inseparable from development and sustainability.” (Manager-7)

“After 20 years in the sector, I may overlook certain issues. If a newcomer says, ‘You are doing it this way, but could it be done differently?’ and we implement that suggestion together, efficiency can increase significantly.” (Manager-8)

Feedback operates not merely as a communicative tool but as a cognitive process that promotes problem solving and creativity-based collaboration. By fostering both horizontal and vertical learning opportunities, it strengthens a culture of collective intelligence within teams (Argyris & Schön, 1996; Smith, 2018). When employees engage in critical yet supportive dialogue regarding each other’s thinking processes, innovative solution capacity increases.

An effective feedback culture shapes not only individual performance but also collective achievement. In this regard, evaluating employees’ critical thinking and collaboration competencies alongside technical expertise becomes essential (Katzenbach & Smith, 2015). Feedback processes function as strategic organizational instruments that reinforce cooperation, build mutual trust, and align members toward shared goals. Such a culture enhances reciprocal responsibility and sustains collective productivity.

4.2.2.2 Participatory Leadership and Decision-Making

Interview findings suggest that feedback is not only a mechanism regulating operational processes but also a strategic force shaping managerial practices. By encouraging open, inclusive, and bidirectional communication, feedback supports leadership models that move away from authoritarian structures toward more participatory and democratic approaches.

“Founders and senior executives approach everyone equally, away from rigid hierarchy; every idea is valued, and mutual criticism and feedback are freely practiced.” (Manager-2)

“Employees and leaders who effectively apply feedback adapt more rapidly to changing market conditions and increasing competition.” (Manager-3)

“A two-way, open communication bridge is established between employees and managers; every employee can express ideas freely, but the final decision is made by the responsible leader after listening to all perspectives.” (Manager-8)

Such a structure reflects a leadership model that values employees’ knowledge, experience, and insights rather than adhering strictly to hierarchical authority. Horizontal feedback and shared dialogue support transformational leadership principles (Bass, 1985). Transformational leaders foster development, inspire motivation, and unite teams around shared objectives. This leadership style enhances adaptability during periods of change and innovation and increases voluntary employee engagement.

Manager-8’s statement reflects participatory leadership, where employee ideas are not merely heard but integrated into decision-making processes. This approach contributes to democratic organizational climates and strengthens organizational citizenship behaviors (Organ, 1988; Podsakoff et al., 2018; Worku, 2024). When systematically embedded within leadership practices, feedback enhances employee commitment and trust between leaders and subordinates, thereby establishing a sustainable foundation for collaboration.

4.3 Implementation Strategies of Feedback Competencies in the Workplace

The implementation strategies of feedback competencies in the workplace were examined under two main dimensions: structural integration of feedback and developmental practices supporting feedback culture.

4.3.1 Structural Integration of Feedback

Structural integration of feedback was categorized under three codes: structured feedback mechanisms, reward and recognition systems encouraging feedback, and open and two-way communication practices.

4.3.1.1 Structured Feedback Mechanisms

Managers’ statements indicate that integrating feedback into organizational structures is not merely a cultural attribute but a systematically designed process. The use of regular and structured feedback channels enhances the reliability and effectiveness of organizational communication while supporting the sustainability of organizational learning processes (Argyris & Schön, 1996; López-Cabrales & Valle-Cabrera, 2020).

“We collect and evaluate feedback regarding company policies through surveys, workshops, and meetings.” (Manager-4)

“We conduct one-on-one meetings every quarter; during this process, we observe that employees become more open to feedback and more motivated.” (Manager-8)

“At the end of projects, meetings are held where everyone receives feedback from both managers and colleagues.” (Manager-3)

The formal mechanisms emphasized by Manager-4 demonstrate that feedback operates not solely through interpersonal interactions but also through institutional systems. Periodic and broad-based practices enable employees to systematically communicate both emotional responses and process-related critiques (London & Smither, 2002). Consequently, structured and regular feedback mechanisms emerge as strategic tools that enhance employee engagement and organizational efficiency while transforming organizations into self-renewing and learning systems.

4.3.1.2 Reward and Recognition Systems Encouraging Feedback

Managers utilize reward systems not only as motivational instruments but also as strategic mechanisms integrating feedback culture into organizational structures. The recognition and rewarding of innovative

ideas facilitate the internalization and sustainability of feedback behaviors among employees (Deci & Ryan, 2000).

"We reward any idea; these systems have become quite widespread." (Manager-1)

"Ideas are evaluated internally by experts, and when implemented, their contribution to the company is calculated." (Manager-6)

The reward practices emphasized by Manager-1 increase employees' willingness to voice ideas and transform feedback into a participatory value-creation process. Manager-6's focus on measurable contribution ensures that ideas are not merely expressed but are evaluated within a corporate value framework (Grant, 2008). This approach elevates feedback from a simple communication tool to a strategic element contributing to the organizational value chain. By reducing a culture of silence (Milliken, Morrison & Hewlin, 2003), reward systems encourage employees to express their views more openly while supporting both individual motivation and collective learning and adaptation.

4.3.1.3 Open and Two-Way Communication Practices

Interview findings indicate that open and two-way communication practices play a critical role in institutionalizing feedback culture. Promoting horizontal communication, fostering trust, and enabling employees to freely articulate ideas are central to sustaining feedback effectiveness (Edmondson, 1999; Detert & Edmondson, 2011).

"Through our 'straight talk' initiative, we establish a permanent, open, and two-way communication bridge between employees and managers." (Manager-2)

"Founders and senior management approach everyone equally, regardless of position." (Manager-1)

"In our social spaces, which we call the 'village square,' employees can gather during flexible hours and share their ideas." (Manager-6)

The "straight talk" initiative highlighted by Manager-2 illustrates that feedback is embedded not only in formal procedures but also in daily organizational interactions. Manager-6's example demonstrates that informal social environments reinforce interpersonal communication and create trust-based feedback spaces (Akıncı Vural, 2010). These strategies extend feedback beyond performance management functions and position it at the core of organizational learning and adaptive capacity.

4.3.2 Development Practices Supporting Feedback Culture

Development practices supporting feedback culture were categorized under three codes: training and competency development programs, mentoring and knowledge sharing, and informal idea-sharing environments.

Managers' statements reveal that feedback culture is strengthened not only through structural mechanisms but also through development-oriented practices such as training, mentoring, and free-thinking environments. These practices enhance employees' competencies in giving and receiving feedback while contributing to the institutionalization of feedback behaviors.

4.3.2.1 Training and Competency Development Programs

"In addition to feedback and recognition systems, we also have traditional training programs." (Manager-5)

"We provide critical thinking and problem-solving training to everyone." (Manager-1)

"We first teach employees how to express their ideas." (Manager-4)

Managers conceptualize feedback as a communication competence that can be intentionally developed. Systematic training programs focusing on critical thinking and problem solving foster more analytical and solution-oriented approaches among employees (Cottrell, 2017). This perspective aligns with Bandura's (1977) Social Learning Theory, which suggests that feedback behaviors are developed through modeling and reinforcement.

4.3.2.2 Mentoring and Knowledge Sharing

"We transfer the ideas that have led us to success through academies or mentors." (Manager-2)

"We invite external speakers." (Manager-8)

Mentoring functions as a mechanism reinforcing feedback competencies through experiential knowledge transfer. Whether formally structured or not, such practices enable employees to better understand organizational context. Knowledge exchange through academies and expert speakers supports both individual development and the sustainability of organizational learning culture (Eby et al., 2013).

4.3.2.3 Informal Idea-Sharing Environments

"Free-thinking environments allow employees to share their ideas and perspectives." (Manager-7)

"We continuously invest in developing different perspectives." (Manager-8)

Free-thinking environments enable employees to express creativity within safe and supportive contexts. This aligns with Amabile's (1996) social psychology of creativity, which emphasizes that supportive social environments enhance innovative capacity. Moreover, the opportunity for free expression strengthens intrinsic motivation and increases organizational commitment (Ryan & Deci, 2020).

5. CONCLUSION

This study examined the strategic role of feedback culture in contemporary organizations from the perspective of managers and analyzed the findings within a thematic framework derived from qualitative data. The analysis revealed that feedback culture operates through three interconnected dimensions: feedback competencies, the impact of feedback on organizational processes, and the implementation strategies that support feedback practices in the workplace. These dimensions collectively illustrate how feedback functions simultaneously at the individual, organizational, and structural levels.

At the individual level, feedback competencies emerged as a fundamental component of effective feedback culture. The findings show that critical thinking and problem-solving abilities enable employees to question existing practices, analyze information critically, and consider alternative perspectives. These competencies allow employees to move beyond routine task execution and actively participate in identifying problems, analyzing root causes, and developing innovative solutions.

At the organizational level, feedback practices were found to significantly influence both organizational performance and company culture. Feedback contributes to competitive advantage, innovation capacity, and sustainability by enabling organizations to respond more effectively to environmental changes and market dynamics. In addition, feedback strengthens collaborative organizational cultures and participatory leadership practices by encouraging open communication, multivocality, and trust-based interactions within the workplace.

At the structural level, the effectiveness of feedback culture depends largely on the organizational mechanisms that support its implementation. Structured feedback systems, reward and recognition mechanisms, and open communication practices facilitate the integration of feedback into organizational structures. Furthermore, developmental initiatives such as training programs, mentoring practices, and informal idea-sharing environments contribute to strengthening employees' feedback competencies and sustaining feedback behaviors within organizational culture.

From a practical perspective, organizations should institutionalize feedback practices through structured mechanisms, open communication channels, and participatory leadership approaches. Encouraging employees to question processes, express alternative perspectives, and engage in constructive dialogue can strengthen organizational learning and innovation capacity. Additionally, training programs that develop critical thinking, communication, and problem-solving skills may further enhance feedback competencies across organizational levels.

Future research may extend the findings of this study by examining feedback culture in different sectors, organizational sizes, and cultural contexts. Incorporating perspectives from employees at different

hierarchical levels and exploring the role of digital feedback systems may also provide deeper insights into the evolving nature of feedback practices in contemporary organizations.

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INSTITUTIONALISING INTEGRITY IN STATUTORY BODIES: DESCRIPTIVE EVIDENCE FROM MALAYSIA

Dr. Nurhidayah Yahya^{1*}, Afzal Izzaz Zahari², Sulaiman Helmi³, Nur Azlina⁴

¹Accounting Research Institute, Universiti Teknologi MARA, Shah Alam, Malaysia

²School of Management, Universiti Sains Malaysia, Malaysia

³Master of Management, Universitas Bina Darma, Indonesia

⁴Faculty of Business, Universitas Riau, Indonesia

**Corresponding author: nurhidayahyaha@uitm.edu.my*

Abstract

Malaysian statutory bodies are pivotal implementers of federal and state policy priorities and are largely financed through public funds; accordingly, they operate under heightened public expectations to institutionalise integrity in decision-making and service delivery. This study aims to profile the level and pattern of corporate integrity practices in Malaysian statutory bodies by assessing three interrelated elements of integrity infrastructure: ethical foundation, ethical culture, and ethical risk management. An organisational-level survey was administered across federal and state statutory bodies, with integrity practices measured on a 7-point Likert scale. The results show consistently above-average integrity levels across the three components. Ethical foundation records the highest level ($M = 5.947$, $SD = 0.986$), followed closely by ethical culture ($M = 5.912$, $SD = 0.970$). Ethical risk management remains positive but is comparatively lower; notably, the item capturing the use of ethical risk management to plan and predict ethical risks reports a mean of 5.909. Taken together, the findings indicate that corporate integrity in Malaysian statutory bodies is relatively robust, particularly in leadership-driven foundations and embedded cultural norms, while the most material scope for strengthening lies in formalising and systematising anticipatory integrity risk management to protect public resources further and reinforce public trust.

Keywords: *Corporate integrity practices, Malaysian statutory bodies, ethical foundation, ethical culture, ethical risk management*

1. Introduction

Corporate integrity has become a critical issue in public governance because public organisations are judged not only by the services they deliver, but also by the ethical quality of their decisions, stewardship of public resources, and accountability to stakeholders. The Organisation for Economic Co-operation and Development (OECD) (2020) define public integrity as the consistent alignment with, and adherence to, shared ethical values, principles, and norms in order to uphold the public interest over private interests. More recent evidence from the OECD (2024) shows that although many jurisdictions have strengthened formal integrity frameworks, substantial implementation gaps remain, particularly in corruption risk management, internal control, and audit practice. This makes integrity especially relevant to Malaysian statutory bodies, which implement federal and state policy priorities and operate under heightened expectations of transparency, accountability, and ethical conduct. In Malaysia, the Malaysian Anti-Corruption Commission (2024), through the National Anti-Corruption Strategy 2024–2028, continues to emphasise the strengthening of integrity, transparency, and governance across public institutions.

The importance of Corporate Integrity Practices (CIPs) is further reinforced by recent Malaysian evidence and cases. According to the Malaysian Anti-Corruption Commission (2024), 2,163 public

officials were arrested for corruption-related offences between 2019 and 2023, representing 43.3% of total arrests over that period. At the perception level, Malaysia's Corruption Perceptions Index 2024 remained at a score of 50 and rank 57, indicating that public trust in institutional integrity remains fragile, although later reporting on Corruption Perceptions Index 2025 suggests some improvement to a score of 52 and rank 54 in 2026 (Bernama, 2026). Recent cases involving statutory or public-sector-linked entities, including allegations of abuse of power, fund misappropriation, and questionable transactions, further illustrate that integrity failures continue to pose material governance risks in Malaysia (The Star, 2024). Against this backdrop, examining integrity through the three elements proposed by Dubinsky and Richter (2015)—ethical foundation, ethical culture, and ethical risk management—offers a useful way to understand how integrity is institutionally embedded in statutory bodies and where further strengthening may be needed. Hence, the study aims to profile the level and pattern of CIP in Malaysian statutory bodies by assessing three interrelated elements of integrity infrastructure: ethical foundation, ethical culture, and ethical risk management.

2. Literature Review

CIPs refer to the organisational systems, values, controls, and behavioural expectations that enable an institution to operate ethically, lawfully, and in the public interest (Kaptein & Wempe, 2002). In the public sector, integrity is increasingly framed not as a narrow matter of individual morality, but as an institutional capability embedded in governance structures, leadership processes, culture, and risk management (OECD, 2020, 2024). This framing is particularly useful for statutory bodies because these organisations operate under public scrutiny and are exposed to integrity risks such as abuse of power, weak compliance, resource misuse, and reputational harm.

Within the CIP literature, the three elements of ethical foundation, ethical culture, and ethical risk management are most directly associated with the Global Ethics and Integrity Benchmark developed by Dubinsky and Richter (2015). This benchmark has been used to frame corporate integrity as an integrated system rather than a single ethical attribute. In the Malaysian context, these dimensions were also adapted in prior work on statutory bodies and integrity measurement, including Yahya (2022), which applied the benchmark to corporate-level analysis in statutory bodies. However, the present study does not rely primarily on a single thesis perspective; rather, it uses Dubinsky and Richter (2015) as the central conceptual anchor, while drawing on Yahya (2022) only as contextual support for the Malaysian statutory body setting.

2.1 Ethical Foundation

Drawing on Dubinsky and Richter (2015), ethical foundation refers to the formal and structural basis upon which organisational integrity is built. This dimension includes organisational vision and goals on integrity, leadership commitment, ethics resources, and compliance with rules, policies, and procedures. Ethical foundation matters because it provides visible institutional signals about what the organisation values, what it expects from its members, and how ethical conduct is to be governed. Related work also suggests that ethical leadership is most effective when supported by enabling systems and decision environments, rather than treated as a purely personal quality (Lasthuizen et al., 2025). For statutory bodies, a strong ethical foundation provides the institutional architecture through which integrity becomes part of governance rather than remaining aspirational.

2.2 Ethical Culture

Ethical culture refers to the shared values, norms, expectations, and behavioural patterns that shape how members of an organisation understand and enact ethical conduct (Dubinsky & Richter, 2015). If ethical foundation provides the formal basis of integrity, ethical culture reflects whether those formal arrangements are internalised and translated into everyday organisational life. Roy et al. (2024) argue that ethical culture plays a critical role in ethical decision-making and organisational conduct, while Cabana and Kaptein (2025) show that team ethical culture is central to the effectiveness of ethics programmes in preventing unethical behaviour. In a similar vein, Dubinsky and Richter (2015) treat ethical culture as a core integrity element because integrity becomes meaningful only when ethical expectations are reinforced through communication, training, behavioural consistency, and shared norms.

2.3 Ethical Risk Management

According to Dubinsky and Richter (2015), ethical risk management extends integrity from values and behaviour into prevention and control. It includes mechanisms such as whistleblowing, investigation procedures, confidentiality, openness, responsiveness, and the capacity to anticipate areas of high integrity risk. This makes ethical risk management the most preventive dimension of CIP. It reflects whether the organisation can move beyond reactive discipline and towards anticipatory governance. Contemporary integrity scholarship and OECD guidance also support this emphasis, arguing that mature public integrity systems require robust risk identification, internal control, and monitoring capacity rather than reliance on compliance alone (OECD, 2020, 2024).

3. Methodology

This study employed a quantitative, cross-sectional survey design. The unit of analysis was the organisation, namely Malaysian statutory bodies. There are 291 statutory bodies in Malaysia under 23 ministries. The survey was distributed to statutory bodies' Chief Executive Officers (CEOs) or equivalent senior representatives because they were expected to possess broad knowledge of organisation-wide governance arrangements, integrity structures, and risk management processes. They were chosen by their respective ministries to be appointed as CEO in the statutory bodies. The use of top executives as key informants is widely recognised in organisational research where the constructs of interest concern organisation-wide systems rather than departmental detail (Kumar et al., 1993).

The instrument measured CIP across three dimensions: ethical foundation, ethical culture, and ethical risk management. The measurement structure follows the Global Ethics and Integrity Benchmark by Dubinsky and Richter (2015), while the Malaysian statutory body adaptation is consistent with prior measurement development in Yahya (2022). All items were measured on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. Likert-type scales are widely used in survey research because they allow respondents to express degrees of agreement in a structured and interpretable form (Likert, 1932; Allen & Seaman, 2007).

In line with the descriptive purpose of the study, the data were analysed using means and standard deviations. This approach is appropriate for profiling the general level and pattern of integrity practices across the sampled statutory bodies (Field, 2018; Pallant, 2020). From 291 surveys distributed, the final sample comprised 194 usable organisational responses.

4. Results

The findings indicate that CIP in Malaysian statutory bodies are consistently above average, suggesting that integrity is relatively well institutionalised across the sampled organisations. The overall mean score for CIP was 5.921 with a standard deviation of 0.962. Among the three dimensions, ethical foundation recorded the highest mean ($M = 5.947$, $SD = 0.986$), followed closely by ethical culture ($M = 5.912$, $SD = 0.970$). These results suggest that statutory bodies are comparatively stronger in formal integrity structures and in the embedding of ethical values and expectations in organisational life. Ethical risk management, although still positive, recorded the lowest mean ($M = 5.909$, $SD = 1.084$), indicating comparatively weaker maturity in the formalisation and systematisation of anticipatory integrity management. Taken together, the findings portray a relatively robust integrity profile, but one that is not entirely even across all dimensions. The pattern indicates that leadership-driven foundations and embedded cultural norms are stronger than the more preventive and systematised management of integrity risks.

4.1 Discussion

The results support the view that corporate integrity in statutory bodies is best understood as a multidimensional organisational infrastructure. The relatively stronger result for ethical foundation suggests that statutory bodies have made progress in establishing the formal architecture of integrity through leadership commitment, policies, reporting structures, and governance arrangements. This interpretation is consistent with literature that positions ethical leadership and institutional commitment as foundational to public integrity (OECD, 2020; Zahari et al., 2024).

The high score for ethical culture indicates that integrity in statutory bodies is not confined to formal

procedures alone. Rather, integrity appears to have been internalised to some extent through shared expectations, communication, and behavioural norms. This is significant because ethical culture is widely regarded as the mechanism through which formal ethical systems become behaviourally meaningful (Roy et al., 2024; Cabana & Kaptein, 2025).

The comparatively lower result for ethical risk management is the most policy-relevant finding. Although the score remains positive, it suggests that risk-based integrity management is the least mature and least consistently institutionalised element of CIP across statutory bodies. This result echoes the OECD's Anti-Corruption and Integrity Outlook 2024, which reports that many governments have stronger formal integrity regulations than actual implementation capability in corruption risk management and audit practice (OECD, 2024). In practical terms, Malaysian statutory bodies may have progressed further in establishing ethical structures and norms than in developing systematic, anticipatory, and preventive integrity risk capability.

5. Conclusion

From a practical perspective, the study suggests that integrity enhancement in Malaysian statutory bodies should now move beyond maintaining formal ethical structures and positive cultural norms alone. Greater attention should be given to strengthening anticipatory integrity risk management through better mechanisms for identifying ethical vulnerabilities, planning for risks, learning from misconduct cases, and formalising preventive responses. Such improvements would help statutory bodies protect public resources more effectively and reinforce public trust.

In conclusion, the study shows that corporate integrity in Malaysian statutory bodies is generally robust, particularly in terms of ethical foundation and ethical culture. However, the most meaningful scope for improvement lies in strengthening the formalisation and systematisation of ethical risk management. This would help statutory bodies move from a largely structure- and culture-based integrity posture toward a more preventive and resilient integrity system.

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EXPLORING PARENTS' SCHOOL CHOICE IN A CITY IN THE MALDIVES

Aishath Nabeela*, Dr. Mariyam Niyaf Mohamed
Zikura International College, Fuvahmulah City, Maldives

**Corresponding author: nabylaabdulaziz@gmail.com*

Abstract

School choice is an increasingly important decision that empowers parents to select educational institutions that best meet the needs and aspirations of their children. This study explores the factors that influence parental school choice and examines the reasons behind student mobility in a selected city in the Maldives. Using Rational Choice Theory as the conceptual framework, the study investigates how parents rationally evaluate their options to maximize educational outcomes for their children. A qualitative case study approach was employed, with data collected through semi-structured interviews with seven parents. Thematic analysis revealed that proximity to home or workplace, academic quality, religious education, teacher-parent relationships, and affordability were key determinants of initial school choice. Despite careful selection, several parents later transferred their children due to unresolved bullying, dissatisfaction with teacher behavior, lack of extracurricular opportunities, residential relocation, and concerns about the religious and moral environment of schools. The findings provide valuable insights for school leaders and policymakers aiming to improve school retention rates, meet parental expectations, and create educational environments that support student success. Further, findings point to the importance for public schools to enhance academic programs, expand extracurricular activities, foster strong teacher-parent relationships, promote fairness and transparency, and implement effective conflict resolution strategies. The study also recommends further research to explore regional variations and the long-term impacts of student mobility across the Maldives.

Keywords: *Parents Preferences, School Choice, Maldives, school mobility*

1. INTRODUCTION

School Choice is a concept which allows parents to exercise their preferences in choosing the best educational option for their children (Shiferaw & Kenea, 2024). A study done to examine determinants of parental school choice by Shiferaw and Kenea (2024), showed that parents' school choice is critically affected by school related factors: academic performance, teacher quality, school facilities, parent teacher relation and school curriculum. Another study by Hofflinger et al., (2019), showed that parents prioritize school's proximity, quality and whether the school provides religious education. Some of the research on this area identified academic quality as the number one factor. Moreover, factors such as proximity to home and workplace, extracurricular activities, cost and safety are some factors which parents consider when choosing a school.

In the Maldives, the overwhelming majority of schools are public schools which include 215 state schools, 4 community schools and 54 private schools (Ministry of Education, 2022). The national school system frames four consecutive tiers of preschool teaching (4-6 years), primary (6-13 years), secondary (13-16 years), and higher secondary from (16-18 years) (UNESCO, 2022). With the ratification of the Education Act in November 2022, the government of Maldives is obligated to provide free education for children from 4 years of age to 18 years of age-, from preschool education to higher secondary education (Education Act, 2020).

1.1 Problem Statement

Researchers widely acknowledge that parents consider a variety of factors when selecting schools for their children, including academic performance, teacher quality, proximity to home, curriculum offerings, and the availability of extracurricular activities (Alsuiadi, 2015; Burgess et al., 2014; Cantu et al., 2021). These elements often form the basis of initial school selection. However, school choice does not always remain static. Rumberger (2015) highlights that most students, at both elementary and secondary levels, experience at least one non-promotional school transfer—meaning a change in school not associated with moving to the next grade level. In many cases, students transfer multiple times throughout their academic journey, and it is typically the parents who initiate these transitions. Such mobility can have adverse effects, including disruption of peer relationships and the weakening of student-teacher bonds, which can, in turn, negatively influence the child's academic and social development (Rumberger, 2015).

In contexts where parents exercise full autonomy over their children's educational paths, understanding the motivations behind their decisions to switch schools after a few years becomes critically important. These decisions are seldom arbitrary. As Alsuiadi (2015) notes, dissatisfaction with the education system often drives parents to transfer their children between public and private institutions. This dissatisfaction may stem from perceived or actual shortcomings in school management, teaching quality, or alignment with parental expectations.

Local insights further underscore this trend. According to a school administrative officer, a total of 88 students transferred out of one school between 2022 and 2024 (A. Ahmed, personal communication, 2024), suggesting a significant pattern of student mobility within the selected city. Currently, there are 2,525 students enrolled across both public and private schools in the city (Ministry of Education, 2024). However, enrollment distribution is uneven: some schools have less than 12 percent of the total student population, while others accommodate over 40 percent (Ministry of Education, 2024). A leading teacher reported that student numbers in their school are declining each year (A. Ahmed, personal communication, 2024), raising concerns about the sustainability and competitiveness of certain schools in the city.

This study seeks to explore the underlying factors that influence parents' decisions when choosing and switching schools for their children. By identifying the key preferences and concerns that shape school selection, this research aims to provide school leaders with actionable insights. Understanding these factors can support educational institutions—especially those facing declining enrollments—in implementing targeted improvements to attract new students and retain existing ones.

1.2 Research Questions

What factors do parents consider when initially choosing public/private schools?

What are the reasons parents transfer children from school to school?

What can Public Schools do to retain/or increase their student enrollment?

2. LITERATURE REVIEW

2.1 Theory

According to rational choice theory, people are logical thinkers who consistently and methodically make decisions based on well-defined preferences and objectives. The rational choice theory places a strong emphasis on how crucial information processing is to making decisions. This theory uses the idea of utility maximization, which offers a framework for comprehending how parents choose their children's education in order to maximize their level of happiness or utility (Alothman et al., 2024).

Bosetti (2004), as cited in Wallace, (2021), grounded her findings in rational choice theory. By making their decision based on their most valued factors.

According to (Altenhofen et al., 2016), as cited in Venketsamy & Miller(2021), when parents can choose a school that aligns with their preferences, values and goals, they can ensure that their children receive an education based on their needs and Bekele and Kenea (2024) as cited in Venketsamy & Miller, 2021, stated that the most important role for a parent in their children's academic life is choosing

the school they attend as school choice give parents the power to determine the future of their children's education and also influencing important educational decisions.

When selecting a school for their children, parents consider a number of factors, including academic reputation, curriculum, extracurricular activities, cost, safety, and proximity to home. Other factors may be peer pressure, cultural or societal influences, emotions, or personal preferences (Lubienski and Lubienski, 2013).

Rationality in decision making is choosing the best option available based on clear understanding and by considering the outcomes. It is important to make the right decision when choosing schools as it could put them on a path towards lifelong learning and a possible successful career for their children (Gomendio, 2017, as cited in Alothman et al., 2024). For instance, a parent might choose the reputation of the school over more practical considerations which might be more beneficial for the child (Alothman et al., 2024).

In the end, each parent's level of rationality in decision-making may vary, depending on personal preferences, values, and situations (Van den Heuvel et al. 2021). While some parents base their decisions on anecdotal evidence, intuition, and personal experience, others may use a very analytical approach that considers all pertinent elements and the long-term effects on the child. In any case, most parents want to provide their kids with the greatest education possible and provide them with chances to succeed academically and intellectually.

According to Venketsamy and Miller (2021), the education system organized as a free choice would promote educational performance due to enhanced competition. They further argued that if educational performance is compromised, parents choose to move their children to other schools in search of better opportunities. According to the findings of the same study, Venketsamy and Miller (2021), recommended that schools should make their open days very informative since the information gathered in these events play a crucial role in parent's decision making about school choice.

2.2 Distinction between Public and Private Schools

As stated by Dillsa et al. (2010), the major factor which distinguishes public and private schools is public schools are fully funded by the government and private schools are funded by the affiliated organization. In addition, public schools cannot deny access for any particular student provided there is a place available for them. These schools must adhere to the national curriculum and rules and regulations made by the Ministry of Education (Lieberman, 1998). The quality of instruction, class size, school-parent relationships, school facilities, physical education, and sports activities are the five criteria that are statistically more likely to influence a student's decision to attend a private school, according to Venketsamy and Miller (2021). The same study showed that some parents choose public schools because they feel private schools promote their school to make money but lack implementation of guidance and acceptable manners.

2.3 Factors influencing parents' choice of schools

The appeal of technologically connected schools is an intriguing point made by Maile (2004:105) that merits discussion in the twenty-first century. He emphasizes how parents tend to favor schools with cutting-edge activities and modern technologies. This element is closely related to potential job paths. Moreover, according to Msila (2009), parents prefer to send their children to schools with good reputation, good management, and well-disciplined students combined with dedicated teachers.

Research on school choices shows that students' choices are influenced by how much importance they place on academics, convenience, school features, and safety (Goldring & Rowley, 2006). Parents indicated that being close to their home and place of employment was a significant factor in their choice of school (Evans and Cleghorn, 2014). According to the same poll, 60.3% of participants said that it is beneficial when the school is close to their place of employment, and 46.5% of participants said that the school must be close to where they reside. Lipsky, Friedman & Harkema (2017), stated that most parents rely on the information gathered through friends and word of mouth when choosing school, not the information provided by the schools.

2.4 Causes and consequences of Student Mobility

School change could be initiated either by parents or school. This change could be due to voluntary or involuntary reasons. According to Rumberger & Barbara (2015), most school transfers are initiated by parents and students, and it's mainly because of residential change. Parents and students change school not only due to residential change, but open enrollment policies allow parents to change their children from one school to another (Rumberger & Barbara, 2015). Despite fairly robust research on the topic, the questions on school mobility is still hard to answer. Numerous studies released since 2009 have also discovered conflicting effects of student mobility. Students who made non-promotional school changes between kindergarten and the 12th grade were less likely to graduate from high school on time, completed fewer years of education, had lower occupational prestige in their jobs, had more depressive symptoms, and were more likely to be arrested as adults, according to a study that followed a cohort of preschoolers in Chicago for 25 years (Rumberger & Barbara, 2015). The effects of mobility were more pronounced for transfers between the fourth and eighth grades, and they outweighed the effects of related factors such as poverty and residential mobility (Rumberger & Barbara, 2015).

Sorin & Iloste (2003), found that in line with previous research, participants identified school and family concerns as antecedents of mobility. Most participants stated that one of the main reasons why students switch schools is housing changes, which occur when families relocate within the same area or to a different one.

3. METHODOLOGY

This chapter outlines the research methodology employed to explore parents' preferences and decision-making processes when selecting schools for their children in a selected city in the Maldives. Given the exploratory nature of the study, a qualitative case study approach was adopted to gain in-depth insights into the experiences, motivations, and considerations of parents during school selection. The chapter details the research design, population and sampling strategy, research instrument, and data collection procedures. It also elaborates on the steps taken to ensure the credibility and ethical soundness of the study, as well as the methods used for data analysis. Each component was carefully chosen to align with the study's objectives and to ensure a robust and contextually relevant exploration of parental school choice.

To explore and understand the intricate preferences of parents when selecting schools for their children, this study adopted a qualitative research design, specifically employing the qualitative case study method. As Creswell & Creswell (2018) articulate, qualitative research is a methodology dedicated to investigating and comprehending the meanings individuals or groups ascribe to a particular human situation. This approach is particularly valuable when the key variables for examination are not yet well-defined (Creswell & Creswell, 2018), making it ideally suited to the exploratory nature of this research into parental school choice.

The qualitative case study method provides an in-depth understanding of a phenomenon within its specific context (Krusenvik, 2016). Hence, by focusing on the experiences and perspectives of individual parents, this approach allows for a rich and nuanced exploration of the various factors influencing their school selection decisions. This method facilitates a holistic view, capturing the complexities and subtleties often missed in quantitative approaches. The emphasis is on understanding the 'why' behind parental choices, delving into their values, priorities, and the contextual elements that shape their preferences. Through this detailed examination of individual cases, the study aims to uncover patterns and insights into the multifaceted process of school selection from the parents' perspectives.

The target population for this study comprised parents residing in a selected city in the Maldives who have school-age children. To ensure a comprehensive understanding of the factors influencing school choice and mobility, the sampling strategy focused on parents of children in the LKG to 10th grades.

The sample was stratified into two categories based on parents' experiences with school mobility:

Category 1: Parents who have changed their child's school: This category included parents who had transferred their child from one school to another for any reason since initial enrollment.

Category 2: Parents who have not changed their child's school: This category comprises parents who had maintained their child's enrollment in the same school since initial enrollment.

Initially, this research involved 12 parents: six participated in individual interviews, enabling a deep dive into their personal experiences and viewpoints. While a focus group discussion was planned for the remaining six parents to provide complementary data and allow for triangulation, it was ultimately not conducted due to time constraints. However, this change in methodology is not anticipated to compromise the overall findings of the research. 7 parents participated in the interviews.

A purposive sampling method was utilized to select participants. Purposive sampling, also known as judgmental or selective sampling, is a non-probability sampling technique in which researchers intentionally select participants who can provide rich and relevant information about the phenomenon of interest (Creswell & Creswell, 2017). In this study, purposive sampling was appropriate because it allowed the researcher to target parents with specific experiences and knowledge related to school choice and mobility.

Sample size in qualitative research is typically smaller than in quantitative research, as the goal is not to achieve statistical generalizability but rather to obtain rich, in-depth data that can provide insight into the complexity of a phenomenon. As Gentles et al. (2015) argue, qualitative research "uses smaller samples to collect data appropriate for comprehending the intricacy, depth, diversity, or context around a phenomenon," whereas quantitative research "uses larger samples to reflect populations." In this study, data collection continued until saturation was reached. Saturation, in qualitative research, is the point at which no new information or themes are emerging from the data, and further data collection is unlikely to provide additional insights (Saunders et al., 2018). The principle of saturation guided the determination of the final sample size, ensuring that the data collected were sufficient to address the research questions comprehensively.

As this study employed a qualitative approach, an interview guide (Appendix A) served as the primary instrument for data collection. The interview guide was structured around a set of semi-structured questions, carefully designed to elicit detailed information regarding parents' school preferences and school mobility experiences. This semi-structured format provided a balance between structure and flexibility. While a core set of questions ensured that key areas were covered with all participants, the open-ended nature of the questions allowed for follow-up inquiries and the exploration of emergent themes, enabling a deeper and more nuanced understanding of the research topic.

The development of the interview guide involved several key steps to ensure its validity and reliability. First, a thorough review of the existing literature on school choice and parental decision-making in similar contexts was conducted to identify relevant themes and potential lines of inquiry. This review informed the initial set of questions, which were then refined based on the specific research objectives and the Maldivian educational context. The guide was also reviewed by experts in qualitative research and education to assess its clarity, relevance, and comprehensiveness.

The questions were designed to explore not only the 'what' of school choice (i.e., which schools parents choose) but also the 'why' and 'how' (i.e., the underlying reasons and processes involved in their decision-making). The use of open-ended questions encouraged participants to provide rich, detailed narratives, capturing the complexity and contextually of their experiences.

To ensure the credibility of the analysis, several strategies were employed throughout the research process. First, prolonged engagement with the data was maintained through repeated readings of the transcripts to gain a deep understanding of participants' responses. Additionally, peer debriefing was conducted by discussing preliminary codes and themes with a colleague familiar with qualitative research to minimize researcher bias. An audit trail was maintained by documenting each step of the analytical process, including coding decisions and thematic development. Member checking was also utilized, where participants were invited to review and confirm the accuracy of transcribed data and emerging interpretations, enhancing both credibility and transferability of the findings.

Prior to the commencement of this study, ethical clearance was obtained from Zikura International College, in accordance with the institution's guidelines for academic research. To safeguard the rights

and welfare of all participants, written informed consent was obtained from each individual involved in the study. Participants were provided with a clear explanation of the research objectives, procedures, and their role in the study. They were assured that all data collected would remain strictly anonymous and confidential, and that their identities would not be disclosed at any stage of the research process. Moreover, participants were explicitly informed of their right to voluntarily withdraw from the study at any time, without facing any form of penalty or disadvantage. These measures were implemented to uphold the highest ethical standards in line with responsible research practices.

A focus group discussion, as defined by Bairagi & Munot (2019), is a facilitated group interview involving individuals who share a common characteristic relevant to the research. This method was intended to foster interaction and generate a broader range of perspectives on the topic. However, due to unforeseen time constraints, the focus group discussion was not conducted. The decision was made to prioritize the rich, in-depth data obtained through the individual interviews, which reached saturation and were deemed sufficient to address the research questions effectively.

Throughout the data collection process, the utmost attention was paid to the confidentiality and security of the information shared by the participants. All collected data, including audio recordings and transcribed notes, was stored with stringent security measures on a password-protected computer accessible only to the researcher. This ensured the privacy and anonymity of the participants, upholding ethical research standards.

Cole (1998, as cited in Musthafa & Naseer, 2024), described content analysis as a systematic and objective technique for analyzing transcribed, verbal, or graphic communication. In this study, it served as the primary analytical framework, providing a structured means of interpreting the qualitative data in alignment with the study's exploratory objectives.

After the data collection phase, all interview recordings were transcribed verbatim to prepare the dataset for systematic analysis. The transcribed data were then analyzed using QDA Miner Lite, a qualitative data analysis software designed to facilitate the organization, coding, and interpretation of textual data. The software enabled efficient handling of large volumes of qualitative information and supported the identification of recurring patterns and themes.

A thematic approach was employed to analyze the data, allowing for the emergence of key themes and patterns based on participants' responses. The analysis followed an inductive content analysis framework, wherein themes and categories were derived directly from the data without relying on pre-established codes. This approach ensured that the analysis remained grounded in the actual experiences and perspectives of the participants.

The process involved a careful examination of participants' responses to the main interview questions. Initial codes were assigned to meaningful segments of text, which were then grouped into broader categories and overarching themes. Through iterative comparison and refinement, the themes were developed to reflect the underlying narratives in the data.

4. RESULT AND DISCUSSION

This chapter presents the findings from the data collected through semi-structured interviews with parents from a selected city in the Maldives. The objective of this study was to explore the factors that influence parents when choosing schools for their children, identify the reasons why they may later change that choice, and propose strategies that public schools could adopt to retain or increase student enrollment.

Using a thematic analysis approach, several dominant themes were identified. These themes are structured according to the three research questions guiding the study.

4.1 Overview of Participants

The study engaged 7 participants in total, comprising parents who have children of school age. Participants were divided into two categories: those who had changed their child's school after initial enrollment, and those who had retained their child in the same school.

Table 1. **Participants Information**

Demographic Information of the Participants				
P	Gender	No. of Kids	Grades	Employment Status
A	Male	3	LKG,6,8	Employed
B	Female	2	Nursery,6	Employed
C	Female	3	LKG,8,10	Employed
D	Female	2	3,5	Unemployed
E	Female	2	UKG,3	Employed
F	Female	3	2,2,6	Unemployed
G	Female	2	8,12	Employed

The thematic analysis of the interview data revealed several dominant and interconnected themes related to parents' school choice and mobility decisions. These themes are presented below, organized according to the study's research questions.

4.2 Factors Influencing Initial School Choice

The findings indicate that parents consider a range of interrelated factors when making their initial school choice for their children. These factors reflect a complex interplay of practical considerations, academic priorities, cultural values, and interpersonal dynamics.

4.2.1 Proximity and Convenience

Proximity and convenience emerged as significant factors in parents' initial school selection. Many parents expressed a preference for schools located close to their home or workplace. This preference was primarily driven by the desire to facilitate easier transportation for their children and to enable closer parental involvement in their children's academic lives. As some parents noted:

"Bringing children to where one works is convenient in many ways. All activities conducted by the school can be closely observed, and teachers frequently meet with us and we know the children's performance." (Respondent C)

"The School I enrolled my kid in was near our house. That's why I enrolled them there." (Respondent E)

However, it is important to note that while proximity is a significant factor for many parents, it is not always the overriding consideration. Some parents indicated a willingness to prioritize other factors, such as school quality or specific programs, even if it meant choosing a school that was less conveniently located:

"Don't want to send to a place that's not good for the child no matter how close it is." (Respondent D)

Parents with younger children, in particular, emphasized the importance of geographical convenience in enabling them to effectively manage their work and family responsibilities.

4.2.2 Academic Reputation and School Quality

The academic reputation and perceived quality of education offered by a school were central to parents' decision-making processes. Parents often relied on a combination of sources to assess a school's academic standards, including community reputation, word-of-mouth recommendations from other parents, and their own prior experiences with the school. For example, one parent stated:

"Based on the first experience and because the school was good, I enrolled the second child in that school." (Respondent E)

Parents frequently linked academic achievement to both vocational education and religious knowledge,

reflecting the dual importance they placed on these domains. They sought schools that not only provided a strong foundation in core academic subjects but also offered opportunities for students to develop practical skills and acquire religious knowledge. As another parent noted,

"I heard other parents saying this school was very good." (Respondent E)

"The standard of the school is also very good - by the time children finish foundation, they are at a level to study grade 1." (Respondent D)

In some instances, parents also considered objective indicators of school quality, such as test scores and rankings, although these were not always the primary determinants of their choices:

"I consider the school's academic reputation, teacher quality, class sizes, available extracurricular activities, school safety, diversity, and how well the school communicates with parents. I also look into the school's values and culture to make sure they align with ours." (Respondent B)

4.2.3 Emphasis on Religious Education

Religious instruction played a crucial role in school selection for many parents. Parents frequently voiced a preference for schools that prioritized Islamic teachings, Quran memorization, and the inculcation of strong moral values. This emphasis on religious education reflects the importance of Islam in Maldivian society and the desire among parents to ensure that their children's education is aligned with their religious beliefs and cultural traditions. As one parent stated:

"If there's a place like Arabiyya opened here with programs like memorizing the Quran, I'd like to transfer." (Respondent C)

This finding highlights the strong desire among parents to provide their children with a holistic education that integrates Islamic values with mainstream academic subjects.

4.2.4 Teacher-Parent Relationship

The nature of the relationship between teachers and parents was identified as a significant influence on school choice. Parents expressed a preference for schools where teachers maintained open and proactive communication with them regarding their children's progress and any challenges they may be facing. A parent emphasized this point:

"Maintaining a close relationship with parents, sharing information related to the children's studies even by calling when at home, strengthens the relationship." (Respondent B)

Parents viewed a strong bond and effective communication between teachers and themselves as directly contributing to their children's educational success. They believed that close collaboration between home and school fostered a supportive learning environment and enabled them to work together with teachers to address their children's individual needs.

4.2.5 Extracurricular Activities

Participation in extracurricular activities, particularly structured programs such as cadet training and sports, was another factor that parents valued in their school selection. Parents believed that these activities contributed to their children's character development, instilled discipline, and enhanced their social skills. The availability of a diverse range of extracurricular options was seen as an indicator of a well-rounded education. Conversely, the absence or limited availability of such programs was noted as a drawback for some schools.

4.2.6 Affordability

Financial considerations also played a role in parents' school choice decisions. Several parents highlighted the appeal of schools with low or no tuition fees, as these institutions made education more accessible to families facing financial constraints. Affordability was particularly important for parents with multiple children or those from lower-income households.

4.3 Reasons for Changing Schools

Despite parents' careful initial school selections, a variety of factors led them to transfer their children

to different schools. These reasons highlight the dynamic nature of parental preferences and the importance of schools addressing a range of parental concerns to ensure student retention.

4.3.1 Bullying and Student Conflicts

Bullying emerged as a significant cause for school transfer. Parents reported that instances of teasing, discrimination, and physical aggression among students were sometimes not adequately addressed or resolved by school administrations. The perceived lack of effective intervention by schools in dealing with bullying incidents often led parents to seek alternative school environments that they believed would provide a safer and more supportive atmosphere for their children. One parent shared a personal account of such an experience:

"Bullying issues arose. We talked to the school. The school also tried, but since it didn't stop, and it was affecting the child's behavior, we changed schools." (Respondent G)

The absence of clear and consistently enforced anti-bullying policies and the lack of effective conflict resolution mechanisms within schools were cited as contributing factors to this issue.

4.3.2 Dissatisfaction with Teachers

Concerns about teacher behavior and the perception of unfair treatment of students were recurrent themes in parents' decisions to transfer their children. Some parents expressed dissatisfaction with instances where teachers were perceived to be treating students unequally, often favoring those who received private tuition from them or with whom they had closer personal relationships. One participant explained:

"Students who receive private tuition from a teacher are particularly close to that teacher." (Respondent C)

This perceived favoritism led to feelings of marginalization and resentment among other students and resulted in dissatisfaction among their parents, who viewed such behavior as detrimental to their children's learning and emotional well-being.

4.3.3 Lack of Extracurricular Opportunities

The limited availability or absence of structured extracurricular activities was another reason cited by parents for transferring their children to different schools. Parents who placed a high value on the development of their children's character, discipline, and social skills often sought schools that offered a wider range of extracurricular programs, such as cadet programs, sports, and clubs.

4.3.4 Residential Relocation

Residential relocation, particularly due to housing developments that resulted in shifts in population distribution across different areas or islands, was a significant cause of school mobility. As one parent noted:

"The population decreased the most when people's residences moved to other areas of the island due to the construction of flats in another part of this island."

These relocations often necessitated changes in school enrollment as families sought schools that were closer to their new residences.

4.3.5 Religious and Moral Concerns

Concerns related to the perceived decline in religious instruction or the moral environment of a school also prompted some parents to seek alternative educational settings that they believed were more aligned with their family's religious values and moral principles. For these parents, the integration of religious values and moral education into the school curriculum and the overall school culture was a primary consideration. As some parents indicated:

"The highest priority is given to schools with Islamic values." (Respondent G)

"Especially religious matters, no other school works on those matters to the level this school does." (Respondent G)

4.3.6 Administrative Disagreements

Finally, disagreements with school administrative decisions, particularly those related to competitions, disciplinary actions, or perceived favoritism, also led some parents to transfer their children to different schools. These disagreements often stemmed from parents' concerns about fairness, transparency, and the overall management of the school.

4.4 Strategies for Public Schools to Retain Students

Participants offered valuable insights into strategies that public schools could implement to minimize student mobility and enhance student retention. These suggestions highlight the importance of a holistic approach that addresses not only academic quality but also the social, emotional, and cultural needs of students and their families.

4.4.1 Enhance Academic Quality

Participants emphasized the critical need for public schools to invest in continuously improving academic outcomes and expanding their educational offerings. This includes not only strengthening core academic subjects but also providing additional programs that align with parents' values and priorities, such as enhanced Quran classes and comprehensive moral education programs. Parents believe that schools that demonstrate a commitment to academic excellence and provide a well-rounded education are more likely to retain their students and attract new enrollments.

4.4.2 Foster Stronger Relationships

The importance of cultivating strong and positive relationships between teachers, students, and parents was a recurring theme in the interviews. Participants stressed the need for open and consistent communication channels, regular feedback sessions, and opportunities for parents to be actively involved in their children's education. Schools that prioritize building strong home-school partnerships are seen as more supportive and responsive to the needs of their students and families.

4.4.3 Expand Extracurricular Programs

Participants recommended that public schools expand and diversify their extracurricular offerings to cater to a wider range of student interests and talents. The provision of a variety of extracurricular activities, including structured programs such as cadet training and sports, was seen as essential for promoting students' character development, instilling discipline, and enhancing their social skills. Schools that offer a rich and engaging extracurricular program are more likely to be viewed as providing a well-rounded education and are therefore more attractive to parents.

4.4.4 Address Bullying Proactively

Participants strongly emphasized the need for schools to develop and implement more effective anti-bullying policies and conflict resolution mechanisms. They noted that unresolved student conflicts and instances of bullying were major drivers of school mobility, as parents sought to protect their children from harmful and unsafe learning environments. Schools that take a proactive and comprehensive approach to addressing bullying, including clear policies, consistent enforcement, and effective intervention strategies, are more likely to create a positive and supportive school climate that fosters student well-being and promotes retention.

4.4.5 Promote Transparency and Fairness

Participants stressed the importance of ensuring fairness and transparency in all aspects of school operations, including competitions, disciplinary actions, and reward systems. Perceptions of favoritism or unfair treatment can erode parental trust and lead to dissatisfaction, ultimately contributing to school mobility. Schools that are committed to transparency and fairness in their decision-making processes are more likely to maintain the trust and confidence of parents and the community.

4.4.6 Involve Parents in Decision-Making

Participants suggested that public schools should actively seek to involve parents in discussions and decisions related to school improvement. This could be achieved through regular surveys, feedback forums, parent advisory councils, or other mechanisms that provide parents with a voice in shaping the direction of the school. One parent emphasized this point:

"Show people the improvements. Don't just say we'll improve things after doing a study, show the

improvements." (Respondent G)

By involving parents in the decision-making process, schools can demonstrate their responsiveness to community needs and priorities, foster a sense of shared ownership, and enhance parental satisfaction and support.

4.5 Characteristics of an Ideal School

Parents articulated their vision of an ideal school, highlighting several key attributes.

4.5.1 Focus on Holistic Development

An ideal school should prioritize the holistic development of students, encompassing academic, social, emotional, and moral growth.

"According to me an ideal school would be a place where students feel safe, supported and inspired to learn and grow, not only academically but also socially, emotionally and morally." (Respondent B)

"The highest priority should be given to children's morals. Along with that, academics and extra activities as well." (Respondent G)

4.5.2 Strong Academic Program

A rigorous and engaging academic program that fosters a love of learning was essential.

"The principal should be a very academic person. They should be very visionary." (Respondent C)

"They will reach this minimum level. By the end of Key Stage 1, every child will know how to read and write and have basic numeracy." (Respondent C)

4.5.3 Positive School Culture

A positive and harmonious school culture, characterized by respect, equality, and open communication, was deemed crucial.

"A school should have a very healthy working environment." (Respondent C)

"Teachers should be very close to students. Students should feel that the teacher is very close to them, then students will also respect teachers." (Respondent A)

4.5.4 Religious and Moral Guidance

The integration of religious and moral values into the school curriculum and environment was considered important by some parents.

"First and foremost, the highest priority should be given to providing religious education to children." (Respondent G)

"The teaching there needs to be good, especially teachers should set an example for students in religious matters. Arrangements should be made for prayer even during school hours." (Respondent A)

4.5.5 Life Skills and Practical Knowledge

Integrating life skills was seen as important to parents.

"Teaching children how to behave in society is very important. And I believe an ideal school will teach important life skills needed for the child's life. Cleaning, cooking, such general life skills." (Respondent E)

4.6 The Role of Parents

Parents play an active role in their children's education, and the interviews revealed their perspectives on their responsibilities.

4.6.1 Communication and Collaboration

Parents emphasized the importance of open communication and collaboration with the school to address any issues and support their children's learning.

"The best thing would be to keep the child in the school they are in and work on resolving any issues

that arise by talking to the teachers or school leaders." (Respondent D)

"If something negative is noticed from the school, by talking to the school, through cooperation between the school and parents, a good future can be found for the child." (Respondent A)

4.6.2 Guidance and Support

Parents recognized their responsibility to guide and support their children, teaching them values, coping strategies, and conflict resolution skills.

"As a parent, when there's an issue between two children, you should actually give advice to your own child... If we explain to children this way, many issues will be resolved." (Respondent D)

"If your child is being bullied, you can teach them how to face such situations." (Respondent G)

4.7 Key Findings

Parents make informed decisions when selecting schools for their children, with several key factors influencing their choices. Foremost among these is the pursuit of academic excellence, where parents seek institutions that demonstrate strong educational outcomes and rigorous curricula. Additionally, many families prioritize religious education, particularly in areas where faith-based values play a significant role in their upbringing. Proximity to home is another critical consideration, as parents often prefer schools that are easily accessible, facilitating logistics associated with daily commutes. The strength of the teacher-parent relationship also plays a vital role, as positive interactions can foster a supportive educational environment. Finally, financial affordability remains a cornerstone of decision-making, with parents keenly aware of the economic implications associated with tuition and related expenses.

When students do transition to different schools, a few predominant factors emerge. Notably, incidents of bullying have been highlighted as a major concern, prompting families to seek safer environments. Furthermore, dissatisfaction with teacher behavior or the overall leadership of a school can catalyze a move, as parents desire an atmosphere conducive to their children's growth and well-being. Relocation, whether for personal or professional reasons, often necessitates school changes as families adapt to new communities. Moreover, a lack of extracurricular activities can lead to transfers, as parents seek comprehensive educational experiences that extend beyond academics.

In light of these findings, parents have underscored the need for public schools to make significant improvements in several areas to enhance student retention. Increasing academic standards is essential for fostering an environment of excellence. Furthermore, strengthening the relationships between students and parents within the school community can lead to a more cohesive and supportive atmosphere. Expanding extracurricular offerings will not only enrich the student experience but also engage families in the school culture. Implementing effective anti-bullying measures is crucial to ensure a safe and nurturing environment for all students. Lastly, enhancing fairness and transparency in school policies can build trust and confidence among parents, encouraging them to remain committed to their local schools.

By recognizing the interplay of various factors—academic quality, safety, relationship dynamics, and financial considerations—stakeholders can better address the needs and concerns of families, ultimately fostering a more positive educational landscape.

4.8 Discussion

The findings of this study align with and expand upon existing research in several key areas of school choice and mobility. Consistent with Shiferaw and Kenea (2024), parents in this study prioritized academic reputation and quality when selecting schools, highlighting the ongoing importance of academic excellence in parental decision-making. Similarly, the emphasis on proximity and convenience echoes Hofflinger et al. (2019), underscoring how spatial factors influence school choices, especially among working parents.

The significance of a positive school environment, safety, and anti-bullying measures aligns with research on school climate's impact on student well-being and attrition (Rumberger & Barbara, 2015).

The study's identification of religious and moral values as central factors for many parents reflects the cultural context of the Maldives and is consistent with prior findings that religious values often play a critical role in school selection in similar settings.

Moreover, the reasons for student mobility—dissatisfaction with academic quality, safety concerns, and social issues—correspond with established literature indicating that perceived school deficiencies prompt parents to seek alternatives (Bosetti, 2004; Wallace, 2021). The role of parent-school partnerships in retaining students supports prior research emphasizing the importance of open communication and collaboration to foster positive educational outcomes (Hofflinger et al., 2019).

5. CONCLUSION

Understanding parents' school choice preferences and reasons for school mobility is critical for improving educational outcomes and enhancing student retention. This study reinforces the idea that parents act as rational decision-makers, carefully weighing factors that maximize their children's educational benefits. By aligning school offerings with parental expectations, fostering strong relationships, ensuring transparency, and maintaining high academic and moral standards, public schools in the Maldives can become more competitive and better serve the needs of families and communities. Through strategic, informed action, it is possible to minimize student mobility, enhance educational experiences, and contribute positively to the nation's broader educational goals.

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DOES ORGANIZATIONAL READINESS REDUCE FRAUD? EVIDENCE FROM CLOUD ACCOUNTING ADOPTION IN SMES

Budi Septiawan ^{1,2*}, Intan Salwani Mohamed ³, Yuslina Zakaria ¹, Atang Hermawan ⁴

¹ Accounting Research Institute, Universiti Teknologi MARA, Malaysia.

² Accounting Study Program, Universitas Pasundan, Indonesia

³ Faculty of Accountancy & Accounting Research Institute, Universiti Teknologi MARA, Malaysia.

⁴ Postgraduates Program, Universitas Pasundan, Indonesia

**Corresponding author: budi.septiawan@unpas.ac.id*

Abstract

Fraud remains a persistent challenge among small and medium-sized enterprises (SMEs), particularly in environments with limited internal control systems. While organizational readiness and digital technologies such as cloud accounting are often considered key solutions to mitigate fraud, their actual effectiveness remains uncertain. This study investigates whether organizational readiness reduces fraud occurrence, with evidence drawn from the role of cloud accounting adoption in SMEs. Using a quantitative approach, data were collected from SMEs and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results show that organizational readiness—measured through organizational resources, digital capability, and organizational culture—significantly influences cloud accounting adoption. However, cloud accounting adoption does not have a significant effect on fraud occurrence. Furthermore, organizational culture is found to have a significant positive relationship with fraud occurrence, indicating potential weaknesses in informal or trust-based control environments. These findings suggest that organizational readiness does not necessarily reduce fraud, as the adoption of cloud accounting alone is insufficient to mitigate fraudulent practices. The study highlights the importance of aligning technological adoption with effective governance and control mechanisms. This research contributes by providing empirical evidence on the limited role of digital accounting systems in reducing fraud within SMEs.

Keywords: *Organizational Readiness; Cloud Accounting Adoption; Fraud Occurrence; SMEs; PLS-SEM*

1. INTRODUCTION

Fraud poses a significant risk to organizations of all sizes, including small and medium-sized enterprises (SMEs), where its impact can be particularly severe due to limited resources and less formalized control structures. Small businesses are especially vulnerable, as fraud has been identified as a contributing factor to financial distress and even business failure (Dunne, 2014; N'Guilla Sow et al., 2018). Fraudulent activities may take various forms, including asset misappropriation, corruption, and identity-related crimes, all of which carry serious financial and legal consequences. Empirical evidence further underscores the scale of this issue, with the Association of Certified Fraud Examiners (ACFE, 2024) reporting that the Asia-Pacific region experienced a median loss of nearly \$200,000 per case during the 2022–2023 period. In response to these challenges, organizations have increasingly adopted various fraud management strategies aimed at reducing opportunities for misconduct. These include the implementation of internal controls, monitoring mechanisms, and the use of digital technologies to enhance transparency and oversight (Aris et al., 2015; N'Guilla Sow et al., 2018). Among these technological solutions, cloud accounting has emerged as a promising tool for SMEs due to its flexibility, cost efficiency, and ability to provide real-time financial information (McLIVER, 2020). Such systems enable automated transaction recording and centralized data storage, which can strengthen

monitoring processes and support accountability (Fareed Shaqqour et al., 2021). Prior studies also emphasize the importance of organizational measures, such as fostering ethical culture and implementing control procedures, in supporting fraud prevention efforts (Aris et al., 2015; Zainal et al., 2022).

However, despite these advancements, the effectiveness of digital technologies in mitigating fraud remains uncertain. In many SMEs, the adoption of systems such as cloud accounting does not necessarily translate into stronger control environments, particularly when organizational practices remain informal and governance mechanisms are weak (Samuel & Thamaraiselvi, 2025). This suggests that technological solutions alone may be insufficient, and their effectiveness is likely contingent upon the organizational context in which they are implemented. Given the limitations of technological solutions in addressing fraud, attention has increasingly shifted toward organizational factors that influence their effective implementation. One of the most critical of these factors is organizational readiness, which refers to the extent to which a firm possesses the necessary resources, capabilities, and supportive environment to adopt and utilize new technologies effectively (Andayani et al., 2026). Organizational readiness is often reflected in the availability of financial and human resources, the level of digital capability, and the presence of a culture that supports innovation and change.

Prior research indicates that higher levels of organizational readiness significantly enhance the likelihood of successful technology adoption, particularly in the context of SMEs (Permatasari et al., 2025). Firms that are better prepared are more capable of integrating digital systems such as cloud accounting into their operational processes and decision-making practices. However, while organizational readiness is widely recognized as a key driver of technology adoption, its role in mitigating fraud remains less clearly understood. In particular, it is unclear whether readiness not only facilitates adoption but also contributes to strengthening internal control environments and reducing fraudulent behavior. Moreover, organizational culture—an important dimension of readiness—may have complex implications for fraud risk. While a supportive and trust-based culture can encourage collaboration and efficiency, it may also weaken formal control mechanisms if not accompanied by adequate oversight (Kemiklikiran & Kızrak, 2022). This suggests that organizational readiness may not uniformly lead to positive outcomes, and its relationship with fraud could vary depending on how its components are manifested within SMEs.

Despite the growing body of literature on digital technology adoption and fraud prevention, limited empirical research has examined the extent to which organizational readiness contributes to reducing fraud, particularly through the adoption of cloud accounting in SMEs. Existing studies have largely focused on the determinants of technology adoption, with less attention given to its actual impact on fraud mitigation and control effectiveness. This gap is especially relevant in the context of developing economies, where SMEs often operate under resource constraints and informal governance structures. Therefore, this study aims to investigate whether organizational readiness reduces fraud occurrence, with a particular focus on the mediating role of cloud accounting adoption. Drawing on empirical data from SMEs in Indonesia, this research employs Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the relationships among organizational readiness, cloud accounting adoption, and fraud occurrence. By doing so, this study seeks to provide a more comprehensive understanding of whether technological adoption, when supported by organizational readiness, is sufficient to mitigate fraud or whether additional governance mechanisms are required.

2. LITERATURE REVIEW

2.1 Organizational Readiness

Organizational readiness refers to the extent to which a firm is prepared to adopt and implement new technologies, particularly in terms of its internal resources, capabilities, and supportive environment (Shahadat et al., 2023). It reflects not only the availability of tangible assets, such as financial and technological resources, but also intangible elements, including managerial support and organizational willingness to embrace change. In the context of SMEs, readiness is especially important due to inherent constraints in financial capacity, human resources, and technological expertise, which may affect their ability to adopt and effectively utilize digital innovations (Nair et al., 2019). These limitations often

make SMEs more selective and cautious in adopting new technologies, thereby increasing the importance of internal preparedness.

Drawing on the Technology–Organization–Environment (TOE) framework, organizational readiness is associated with internal organizational factors that shape a firm’s preparedness for technological change (Zhen et al., 2021). This framework highlights that successful technology adoption is not solely driven by external pressures or technological availability, but also by the organization’s internal condition, including its structural, cultural, and capability-related attributes. Firms with higher levels of readiness are more likely to align technological initiatives with their operational and strategic objectives, leading to more effective implementation outcomes. In this study, organizational readiness is operationalized through three key variables—digital capability, organizational culture, and organizational resources—which are examined individually to better capture their distinct roles in influencing technology adoption and fraud-related outcomes. This approach allows for a more nuanced understanding of how different aspects of readiness contribute to both the adoption process and its potential implications for organizational control and risk management.

2.1.1 Digital Capability

Digital capability is a critical factor for small and medium-sized enterprises (SMEs) undergoing digital transformation, as it reflects a firm’s ability to adopt, utilize, and integrate digital technologies into its organizational processes (M. Zhang et al., 2024). It plays a significant role in enhancing competitiveness and enabling firms to respond effectively to changes in the digital environment (M. Zhang et al., 2024). Beyond basic technology usage, digital capability also encompasses the ability to reconfigure existing processes, improve operational efficiency, and support data-driven decision-making, which are essential in increasingly dynamic and competitive markets. Drawing on the concept of dynamic capabilities, digital capability can be understood through three key components: digital perception, digital operation, and digital integration. Digital perception enables firms to identify technological trends and emerging market opportunities, while digital operation reflects the ability to effectively utilize digital tools in daily activities (Warner & Wäger, 2019). Meanwhile, digital integration refers to the capacity to embed digital technologies across organizational functions, ensuring alignment between technological initiatives and business processes. Together, these capabilities allow SMEs to not only adopt digital innovations but also leverage them strategically to enhance performance and adaptability.

2.1.2 Organizational Culture

Organizational culture refers to the shared values, beliefs, and norms that shape behavior within an organization and influence how employees respond to rules and control mechanisms (N’Guilla Sow et al., 2018). It represents an important informal control system that guides decision-making and daily practices within firms. In SMEs, culture plays a particularly crucial role in guiding operations, as these organizations often rely more on interpersonal relationships and informal structures rather than formalized procedures. A strong ethical culture can support fraud prevention by encouraging transparency, accountability, and responsible behavior among employees (Zhen et al., 2021). Conversely, a weak or overly trust-based culture may increase vulnerability to fraudulent behavior, especially when it is not supported by adequate monitoring and control mechanisms (N’Guilla Sow et al., 2018). Furthermore, organizational culture influences employees’ acceptance of digital technologies and internal control systems, thereby affecting the effectiveness of such mechanisms (Zhen et al., 2021). As such, organizational culture not only shapes behavioral norms but also plays a critical role in determining how effectively both technological and control systems are implemented within SMEs.

2.1.3 Organizational Resources

Organizational resources refer to the financial, human, and technological assets available within a firm that support its operations and strategic initiatives (Mujalli et al., 2024). These resources form the foundation upon which organizations implement innovations and maintain effective control systems. In SMEs, the availability of adequate resources is a critical factor influencing the adoption and effective use of digital technologies, including cloud accounting systems, as limited resources often restrict their ability to invest in new solutions. Limited financial capacity and a lack of skilled personnel frequently constrain SMEs in implementing robust internal controls and fraud prevention mechanisms (Mujalli et

al., 2024). Such constraints may result in weaker monitoring systems and increased exposure to operational risks. Conversely, firms with stronger resource bases are better positioned to invest in technological tools, employee training, and monitoring systems that enhance transparency and reduce opportunities for fraudulent activities (Aris et al., 2015). Therefore, organizational resources play a vital role not only in facilitating technology adoption but also in strengthening governance and risk management practices within SMEs.

2.2 Cloud Accounting Adoption

Cloud accounting adoption refers to the extent to which organizations implement and utilize cloud-based accounting systems in their operations, representing a shift from traditional on-premises systems to more flexible and scalable digital solutions (Ionescu, 2019). This transition reflects not only technological change but also a strategic move toward improving accessibility, efficiency, and real-time financial management. Adoption is commonly reflected in the level of system usage, integration with other business applications, and user acceptance within the organization. Adoption also indicates an organization's commitment to leveraging technology to enhance operational efficiency and support informed decision-making processes (Alshamaila et al., 2013). In the context of SMEs, cloud accounting offers several advantages, including real-time data access, streamlined financial processes, and reduced IT infrastructure costs, making it particularly suitable for firms with limited resources (Gangwar et al., 2015). Furthermore, continuous system usage enhances user familiarity and promotes deeper integration into organizational workflows, thereby increasing the overall effectiveness and perceived value of the technology (DeLone & McLean, 2016). As such, the extent of adoption plays a critical role in determining whether cloud accounting can deliver its intended organizational benefits.

2.3 Fraud Occurrence

Fraud occurrence refers to the frequency or extent to which fraudulent activities take place within an organization, reflecting the realization of fraud risk in operational contexts (Wells, 2013). It encompasses various forms of misconduct, such as asset misappropriation, financial statement fraud, and corruption, which can have significant financial and reputational consequences for firms (Zainal et al., 2022). In SMEs, where formal control systems are often less developed, the risk of such fraudulent activities may be more pronounced. The occurrence of fraud is influenced by multiple factors, including the effectiveness of internal controls, organizational culture, and external pressures faced by the organization (Wells, 2013). Weak control environments, lack of oversight, and high levels of trust without proper monitoring can increase opportunities for fraudulent behavior. A higher frequency of fraud cases often indicates deficiencies in governance structures, monitoring systems, and risk management practices. In this regard, fraud occurrence serves as an important indicator of the overall effectiveness of an organization's control environment and its ability to prevent and detect fraudulent behavior (Singleton & Singleton, 2010). Therefore, understanding the factors that contribute to fraud occurrence is essential for developing more effective prevention and mitigation strategies, particularly in the context of SMEs..

2.4 Hypotheses Development

2.4.1 Organizational Readiness Influence Cloud accounting Adoption

Organizational factors play a crucial role in shaping the adoption of digital technologies within firms, particularly in SMEs where resource constraints and internal capabilities significantly influence decision-making processes. These internal conditions determine not only whether firms are willing to adopt new technologies but also their ability to implement them effectively. Digital capability enables firms to understand, evaluate, and utilize technological innovations, while organizational resources provide the necessary financial and human support required for successful implementation. In addition, organizational culture influences employees' acceptance of change and their willingness to engage with new systems, which is critical for ensuring smooth technology integration.

Prior studies suggest that these factors are important determinants of technology adoption, including cloud-based systems (Nair et al., 2019; Shahadat et al., 2023). Firms with higher levels of readiness are generally more proactive in embracing digital transformation and are better equipped to align technological initiatives with their operational needs. Therefore, organizations with stronger digital capability, supportive organizational culture, and sufficient resources are more likely to adopt cloud

accounting systems and leverage them effectively in their business processes.

H1: Digital capability is expected to influence cloud accounting adoption.

H2: Organizational culture is expected to influence cloud accounting adoption.

H3: Organizational resources are expected to influence cloud accounting adoption.

2.4.2 Cloud accounting Adoption Influence Fraud Occurrence

Cloud accounting adoption is often associated with improved transparency, real-time financial reporting, and enhanced monitoring capabilities, which are expected to reduce opportunities for fraudulent activities. These systems enable more accurate and timely recording of financial transactions, thereby improving visibility and traceability within organizational processes. The use of cloud-based systems allows for better tracking of transactions and supports stronger internal control mechanisms, particularly through automated processes and centralized data management (Fareed Shaqqour et al., 2021; Nawaiseh et al., 2024).

However, the extent to which such systems effectively reduce fraud remains an empirical question, particularly in SME contexts where governance structures may be less formalized. In such environments, the effectiveness of cloud accounting systems may depend not only on their technical capabilities but also on how they are implemented and supported by internal control practices. This suggests that technological adoption alone may not be sufficient to mitigate fraud risk without the presence of strong organizational governance and oversight mechanisms.

H4: Cloud accounting adoption is expected to influence fraud occurrence.

2.4.3 Digital Capability, Organizational Culture, Organizational Resources and Fraud Occurrence

In addition to the hypothesized relationships above, this study also examines the direct effects of digital capability and organizational resources on fraud occurrence, as well as the indirect effects of organizational readiness components on fraud occurrence through cloud accounting adoption. These relationships are tested to provide a more comprehensive understanding of both direct and mediating effects within the proposed research model.

H5: Digital capability is expected to influence fraud occurrence.

H6: Organizational culture is expected to influence fraud occurrence.

H7: Organizational resources is expected to influence fraud occurrence.

H8-H10: Cloud accounting adoption mediates the relationship between organizational readiness components and fraud occurrence.

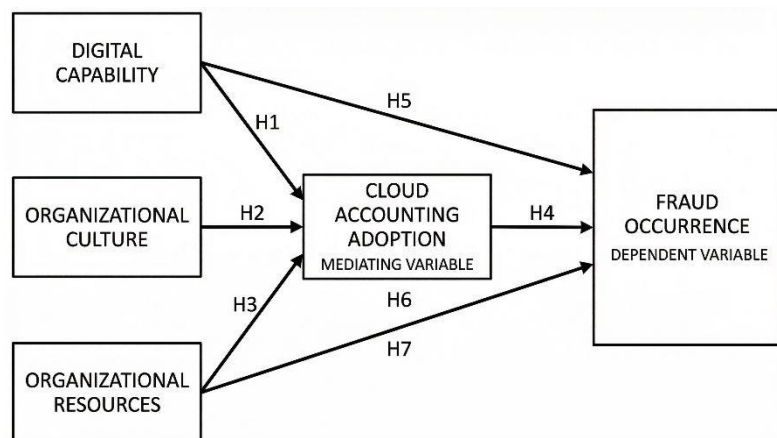


Figure 1. Conceptual Framework

3. METHODOLOGY

3.1 Research Design

This study adopts a quantitative research approach to examine the relationships between organizational readiness, cloud accounting adoption, and fraud occurrence in SMEs. A survey method is employed to collect data from respondents, allowing for the empirical testing of the proposed hypotheses.

Quantitative approaches are widely used in technology adoption and fraud-related studies due to their ability to analyze complex relationships among variables (Y. Zhang et al., 2024)

3.2 Population and Sample

The population of this study consists of small and medium-sized enterprises (SMEs) located in West Java, Indonesia. SMEs are selected as the unit of analysis due to their vulnerability to fraud and increasing adoption of digital accounting systems. The sampling technique used in this study is stratified sampling, targeting respondents who are knowledgeable about the cloud accounting adoption decision makers, such as owners, managers, or accounting staff. The sample size consists of 335 respondents, which is considered adequate for Partial Least Squares Structural Equation Modeling (PLS-SEM), as this method does not require large sample sizes and is suitable for exploratory and predictive research models (Hair et al., 2021).

3.3 Data Collection Method

Data were collected using a structured questionnaire distributed through online platforms (<https://info.populix.co/>). The questionnaire was designed based on established constructs from prior studies and adapted to fit the context of small and medium-sized enterprises (SMEs). All items were measured using a 5-point Likert scale for assessing the occurrence of fraud risks, a 7-point Likert scale for other variables and percentage for organizational resources, ranging from strongly disagree to strongly agree. This approach is commonly used in behavioral and accounting research (Warmbrod, 2014). Prior to full distribution, a pilot test was conducted with 30 respondents to ensure the clarity and reliability of the instrument.

3.4 Measurement of Variables

The constructs in this study are measured using multiple indicators adopted from previous literature:

1. Digital Capability: Measured based on dimensions such as digital perception, operation, and integration (M. Zhang et al., 2024).
2. Organizational Culture: Measured through indicators reflecting shared values, ethical norms, and attitudes toward technology adoption (Ajigini & Chinamasa, 2023; Cameron & Quinn, 2006).
3. Organizational Resources: Measured using indicators related to financial, human, and technological resources available within the firm (Katebi et al., 2022; Mujalli et al., 2024).
4. Cloud Accounting Adoption: Measured based on system usage, integration, and user satisfaction (Al-Okaily et al., 2023; DeLone & McLean, 2016).
5. Fraud Occurrence: Measured by the frequency or likelihood of fraudulent activities within the organization (Wells, 2013; Zainal et al., 2022).

Table 1. The Concept and Construct of Variables

Variables	Questions	Measurements
Digital Capability	- Our organization is capable of identifying digital technology trends that can enhance accounting processes	Reflective 7-point Likert scale
	- We can utilize digital technology to optimize internal business processes and financial resources	
	- We can integrate digital technology to align accounting practices with evolving business needs	
	- We actively shape a digital mindset among employees to support accounting innovation.	
	- Our organization has values and norms that support the adoption of cloud-based technologies like cloud accounting	
Organizational Culture	- Employees are encouraged to adapt quickly to changes in accounting processes and systems	Reflective 7-point Likert scale
	- Cross-functional collaboration is part of our culture and supports the successful adoption of cloud accounting	
	- Our organizational culture supports experimentation and learning through trial-and-error in using digital tools	
	- Our leaders supports innovation in accounting practices by providing space for new ideas	

Organizational Resources	- Approximately, what percentage of your total business budget is used for all information technology needs (for example: purchasing computers, software, internet services, training in the IT field and others)? - Of the total information technology budget, what percentage is used specifically for cloud-based services (for example: subscriptions to online accounting applications) - Approximately, what percentage of your employees have sufficient IT skills to operate and manage a cloud-based accounting system in their daily activities? - Approximately, what percentage of internal employees in your organization have the technical capabilities to implement, configure, and maintain a cloud-based accounting system?	Formative Percentage
Cloud Accounting Adoption	- Cloud accounting is frequently used in our daily financial and accounting operations - Cloud accounting is consistently used for all financial reporting tasks - Our cloud accounting system is well integrated with other business systems or applications - We are satisfied with the performance and ease of use of our cloud accounting system	Reflective 7-point Likert scale
Fraud Occurrence	- How likely is it that corruption (e.g., bribery, kickbacks, conflict of interest, unauthorized payments) could occur in your organization? - If corruption occurred, how significant would the impact be on your organization's financial integrity or business reputation? - How likely is it that asset misappropriation (e.g., cash theft, inventory loss, misuse of company assets, false expense claims) could occur in your organization? - If asset misappropriation occurred, how significant would the impact be on your organization's financial and operational performance? - How likely is it that financial statement fraud (e.g., overstating sales, delaying expenses, manipulating financial records) could occur in your organization? - If financial statement fraud occurred, how significant would the impact be on the accuracy of reports and business decision-making? - How likely is it that cyber fraud (e.g., data theft, unauthorized system access, digital manipulation of accounting records) could occur in your organization? - If cyber fraud occurred, how significant would the impact be on the organization's data security and operational continuity?	Formative 5-point Likert scale Risk x Impact

3.5 Data Analysis Technique

This study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS to analyze the data. PLS-SEM is chosen due to its suitability for complex models involving multiple constructs and mediation effects, as well as its ability to handle non-normal data distributions (Hair et al., 2021). The analysis is conducted in two stages:

3.5.1 Measurement Model Evaluation

The measurement model is evaluated to assess the reliability and validity of the constructs, taking into account both reflective and formative measurement specifications.

For reflective constructs, the evaluation includes:

1. Indicator reliability, assessed through outer loadings (≥ 0.70)
2. Internal consistency reliability, measured using Cronbach's alpha and composite reliability ($\geq$

0.70)

3. Convergent validity, assessed using Average Variance Extracted ($AVE \geq 0.50$)
4. Discriminant validity, evaluated using the Fornell–Larcker criterion and the Heterotrait–Monotrait (HTMT) ratio

For formative constructs, the assessment focuses on:

1. Multicollinearity, evaluated using the Variance Inflation Factor ($VIF < 5$)
2. Indicator relevance and significance, assessed through outer weights and their statistical significance

This approach ensures that each construct is evaluated to its measurement specification, following recommended guidelines for PLS-SEM analysis (Hair et al., 2021).

3.5.2 Structural Model Evaluation

The structural model is evaluated to test the proposed hypotheses and examine the relationships among constructs. The assessment includes:

1. Path coefficients (β) and their significance (t-values and p-values)
2. Coefficient of determination (R^2) to assess the explanatory power of the model
3. Effect size (f^2) to evaluate the contribution of each exogenous construct
4. Mediation analysis, assessed through indirect effects

Bootstrapping with [e.g., 10,000 resamples] is conducted to determine the statistical significance of all estimated relationships.

4. RESULT AND DISCUSSION

4.1 Results

4.1.1 Respondent Profile

A total of 335 respondents from SMEs in West Java participated in this study. The sample consists of 55.7% female and 44.3% male respondents, indicating a relatively balanced gender distribution. In terms of age, the majority of respondents fall within the range of 25 to 35 years old, reflecting a young and productive workforce actively involved in business operations and decision-making. Based on industry classification, most SMEs operate in the trade/retail (32.8%) and food and beverage sectors (31.5%), followed by manufacturing (15.1%), services (12.8%), and creative industries (7.2%). This indicates that the sample is largely dominated by consumer-oriented businesses. Regarding firm characteristics, most SMEs have been operating between 3 to 10 years, suggesting that the majority are relatively established businesses rather than newly formed enterprises. In terms of financial scale, 77.7% of firms report annual revenues between 2 and 15 billion IDR, while the remaining 22.3% generate between 15 and 50 billion IDR. With respect to technology usage, the duration of cloud accounting adoption varies across firms, with most respondents indicating usage between 2 to 5 years. This suggests a moderate level of digital maturity, where firms have begun integrating cloud-based systems into their operations but may still be in the process of optimizing their use. In terms of respondent roles, the sample is dominated by key decision-makers, including owners/directors (35.7%), finance/accounting managers (26.2%), and accounting staff (21.3%). This enhances the reliability of the data, as respondents are directly involved in financial management and organizational decision-making processes. See the table 2 below

Category	Description	Frequency	Percentage (%)
Gender	Male	148	44.3%
	Female	187	55.7%
Age	< 25 years	48	14.3%
	25 – 30 years	110	32.8%
	31 – 35 years	95	28.4%
	36 – 40 years	52	15.5%
	> 40 years	30	9.0%
Industry	Trade / Retail	110	32.8%
	Food & Beverage	105	31.5%
	Manufacturing	50	15.1%
	Services	43	12.8%
	Creative Industry	24	7.2%

Category	Description	Frequency	Percentage (%)
Business Age	< 3 years	60	17.9%
	3 – 5 years	95	28.4%
	6 – 10 years	120	35.8%
	> 10 years	60	17.9%
Annual Revenue	2 – 15 billion IDR	260	77.7%
	15 – 50 billion IDR	75	22.3%
Cloud Accounting Usage	< 2 years	75	22.4%
	2 – 3 years	95	28.4%
	4 – 5 years	105	31.3%
	> 5 years	60	17.9%
Position	Owner / Director	120	35.7%
	Finance Manager	88	26.2%
	Accounting Staff	71	21.3%
	Others (IT, etc.)	56	16.7%
Total Respondents		335	100%

4.1.2 Measurement Model Results

The measurement model evaluation was conducted to assess the reliability and validity of both reflective and formative constructs. For the reflective constructs—Cloud Accounting Adoption, Digital Capability, and Organizational Culture—the results indicate that all indicator loadings exceed the recommended threshold of 0.70, with the exception of one item (OC2 = 0.679), which remains acceptable for exploratory research (Hair et al., 2021). Overall, the constructs demonstrate satisfactory indicator reliability. See the table 3 below.

Table 3. Outer Loadings			
	Cloud Accounting Adoption	Digital Capability	Organizational Culture
CAA1	0.818		
CAA2	0.797		
CAA3	0.830		
CAA5	0.735		
DC1		0.822	
DC2		0.806	
DC3		0.818	
DC5		0.798	
OC1			0.804
OC2			0.679
OC3			0.797
OC4			0.828
OC5			0.802

Internal consistency reliability is confirmed, as Cronbach's alpha and composite reliability values for all constructs exceed the recommended threshold of 0.70 (Hair et al., 2021). Specifically, composite reliability values range from 0.873 to 0.888, indicating strong reliability. Convergent validity is also established, with Average Variance Extracted (AVE) values ranging from 0.615 to 0.658, all above the minimum threshold of 0.50. See the table 4 below.

Table 4. Construct Reliability and Validity				
	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Cloud Accounting Adoption	0.806	0.811	0.873	0.633
Digital Capability	0.827	0.827	0.885	0.658

Organizational Culture	0.842	0.847	0.888	0.615
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Discriminant validity was assessed using the HTMT criterion. While most values are within acceptable limits, the HTMT value between Digital Capability and Organizational Culture (0.988) exceeds the recommended threshold, indicating a potential issue of discriminant validity between these constructs. This suggests that the two constructs may be closely related and should be interpreted with caution. However, both constructs were retained in the model, as they represent conceptually distinct aspects of organizational readiness. Digital capability reflects a firm's technological competence and ability to utilize digital tools, whereas organizational culture captures shared values and behavioral norms within the organization. These constructs were carefully reviewed and validated through prior literature and author discussions to ensure their theoretical distinctiveness. Therefore, despite the high HTMT value, the inclusion of both constructs is justified based on strong conceptual reasoning (Richter et al., 2023). See the table 5 below.

Table 5. Discriminant Validity - HTMT

	Cloud Accounting Adoption	Digital Capability
Cloud Accounting Adoption		
Digital Capability	0.854	
Organizational Culture	0.885	0.988

For the formative constructs, multicollinearity was assessed using Variance Inflation Factor (VIF) values. All indicators show VIF values below the threshold of 5, indicating no significant multicollinearity issues. The significance of indicator weights was evaluated through bootstrapping results. Several indicators were found to be significant (e.g., FO2, FO4, FO5, FO6, FO7, FO8, OR4, OR5), while others were not statistically significant (e.g., FO1, FO3, OR1, OR2). Despite this, non-significant indicators were retained as they may still contribute to the construct's content validity. See the table 6 below.

Table 6. VIF & Outer Loadings Bootsrapping

	VIF	P values
FO1	3.688	0.057
FO2	2.221	0.019
FO3	4.759	0.349
FO4	2.513	0.037
FO5	3.711	0.013
FO6	3.174	0.027
FO7	3.964	0.037
FO8	2.93	0.002
OR1	1.182	0.241
OR2	1.291	0.096
OR4	2.291	0.001
OR5	2.367	0.000

4.1.3 Structural Model Results

The structural model evaluation was conducted to test the proposed hypotheses by examining path coefficients, significance levels, and explanatory power. See the table 7 below.

Table 7. Path Coefficients

	Original sample	Standard deviation STDEV	T statistics O/STDEV	P values	Decision
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H1: Digital Capability -> Cloud Accounting Adoption	0.291	0.118	2.456	0.014	Supported
H2: Organizational Culture -> Cloud Accounting Adoption	0.473	0.115	4.129	0.000	Supported
H3: Organizational Resources -> Cloud Accounting Adoption	0.139	0.041	3.394	0.001	Supported
H4: Cloud Accounting Adoption -> Fraud Occurrence	-0.120	0.196	0.612	0.541	Not Supported
H5: Digital Capability -> Fraud Occurrence	-0.289	0.241	1.201	0.230	Not Supported
H6: Organizational Culture -> Fraud Occurrence	0.667	0.303	2.204	0.028	Supported
H7: Organizational Resources -> Fraud Occurrence	-0.056	0.132	0.425	0.671	Not Supported
H8: Digital Capability -> Cloud Accounting Adoption -> Fraud Occurrence	-0.035	0.070	0.496	0.620	Not Supported
H9: Organizational Culture -> Cloud Accounting Adoption -> Fraud Occurrence	-0.057	0.089	0.640	0.522	Not Supported
H10: Organizational Resources -> Cloud Accounting Adoption -> Fraud Occurrence	-0.017	0.027	0.617	0.537	Not Supported

The results indicate that cloud accounting adoption does not have a significant effect on fraud occurrence ($\beta = -0.120$, $p = 0.541$), suggesting that the adoption of cloud accounting systems alone is insufficient to reduce fraud. Therefore, H4 is not supported. With respect to the antecedents of cloud accounting adoption, digital capability ($\beta = 0.291$, $p = 0.014$), organizational culture ($\beta = 0.473$, $p < 0.001$), and organizational resources ($\beta = 0.139$, $p = 0.001$) all have significant positive effects. These findings support H1, H2, and H3, indicating that organizational readiness factors play an important role in driving the adoption of cloud accounting in SMEs. In terms of direct effects on fraud occurrence, organizational culture shows a significant positive effect ($\beta = 0.667$, $p = 0.028$), indicating that higher levels of organizational culture are associated with increased fraud occurrence. Thus, H6 is supported. In contrast, digital capability ($\beta = -0.289$, $p = 0.230$) and organizational resources ($\beta = -0.056$, $p = 0.671$) do not significantly influence fraud occurrence, leading to the rejection of H5 and H7. The mediation analysis reveals that cloud accounting adoption does not mediate the relationship between organizational readiness components and fraud occurrence. All indirect effects are not statistically significant ($p > 0.05$), indicating that H8 to H10 is not supported.

The coefficient of determination (R^2) shows that the model explains 58.2% of the variance in cloud accounting adoption, indicating moderate explanatory power. However, the model explains only 15.5% of the variance in fraud occurrence, suggesting weak explanatory power for this construct. Effect size (f^2) analysis indicates that organizational culture has a moderate effect on cloud accounting adoption ($f^2 = 0.168$) and a small-to-moderate effect on fraud occurrence ($f^2 = 0.141$). Other relationships exhibit small effect sizes, suggesting limited practical impact. Overall, the results suggest that while organizational readiness significantly drives cloud accounting adoption, its role—along with cloud accounting itself—in reducing fraud occurrence is limited. See the table 8 and 9 below.

Table 8. R-Square

	Original sample (O)	Effect
Cloud Accounting Adoption	0.582	Moderate
Fraud Occurrence	0.155	Weak

Table 9. f-Square

	Original sample (O)	Effect
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Cloud Accounting Adoption -> Fraud Occurrence	0.007	Small
Digital Capability -> Cloud Accounting Adoption	0.063	Small
Digital Capability -> Fraud Occurrence	0.029	Small
Organizational Culture -> Cloud Accounting Adoption	0.168	Medium
Organizational Culture -> Fraud Occurrence	0.141	Small to Medium
Organizational Resources -> Cloud Accounting Adoption	0.046	Small
Organizational Resources -> Fraud Occurrence	0.004	Small

Notes: Effect Size Interpretation based on Cohen (1988)

The final structural model presented in Figure 2 illustrates the relationships between organizational readiness components, cloud accounting adoption, and fraud occurrence. The model includes three exogenous constructs—digital capability, organizational culture, and organizational resources—one mediating variable, cloud accounting adoption, and one endogenous variable, fraud occurrence. During the measurement model evaluation, several indicators were removed due to not meeting the recommended thresholds for reliability and validity. Specifically, indicators with low outer loadings or non-significant contributions were excluded to improve the overall quality of the measurement model. This refinement process is consistent with PLS-SEM guidelines, which emphasize retaining only indicators that adequately represent their respective constructs (Hair et al., 2021). As a result, the final model consists of indicators that demonstrate satisfactory reliability and validity, ensuring more robust and accurate estimation of the structural relationships.

The refined model shows that digital capability, organizational culture, and organizational resources significantly influence cloud accounting adoption, with organizational culture exhibiting the strongest effect. However, cloud accounting adoption does not have a significant effect on fraud occurrence. Among the direct relationships with fraud occurrence, only organizational culture shows a significant positive effect, while digital capability and organizational resources are not significant predictors. The endogenous constructs exhibit varying levels of explanatory power. Cloud accounting adoption achieves a moderate level of explained variance ($R^2 = 0.582$), indicating that organizational readiness components collectively explain a substantial portion of its variance. In contrast, fraud occurrence has a relatively low explained variance ($R^2 = 0.155$), suggesting that other external factors not included in the model may play a significant role in explaining fraudulent behavior in SMEs. Overall, the final model reflects a refined and empirically validated structure, where only reliable indicators are retained, and the relationships among constructs are tested with improved measurement quality. This enhances the robustness of the findings and ensures that the conclusions drawn from the model are both statistically and theoretically sound.

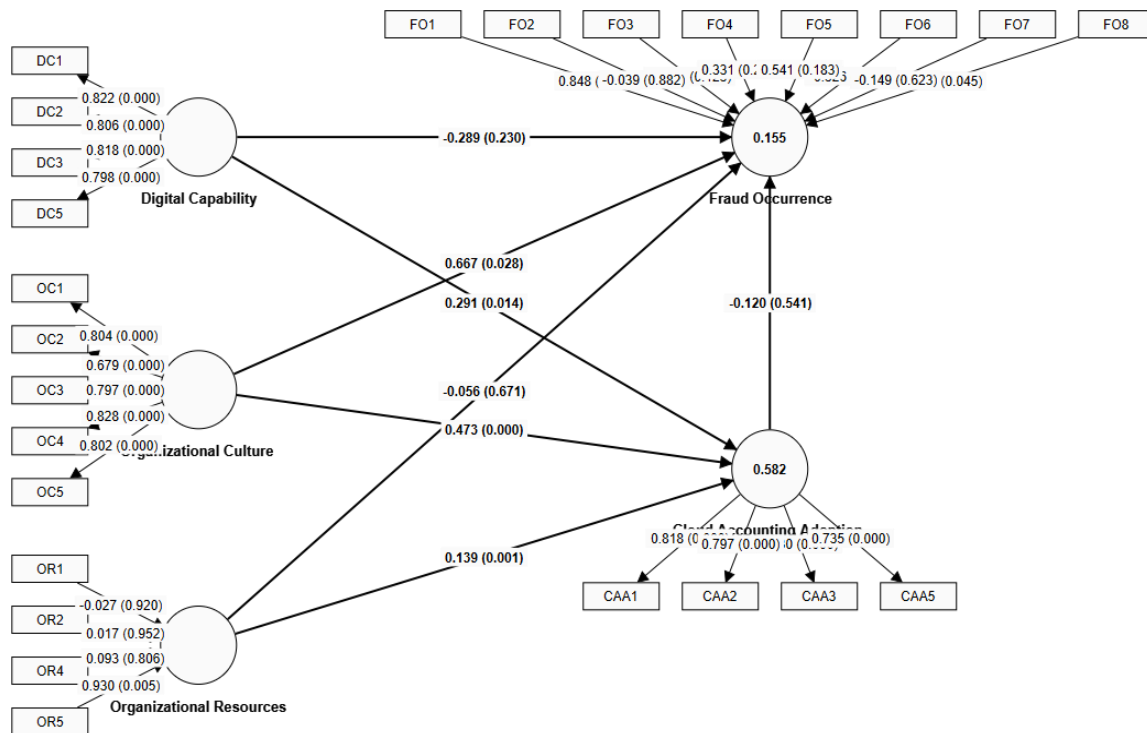


Figure 2. Final Structural Model

4.2 Discussion

The findings of this study provide several important insights into the relationship between organizational readiness, cloud accounting adoption, and fraud occurrence in SMEs. Overall, the results indicate that while organizational readiness significantly influences the adoption of cloud accounting, its role in reducing fraud is limited, highlighting a gap between technological implementation and governance effectiveness. This finding suggests that the presence of internal capabilities and resources alone is not sufficient to ensure effective fraud mitigation, particularly in environments where formal control systems may be underdeveloped.

First, the results confirm that digital capability, organizational culture, and organizational resources significantly influence cloud accounting adoption, supporting prior studies that emphasize the importance of organizational factors in technology adoption. This finding is consistent with the Technology–Organization–Environment (TOE) framework, which suggests that internal organizational conditions play a critical role in shaping innovation adoption (Tornatzky et al., 1990). In particular, organizational culture shows the strongest effect on adoption, indicating that a supportive environment and openness to change are key drivers for implementing digital accounting systems in SMEs. This aligns with previous research highlighting the role of organizational culture in facilitating digital transformation and innovation (Zhen et al., 2021).

However, the study finds that cloud accounting adoption does not have a significant effect on fraud occurrence, suggesting that the implementation of digital accounting systems alone is insufficient to mitigate fraudulent activities. This result challenges the common assumption that increased digitalization automatically enhances transparency and reduces fraud risk. While cloud accounting systems provide features such as real-time reporting and audit trails, their effectiveness depends on how they are utilized within the organization. This finding supports prior arguments that technology must be complemented by strong internal controls and governance mechanisms to effectively reduce fraud (Hassan et al., 2025; Meiriyani et al., 2019).

Another notable finding is that organizational culture has a significant positive effect on fraud occurrence, indicating that higher levels of organizational culture are associated with increased fraud. This result may appear counterintuitive, as culture is often linked to ethical behavior and control. However, in the context of SMEs, this finding can be explained by the prevalence of informal and trust-

based cultures, which may reduce the effectiveness of formal control systems. Excessive reliance on trust without adequate monitoring can create opportunities for fraudulent behavior, as suggested in prior studies on internal control weaknesses in SMEs (N'Guilla Sow et al., 2018; Zainal et al., 2022). Therefore, while culture is important, it must be balanced with formal governance mechanisms to effectively prevent fraud.

In contrast, digital capability and organizational resources do not significantly influence fraud occurrence, indicating that having technological competence and sufficient resources does not necessarily translate into better fraud control. This suggests that the relationship between organizational readiness and fraud is more complex and may involve other factors such as managerial oversight, regulatory compliance, and internal audit practices. This finding reinforces the view that fraud prevention is not solely a technological or resource-driven issue but requires a comprehensive governance approach (Halbouni et al., 2016). Furthermore, the mediation analysis reveals that cloud accounting adoption does not mediate the relationship between organizational readiness and fraud occurrence, indicating that the indirect effects are not significant. This finding suggests that the pathway from organizational readiness to fraud reduction through technology adoption is weak or non-existent in this context. It implies that SMEs may adopt cloud accounting primarily for operational efficiency rather than for strengthening internal controls or fraud prevention.

Finally, the relatively low explanatory power for fraud occurrence ($R^2 = 0.155$) indicates that a large proportion of variance remains unexplained, suggesting that other external or behavioral factors may play a more dominant role in influencing fraud in SMEs. Factors such as regulatory environment, owner involvement, and ethical leadership may provide additional explanatory power and should be considered in future research.

5. CONCLUSION

This study examines the role of organizational readiness in reducing fraud occurrence, with a particular focus on the mediating effect of cloud accounting adoption in SMEs. The findings reveal that organizational readiness—represented by digital capability, organizational culture, and organizational resources—significantly influences the adoption of cloud accounting systems. This confirms that internal organizational factors are critical drivers of digital transformation in SMEs. However, the results indicate that cloud accounting adoption does not significantly reduce fraud occurrence, suggesting that the implementation of digital accounting systems alone is insufficient to mitigate fraudulent behavior. This highlights a critical gap between technological adoption and its effectiveness in strengthening internal control environments. Among the organizational readiness components, only organizational culture shows a significant relationship with fraud occurrence, and interestingly, the relationship is positive. This suggests that in SME contexts, informal or trust-based cultures, when not supported by formal control mechanisms, may increase vulnerability to fraud.

The study contributes to the literature by providing empirical evidence that challenges the assumption that digital technologies inherently reduce fraud risk. It emphasizes that technological solutions must be complemented by effective governance, internal controls, and monitoring systems to achieve meaningful fraud prevention outcomes. From a practical perspective, the findings suggest that SME owners and managers should not rely solely on cloud accounting systems as a fraud mitigation tool. Instead, they should strengthen organizational governance structures, implement formal control procedures, and ensure that technological adoption is aligned with risk management practices.

This study is subject to several limitations. The relatively low explanatory power for fraud occurrence indicates that other factors, such as external regulation, managerial oversight, or ethical leadership, may also play significant roles and should be explored in future research. Additionally, the study focuses on SMEs in a specific context, which may limit the generalizability of the findings. Future studies are encouraged to incorporate broader samples, additional variables, and alternative analytical approaches to further investigate the relationship between technology adoption and fraud mitigation.

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MAPPING BLOCKCHAIN IN PUBLIC SECTOR ACCOUNTING: A BIBLIOMETRIC ANALYSIS AND CONCEPTUAL FRAMEWORK OF THEMATIC CONVERGENCE, AND THE REGULATORY– PUBLICATION GAP

Antares Firman¹, Mohamad Azmi Nias Ahmad² and Eley Suzana Kasim³

¹Accounting Department, Universitas Terbuka, Indonesia.

² Accounting Research Institute, Universiti Teknologi MARA, Malaysia.

³ Accounting Research Institute, Universiti Teknologi MARA, Malaysia.

**Corresponding author: mohdazminias@uitm.edu.my*

Abstract

This study examines the development of Blockchain-based Accounting Information Systems (BAIS) in the public sector through a bibliometric analysis. Although blockchain is increasingly integrated into public-sector financial management, limited attention has been paid to how knowledge in this field is produced, structured and geographically distributed. Based on 59 Scopus-indexed articles published between 2023 and 2026, this study maps its structure, intellectual orientation, and cooperation network using the Bibliometrix (Biblioshiny) tool. The results show a very high level of thematic convergence around core themes such as accounting information systems to distributed ledger and triple-entry accounting. It is obvious that at this point, research on blockchain in accounting has gone beyond conceptual elaboration and entered structural integration. At the same time, the analysis reflects a contrasting reality in the production of global knowledge, where there are countries producing the necessary number and quality of academic output, with Southeast Asia comparatively underrepresented. This disparity indicates a digital governance–publication gap, where countries with strong digital governance but lack of high-impact academic output are not proportionally represented in academia. This gap highlights the disparity between real-world applications and academic exposure. By reframing this gap as a public digital transformation knowledge translation problem, this study contributes an alternative contextualise understanding of why many world regions are underrepresented in the global academic conversation. Moreover, the study also provides a lead to integrated-digital financial innovation with academic records in emerging economies.

Keywords: *Blockchain, Public Sector Accounting, Bibliometric Analysis, Accounting Information Systems, Knowledge*

1. INTRODUCTION

Technological innovations in accounting are underway in a structural transition from centralised, ERP-based architectures to decentralised and real-time digital infrastructures. Particularly, blockchain technology has been one of the main ingredients in this transformation, mainly through the following: immutability, shared ledgers, and continuous verification of transactions (Grigg 2024; Ibañez et al. 2023; Thies et al. 2023). It contributes to reducing the need for periodic reconciliation and increases the credibility and transparency of financial information management (Akter et al., 2024; Hsieh & Li, 2024).

The results of this transformation appear in the field of accounting as a growing interest in the discussion of ledger technologies, triple-entry accounting, and smart contracts (Cai, 2021; Ibañez et al., 2025; Sunder, 2018). These facts show that blockchain is no longer a marginal technology, but is so special that some find it capable of completely changing the way financial data are recorded, certified, and

transferred (Faccia et al., 2021; Petratos, 2024). Consequently, in the context of public sector where accountability, auditability, and transparency shape governance, the implications are particularly pronounced (Bellucci et al., 2022; Kuruppu et al., 2022).

Then in recent years, academic literature regarding blockchain in accounting has expanded quickly. Initial research was more of a conceptual nature and focused mainly on the implications of distributed ledger technology for auditing, reporting, and assurance (Weigand et al., 2018; Hsieh, 2018; Lin, 2018). Recent literature focus on applied dialogues in accounting information systems such as automation, smart contracts, and audit integration (Sarwar et al., 2023; Joseph et al., 2023; Pan et al., 2023).

This transition suggests that blockchain is increasingly a topic of accounting discussion rather than existing solely as a technological subject matter (Kabir et al., 2022; Kitsantas & Chytis, 2022). Yet there has been a relative lack of attention toward how a structured production of knowledge such as blockchain arises across regions and institutions (Hoang et al., 2023; Abu Afifa et al., 2023).

Researching this issue in a context like Indonesia is timely. Regulations such as "Sistem Pemerintahan Berbasis Elektronik (SPBE)" and the "Undang-Undang tentang Informasi dan Transaksi Elektronik (UU ITE)" are manifestations of a strong basis for establishing safety regulations in digital governance industry. These frameworks are indicative of a national intent to digital transformation, such as the rebuilding public sector financial systems.

Although Indonesia stands to gain the most out of its regulatory readiness, there are not many Indonesian publications that study blockchain in public sector accounting appearing on Scopus databases. This shows a regulatory-publication gap, which means international developments in the institution are insufficiently reflected by global academic publications. Much more does this not mean an end of innovation but a disconnection between practice and its openness to the scientific community especially in emerging economies.

The majority of research regarding accounting blockchain has focused on technological capabilities, potential for adoption and conceptual framework (Fikri et al., 2022; Buhussain & Hamdan, 2023; Alsalmi et al., 2023). The structure of knowledge production (how research themes emerge and what geographical distributions exist among contributions) has attracted limited attention (Charkha & Kale, 2024; Bhatt et al., 2024). This study fills this gap by using bibliometric approach to map out intellectual, conceptual and collaborative structure of blockchain research in public sector accounting.

Based on the identified gap, this study is guided by the following research questions:

- RQ1: What are the dominant themes and intellectual structure of blockchain research in public sector accounting?
- RQ2: How is knowledge production distributed across authors, institutions, collaboration networks, and countries?
- RQ3: To what extent does the geographic distribution of publications indicate a potential regulatory–publication gap between digital-governance development and academic visibility?

To address these questions, the study aims to:

- RO1: To map the dominant themes and intellectual structure of blockchain research in public sector accounting.
- RO2: To analyse the distribution of knowledge production across authors, institutions, collaboration networks, and countries.
- RO3: To examine whether the geographic distribution of publications indicates a potential regulatory–publication gap between digital-governance development and academic visibility.

This study contributes to the literature in two ways. Ultimately, it presents a structured mapping of blockchain research in public sector accounting, marking an important orientation and thematic convergence from previously fragmented exploration. Second, it helps conceptualise a regulatory–publication gap, proposing that geographic underrepresentation is one of knowledge translation and not necessarily a lack of innovation.

Placing this gap in the context of wider public sector digital transformation, this study offers a more grounded explanation for variations in academic visibility and sets up future research that pairs

bibliometric trends with empirical exploration.

2. LITERATURE REVIEW

2.1 Blockchain in Public Sector Accounting

There has been growing interest in the use of blockchain technology as a way to improve the integrity, transparency and efficiency of accounting systems. In accounting, its use is frequently related to distributed ledger architectures enabling shared, auditable records of transactions among various stakeholders (Petratos, 2024; Putritama et al., 2024; Elsaedy, 2024). These attributes, such as financial accountability and auditability, are especially important where the public sector is concerned.

Recent research emphasizes the capability of blockchain technology to enhance traceability, reduce information asymmetry, and strengthen internal control mechanisms in public sector financial management (Sarwar et al., 2024; Weinberg & Faccia, 2025; Baiod et al., 2025; Mabo et al., 2022; Han et al., 2023; Chen et al., 2021). The implication of this is that blockchain sits firmly at the confluence not only of a technological innovation, but as an underpinning infrastructure on which effective public sector accounting systems can be built. Yet, even as these studies emphasize technological capability, they offer little clue about how knowledge in this field is structured and distributed.

2.2 Mapping the Development of Blockchain Accounting Research

The body of knowledge on blockchain in accounting has developed from initial theoretical treatments to more application-oriented studies. Early work focused largely on the theoretical implications as well as potential disruption to established accounting practices, whereas recent literature reviewed specific applications of use including audit automation, smart contracts and financial reporting systems (Sunde & Wright, 2023; Thies et al., 2023; Kao & Tsay, 2023).

This evolution denotes a movement away from exploratory analysis toward more structured investigation. Nevertheless, despite the increasing number of studies investigating this emerging concept, we move deeper into fragmentation in similar areas of research across the blockchain domain since the literature typically covers one specific theme in isolation from other related themes without a fuller understanding of how each is interlinked with another (Maiti et al., 2021; Adelowotan and Coetsee, 2021; Fullana and Ruiz, 2021; Sgantzios et al. 2015). This fragmentation suggests that the field has no coherent picture of how its topics fit together.

2.3 Bibliometric Analysis as a Mapping Approach

Bibliometric analysis offers a systematic way to study the evolution of scientific literature by evaluating publication metadata, including authorship, keywords, and collaboration network. This premise allows discerning dominant topics, research clusters, as well as patterns of knowledge generation in a specific discipline.

Bibliometric methods can significantly help in recognizing the new trajectories of research and charting the development paths of cross-cutter issues in blockchain and accounting (Malalla et al., 2026; Bhatt et al., 2024; Rivera & Foderick, 2024 Sarwar et al., 2026). Bibliometric tools allow for a broader understanding of how knowledge is produced and organized by different actors and regions through the visualisation of conceptual structures and collaboration networks.

2.4 Knowledge Production and the Translation Gap

Academic knowledge production is influenced not only by research interest but also by where one's institution sits in collaboration networks and access to publication platforms. Consequently, research is more visible in some regions than in others in global academic databases.

In potentially emerging domains like blockchain in public sector accounting, this thematic imbalance could be suggestive of a possible knowledge translation gap (George & Patatoukas, 2020; Inghirami, 2020; Bonyuet, 2020; Faccia et al., 2020; Faccia et al., 2019), where on the one hand leading-edge practical and innovation outputs are not translated into peer-reviewed academic papers. In other words, this gap does not mean that there is no implementation and may simply reflect differences in the capacity to document, publish, and disseminate knowledge globally.

The underlying theory behind this condition is institutional normative terms that focus on organizational

routines underpinned by formal structures, norms, and pressures of legitimacy (DiMaggio & Powell, 1983). This is not to say that these higher education institutions will either welcome or act on emerging innovations, as these forces are structured and contingent; the institutional environment may help facilitate such opportunities but does not necessarily translate into actual adoption or academic knowledge. Simultaneously, insights from dynamic capabilities theory (Teece, Pisano, & Shuen, 1997; Teece, 2007) extend our understanding of the success factors in implementing digital transformation, which may also call for honed abilities to sense and seize new types of productive resources, as well as reconfigure them into structured knowledge outputs about operational practices. The interplay of institutional conditions and organizational capabilities thus offers a valuable theoretical lens through which to consider why knowledge translation may be stymied in the presence of high technological readiness.

2.5 Linking Literature to the Present Study

Based on this view, the present study adopts a bibliometric approach to analyse the thematic evolution and distribution of knowledge production in blockchain research related to public sector accounting. Thus, in this study, we used bibliometric analysis to simultaneously explore the thematic evolution and knowledge production structure.

3. METHODOLOGY

3.1 Research Design

This study adopts a bibliometric research design to systematically map the development of blockchain research in public sector accounting. Bibliometric analysis is appropriate for examining emerging fields, as it enables the identification of intellectual structures, thematic patterns, and collaboration networks based on published literature.

The approach is used in this study focuses on analyzing publication metadata rather than full-text content. By doing so, it allows for a structured assessment of research trends, conceptual development, and knowledge production within the field.

3.2 Data Source and Search Strategy

The dataset in this study was taken from the Scopus database, selected for its broad coverage of high-impact, peer-reviewed journals' articles in accounting, information systems, and public sector research.

The search query prompt applied in this study is as follows:

(TITLE-ABS-KEY ("blockchain" OR "distributed ledger") AND TITLE-ABS-KEY ("accounting" OR "audit") AND TITLE-ABS-KEY ("public sector" OR "government"))

The search was limited to journal articles published in scopus database ranging from year 2023 to 2026, the purpose is to capture the most recent developments in the field. Records were included when they: (1) were indexed in Scopus; (2) were classified as journal articles; (3) were published within the specified period; (4) addressed blockchain or distributed-ledger technology; (5) contained a substantive accounting or auditing dimension; and (6) explicitly related to public-sector or governmental settings. Records were excluded when they: (1) fell outside the publication period; (2) were not journal articles; (3) addressed blockchain without a substantive accounting or auditing focus; (4) concerned only private-sector, cryptocurrency, or unrelated technical applications; or (5) contained duplicate or incomplete bibliographic information. The retrieved records were screened using their titles, abstracts, and keywords to confirm their relevance to the intersection of blockchain, accounting or auditing, and the public sector. Following this screening process, 59 articles were retained for bibliometric analysis.

All 59 articles were included in the bibliometric analysis, although only those directly relevant to the narrative interpretation are cited in the results and discussion. This distinction is necessary because the bibliometric analysis uses the metadata of the complete dataset, whereas the narrative discussion refers selectively to studies that illustrate particular findings.

3.3 Dataset Scope and Justification

The 2023–2026 period was selected to focus on recent developments following the growing integration

of blockchain with accounting information systems, audit processes, and public-sector governance. The resulting dataset is relatively small because the search targets a specialised intersection of three fields rather than blockchain or accounting research generally. The study therefore prioritises conceptual specificity over broad temporal coverage.

Because the search was conducted before the end of 2026, publication data for that year are incomplete and should not be interpreted as representing a full annual output. The restricted timeframe and dataset size were treated as methodological boundaries when interpreting publication trends, collaboration patterns, and geographic distribution.

3.4 Data Analysis Tools and Techniques

The analysis was conducted using the Bibliometrix package in R, accessed through the Biblioshiny interface. This tool enables comprehensive bibliometric analysis and visualization of scientific literature.

The study employs three main analytical approaches:

- **Performance Analysis**

Performance analysis was used to examine annual publication output, author productivity, and the principal contributors represented in the dataset. This analysis primarily supports the assessment of the field's growth and concentration.

- **Conceptual Structure Analysis**

Conceptual structure analysis was conducted through keyword co-occurrence and thematic mapping to identify dominant themes, their relationships, and their relative levels of development and relevance. This analysis addresses the thematic and intellectual structure examined in RQ1.

- **Social Structure Analysis**

Social structure analysis was used to examine collaboration patterns among authors and countries. The resulting networks indicate the degree of connectivity, clustering, and geographic concentration in knowledge production, supporting RQ2 and the initial assessment underlying RQ3.

These approaches provide complementary insights into the intellectual, conceptual, and social dimensions of the research field.

3.5 Analytical Procedure

The analysis consisted of several stages. First, bibliographic data were extracted and cleaned to ensure consistency in author names, search keywords, and institutional affiliations. Second, performance indicators were created to assess the output of publications and their important contributors. Third, co-word analysis was used to perform a conceptual structure analysis to produce thematic maps. Fourth, a social structure analysis was conducted to visualise collaboration networks and geographical distribution.

This method ensures that the study retains both the development of themes and that knowledge production in different domains by various actors and regions is effectively documented.

4. RESULT AND DISCUSSION

4.1 Performance Structure: Emerging Growth without Cumulative Development

Analysis of publication output reveals that in recent years research on blockchain applications in public sector accounting has been growing. However, as shown in Figure 1, the productivity of authors on this topic remains somewhat scattered. As a result, the group of stable contributors did not become clearly dominant.

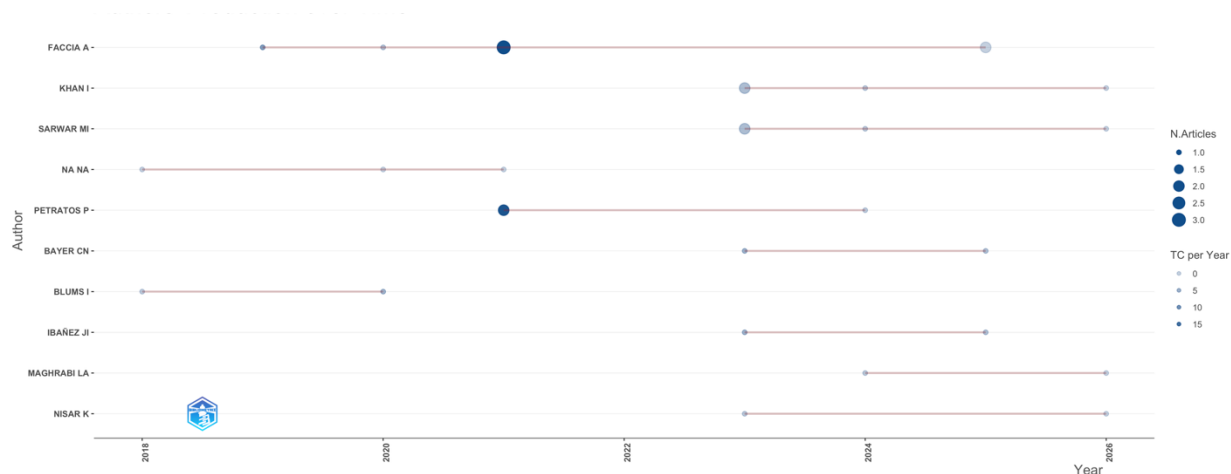


Figure 1. Author's Production Over Time

This lack of dominance suggests that the field has not yet established stable epistemic communities capable of bringing cumulative knowledge development. Instead, all inputs are breakdown segments made by individual authors or small groups, resulting in no continuity in either theory or evidence. Despite the rapid growth in publications suggesting increasing interest, without a preferred author-level focus, there is little indication that the field represents any established intellectual terrain. This is evidenced by the increase in publication numbers; there has not been a similar increase in authors' side-shoring, then sustaining their expertise.

4.2 Conceptual Structure: Convergence toward Accounting-Centric Integration

The use of co-word analysis and thematic mapping as analytical techniques allows for the identification of the distance between research topics, hence structuring them into different clusters. The core themes in the motor quadrant include accounting information systems, blockchain, and distributed ledger (as depicted in Figure 2).

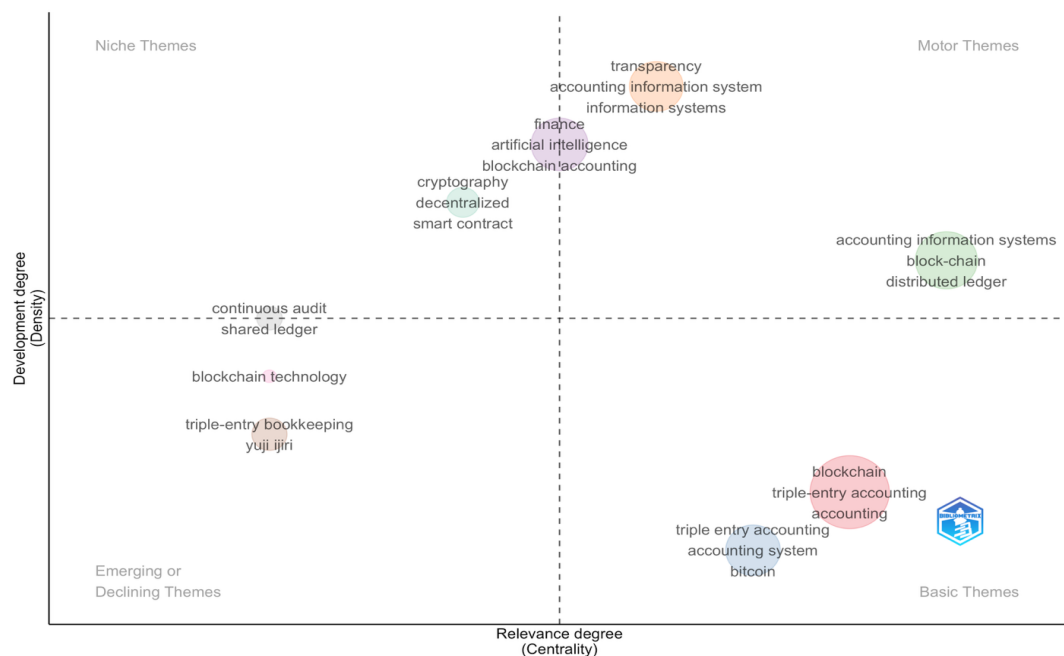


Figure 2. Thematic Map

This prominence signals that blockchain is no longer being conceptualized as a new technological innovation with standing on its own, but as an innovative technology that is getting more fully integrated into existing accounting paradigms, particularly related to accounting information systems. Core themes like accounting and triple-entry accounting anchors the conceptual enterprise at the center of the field,

although they show considerably less coherence. By contrast, more specialist subject areas, smart contracts and cryptography, show up as niche themes representing focused but less interconnected lines of inquiry.

This kind of pattern supports transition away from fragmented exploration and toward a thematic convergence. Accounting oriented application is a relatively well-developed space, with an emergent body of research becoming more tightly organised along this dimension but other dimensions of knowledge production still to be firmly established.

4.3 Social Structure: Clustered Collaboration and Limited Knowledge Diffusion

The collaboration network analysis reveals the presence of distinct clusters of researchers (Figure 3), suggesting the emergence of localized communities engaging in collaborative research.

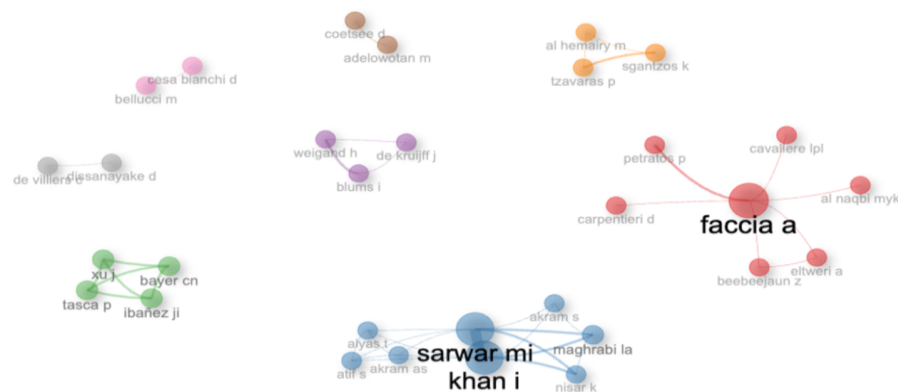


Figure 3. Collaboration Network

The clusters define groups with high internal connectivity that show limited cross-group interaction, implying that knowledge production is occurring within relatively closed networks of collaboration. While this clustering is all too common in new domains, the absence of integration between these clusters limits idea diffusion and hinders the shaping of a more unified research agenda.

Our construct suggests that the intellectual evolution of a field is influenced not only by domains which evolve along thematic lines but also by the network arrangements of collaboration. Without stronger cross-network interaction insights made within specific clusters can remain trapped leading to limited impact in the field.

4.4 Geographic Distribution: Concentration and Structural Imbalance

The country distribution of publications shows a few countries where the research outcome is primarily focused. As illustrated in Figure 4, the field is dominated by contributions from the United States, United, and China, while all other regions contribute relatively little.

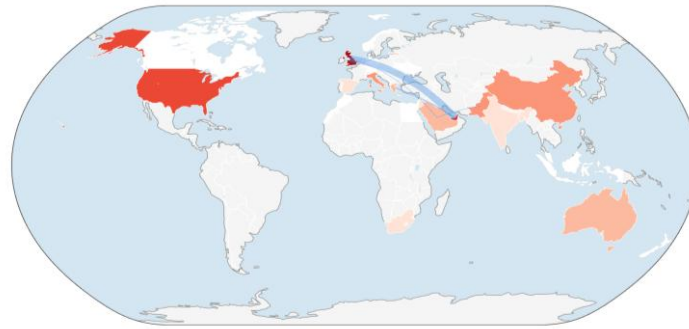


Figure 4. **Country Collaboration Map**

The dataset has near-zero representation from Southeast Asia, specifically. This pattern is representative of an asymmetrical knowledge production landscape, in which the majority of scholarly discourse (and funding) is regulated by a rather small subset of institutional contexts. This focus suggests a bias in how the implications of blockchain technology are envisioned for application within accounting, and indeed what research priorities follow.

This disparity, however, should not be mistaken for a lack of innovation in the regions with fewer representatives. This is rather indicative of variation in academic visibility and production capacity, which might be influenced by institutional capacity, research infrastructure as well as access to international publications.

4.5 Discussion: Explaining the Regulatory–Publication Gap

Together, these results reveal a major disconnect between concept development and knowledge dissemination. Although blockchain research in public sector accounting is increasingly organised and situated at the thematic level, its output remains extremely fragmented at the authorship level, converging around relatively ‘sparsely populated’ networks of clustered engagement for disparate communities of researchers and global geographies.

This disconnect gives rise to what this study describes as a regulatory–publication gap. In contexts like Indonesia which are arguably rather advanced in the establishment of formal regulatory frameworks for digital governance, there seems to be a discrepancy between the state of institutional maturity and academic representation in the global literature.

This gap should not be misinterpreted as a lack of innovation. Rather, it points to inherent structural limitations in the field of knowledge production which produce challenges for producing research such as; lack of incentives to publish academic articles, poor integration between practitioners and researchers/academic institutions, difficulty taking innovations from a system-level into an individual product. Thus, if this hypothesis is true, operationally relevant public sector digital innovations might systematically be missing from peer-reviewed outlets.

From this point of view, bibliometric results are more than only mapping research exercises but instead underscoring knowledge visibility and dissemination dynamics of the information. This gives particular importance to boosting the connections between digital innovation practices and academic publications, particularly in actors like emerging economies where representation tends to be weak. This indicates that this is not a matter of technology adoption but instead practice translating into citable academic knowledge. This makes it clear that the gap is seen not an effect of technology lag, rather this is structural failure to translate innovation into addition or knowledge in this field.

This structural dynamic can be regarded in a reality of an autonomous public university in Indonesia who implement the integrated digital finance system for budgeting, procurements and accountability. This trend of innovation has low representation in international publications regardless of the high level of institutional readiness thresholds from high-impact ratings and deployed next-generation digital governance infrastructure. This condition indicates that institutional readiness alone cannot produce publishable academic knowledge from the perspective of the above framework. As research and

scholarly activity in the domain is still coalescing, operationally embedded digital financial innovations have become part of business practice where scholarly endeavours at making sense and synthesizing insights are ongoing. The institutional support for publication is still growing. As a result, system-level innovations are not yet well-documented in the academic scholarship or policy literature worldwide, which deepens the case that knowledge translation is not just a problem of technology but rather structural as well.

4.6 Conceptual Implication: Toward a Knowledge Translation Framework

The results show that public sector accounting research on blockchain has arrived at conceptual consolidation, as suggested by the convergence of major themes such as accounting information systems, distributed ledger technologies, and triple-entry accounting. However, this conceptual maturity has not been matched by a corresponding professional framework for the production of knowledge. In its place, the landscape is marked by extreme and uncoordinated patterns of collaboration and a distribution of contributions in geographic areas which may serve to create regulatory–publication gaps. This gap reflects a condition in which jurisdictions with comparatively mature digital governance structures do not yield corresponding academic outputs, which is indicative of both empirical innovation in the area relative to its scholarly visibility.

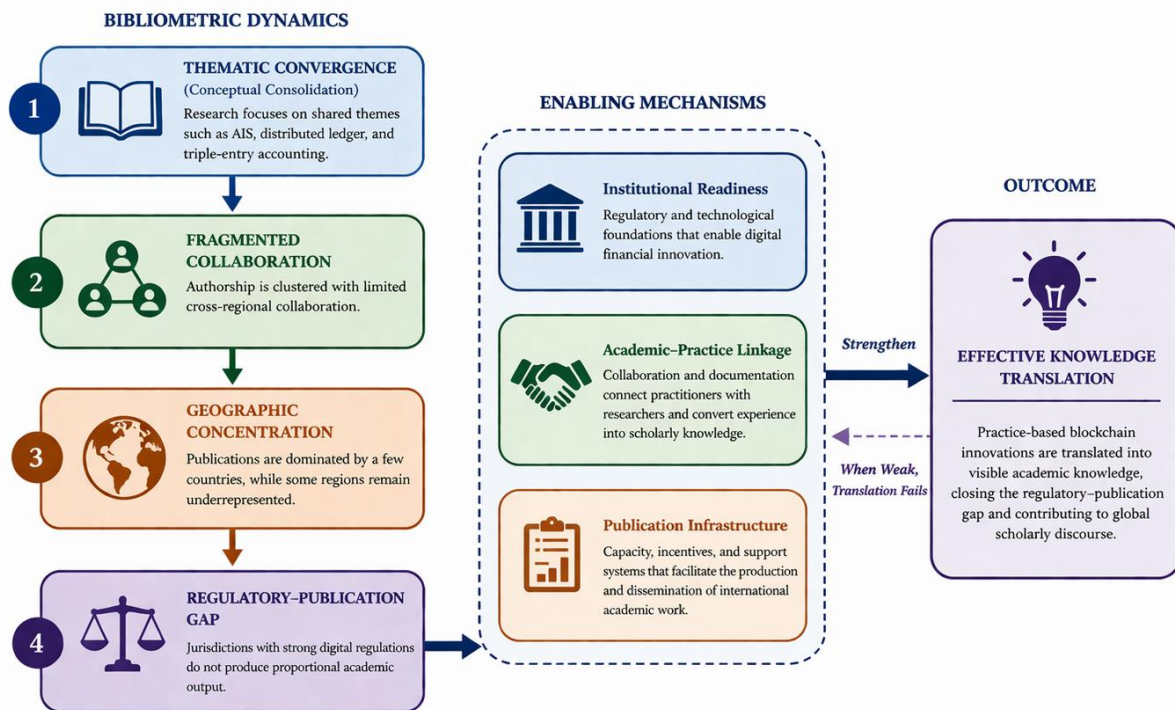


Figure 5. Conceptual Framework for Knowledge Translation

Challenging the taken-for-granted assumption in the digital transformation literature that technology adoption engenders knowledge production. Based on institutional theory and the dynamic capabilities framework, this study conceptualizes knowledge translation as a process that is structurally embedded in external institutional conditions and internal organizational capabilities. The regulatory–publication gap, as shown in Figure 5, is the result of an interaction between bibliometric dynamics and enabling mechanisms: as bibliometric fragmentation creates structural conditions of isolation, enabling mechanisms provide the means to translate practice-based innovations into publishable academic knowledge. From the perspective of dynamic capabilities, institutional knowledge integration is an organisation's ability to transform its experience and practice into formal products. From institutional point of view, these mechanisms are influenced by existing (sometimes unwritten) rules and incentives that may guide the publication of academic work. This research advances a Knowledge Translation Framework, in which the process of translating innovation happening on practice grounds into publishable academic knowledge is shaped by three interrelated mechanisms: institutional

infrastructure readiness, academic–practice linkages, and publication conditions. Institutional readiness facilitates digital innovation but does not automatically result in concrete academic output. Academic–practice linkages judge how much operational innovation is documented in language suitable for scholars, as well as facilitating co-development between researchers and practitioners. Publication conditions are a combination of the capacity, motivation, and supporting systems needed to conduct research on an international academic basis. When these mechanisms are not coordinated, knowledge transfer can with some regularity actually fail, causing urban innovation despite active implementation to have limited global visibility. To bridge the gap between regulatory practice and publishing innovation, as well as digital financial innovations, which might actually obtain some business success in the academic world, on the one hand, and more general governance applications on the other hand, is therefore essential. In Indonesia, this type of structural dynamics is quite marked. Despite powerful governance frameworks being digitised, global academia has little room for local content.

4.7 Propositions for Future Research

Building on the proposed Knowledge Translation Framework, this study advances a set of propositions to guide future empirical investigation into the structural conditions shaping knowledge translation in public sector digital innovation. These propositions are embedded in the fields of institutional theory and dynamic capabilities, which emphasized the interplay between external organizational environments and firms internal capacities in processing innovation into academic knowledge.

4.7.1 Proposition 1: Institutional Readiness is Not Sufficient

P1: Institutional readiness alone systematically fails to generate publishable academic knowledge in the absence of academic–practice linkage.

This proposition illustrates the notion that having reasonable regulatory and technological infrastructure may enable innovation but not necessarily translate to academic output. Institutional readiness alone will be insufficient for successful practice-informing-practice knowledge translation without mechanisms connecting the domains of operational practice and scholarly enquiry.

4.7.2 Proposition 2: Academic–Practice Linkage as a Mediating Mechanism

P2: Academic–practice linkage mediates the relationship between institutional readiness and the production of publishable academic knowledge.

This proposition positions academic–practice linkage as a critical mechanism through which practice-based innovations are documented, interpreted, and transformed into scholarly contributions. Strong collaboration between practitioners and researchers enhances the likelihood that system-level innovations are translated into academic outputs.

4.7.3 Proposition 3: Publication Infrastructure as a Moderating Condition

P3: Publication infrastructure moderates the relationship between knowledge translation processes and global academic visibility.

This proposition suggests that even when knowledge translation occurs, the extent to which it becomes visible in global academic discourse depends on the availability of institutional support, incentives, and access to international publication platforms. Weak publication infrastructure constrains visibility despite the presence of innovation and knowledge generation.

5. CONCLUSION

5.1 Summary of Findings

In this study, using a bibliometric approach, efforts were made to map the development of blockchain research in public sector accounting. The academic field is now converging, looking more into accounting information systems, distributed ledger technology and other related applications. But knowledge production is already structured by unequal distribution, fragmented authorship, clustering of collaboration networks and countries that dominate with offerings concentrated in a few outlets. Thus, although the conceptual convergence is now speeding ahead, the structure of knowledge production grows slow. Therefore, this study highlights a lack of correspondence between what is researched and how it is made and shared.

5.2 Key Insight: The Regulatory–Publication Gap

The analysis uncovered regulatory and publication gap. National conditions for digitisation may be further advanced than the international ones, academic reach can differ in likeliness. There are statistically significant developments in some countries where governance is relatively well prepared for the digital age, such as Indonesia; although, only Scopus indexed the publication outlets within this literature.

Proximity to this gulf indicates structural parameters and not innovative reformed production of academia. Most importantly, it throws light on bottlenecks in the translation hurdle of practice to publishable pieces (shortage of research capacity, tools for documentation and communication between fellow practitioners and the academic space). This is likely not just Indonesia but a more fundamental problem of emerging economies, at least in terms of translating digital innovation successfully into major contributions to the literature that can also be globally seen.

5.3 Implications

Academic Implications:

This study illustrates how bibliometric analysis can be used to follow the formation and evolution of a particular discipline or field, and expose inequities in knowledge production. This somehow indicates how some of the authors from all over the world may not be lucky enough to get recognized by international scholars. This study proposes the regulatory–publication gap as an analytical framework for understanding regional differences in early domains of knowledge. This is especially important in the context of public sector digital transformation.

Practical Implications:

The findings highlight the need for stronger mechanisms by policymakers and public sector institutions to help support the writing about, reflexively learning from, and broadcasting of practice in digital innovation. Specifically, increasing collaboration between practitioners and academic researchers is necessary to translate large scale innovations into publishable actionable knowledge. This includes incentives to publish, Create collaborative research structures and structure-recording of innovations at system level.

5.4 Limitations

This study has several limitations. Firstly, it is based exclusively on the Scopus data so some publications indexed in other databases might have been missed out. Secondly, the relatively small time period (2023–2026) does not allow for revealing broad patterns in the discipline. And last but not least, the relative small dataset and that it is targeting on a niche intersection of blockchain, accounting and public sector may limit the generalisability of conclusions.

5.5 Future Research

Future studies can build upon this work by integrating a wider dataset and lengthier time range to explore the longitudinal history of the field. Furthermore, connecting bibliometric analysis with empirical case studies would allow for deeper understanding on how digital financial innovations are deployed and how these can better be translated into academic knowledge.

Future studies can also go beyond bibliometric mapping and explore how digital financial innovations are integrated into organizations and translated into effects on management accounting. This kind of approaches would help to close the gap between practice and publication, especially in emerging economies where digital transformation initiatives are actively developing but remain underrepresented on the global academic agenda.

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