

# HUMAN BEHAVIOR, DEVELOPMENT and SOCIETY

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The journal has the following objectives:

- a). To stimulate the creation and synthesis of beneficial information, as well as its broad dissemination, especially in the varied fields of the humanities and social sciences,
- b). To foster a deeper understanding regarding the impact of business policies and practices on society, and
- c). To promote the adoption of best practices in communities through education, and to aid in the resolution of community issues for the betterment of society; this represents the development aspect referred to in its name.

**Editorial Objectives**

The editorial objectives are to advance knowledge through use of classical—or the creation of innovative—methods of investigation, and to foster the examination of cross-cultural issues to increase mutual understandings among diverse social groups. Encouraging cooperative studies and scholarly exchange across borders is a key aim, especially when these may have practical applications within the Southeast Asian region. The application of theoretical considerations to organizations, fields, and communities is also an outcome that is sought.

### **Journal Positioning**

The journal is broadly based and has the potential to impact thinking and practices across a range of subject areas, dealing with substantive issues that arise in both developing and developed countries. It will likely appeal to readers with a broad appreciation of the social issues facing organizations, communities, and governments operating under varied challenges and constraints. Its contents are meant to appeal to both the academic community and practitioners in numerous areas of interest.

The positioning of the journal means that a variety of topics is covered in most issues. These, in turn, differ in their philosophical content, academic appeal, and practical implications.

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The journal covers a broad spectrum of topics. These include, but are not limited to, anthropology, allied health focused on community issues and health education, education from the primary to the tertiary levels, literature, language use and acquisition, business, management, finance, geography, psychology, social sciences, philosophy, and theology. Review essays and seminar/forum papers are also accepted when appropriately focused. Well-executed studies that address interesting and significant topics in the areas mentioned above are particularly welcomed. All articles accepted should make significant contributions to understanding and add to the corpus of knowledge in their respective fields.

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## **From the Editor**

This is the second issue of *Human Behavior, Development and Society (HBDS)* for 2024. The journal is an international, open-access, and interdisciplinary peer-reviewed journal published three issues a year by Asia-Pacific International University (AIU). *HBDS* publishes academic research articles in the humanities, social sciences, education, business administration, religion, health, public administration, development, tourism, and other social sciences areas that contribute to the development of the concepts, theories, as well as new knowledge for developing the community and society. The journal's scope is to advance knowledge through the use of classical methods of investigation and to foster the examination of cross-cultural issues that increase mutual understanding among diverse social groups within the international community, with a particular emphasis on Southeast Asia. All articles in the journal are indexed by the Thai-Journal Citation Index Centre (TCI), ASEAN Citation Index (ACI), and the EBSCO database, and digital object identifiers (DOI) are used to provide each article with a permanent web address.

This issue consists of 12 articles, nine of which were written by external researchers, and three of which were authored by AIU researchers. We are delighted to see reports and findings from various disciplines including accounting, education, finance, health, human resource management, information technology, language, marketing, and public administration. Most articles in this issue reflect studies conducted in ASEAN contexts including Myanmar, Philippines, and Thailand, as well as articles from Bangladesh and China. We hope that this issue of *HBDS* will contribute to the development of society and serve as a source of information for various academic fields and research projects.

We would like to invite readers to publish your valuable papers with us. More information may be found on our website, <https://www.tci-thaijo.org/index.php/hbds>. We would also appreciate comments or suggestions from you to help us improve the journal. Finally, we appreciate the hard work of authors, reviewers, editorial board members, executive board members, and journal staff members who have contributed to making this achievement a reality.

**Assistant Professor Dr. Damrong Satayavaksakoon, Editor**

*Human Behavior, Development and Society*

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## The Relationship between Awareness and Implementation of Environmental Management Accounting–Evidence from Small and Medium-Sized Enterprises in Thailand

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### Abstract

In this study the relationship between awareness and implementation of Environmental Management Accounting within small and medium-sized enterprises listed in Market for Alternative Investment in Thailand was explored. A descriptive and correlational study design was adopted, and questionnaires were used to collect data from 57 small- and medium-sized Thai enterprises. The results provided empirical evidence that these firms had a moderate to high level of awareness of some aspects of environmental management accounting, and were practicing it to a certain extent. Furthermore, a positive correlation ( $.500, p < .01$ ) between environmental accounting awareness and accounting practice was found. Hence, this implied that when firms were aware of the impact of environmental disclosures on their operations and had access to environmental management accounting knowledge, they were more likely to adopt appropriate accounting practices. The implementation of environmental accounting among small to medium enterprises in Thailand is still in the early stages. Further support and development are required to foster implementation. Further studies are encouraged—both qualitative studies to gain deeper insights into challenges of implementing environmental management accounting, and quantitative studies about factors that would better enable its practice.

**Keywords:** *Environmental management accounting, awareness, implementation, small-medium enterprises*

### Introduction

Due to environmental issues and climate change, more companies are recognizing the urgent need to act sustainably and be socially responsible. Sustainability has become a requirement for all companies and across all industries. Sustainability refers to a business approach that creates long-term value by taking into consideration how a given organization operates in its ecological, social, and economic environments (Klein et al., 2022). Many companies are including environmental concerns in their key business strategies. Hence, environmental management accounting (EMA) has been introduced and is highly encouraged, as it supports internal environmental management processes and reduces environmental risks and associated environmental costs.

Previous studies have focused primarily on big companies listed in the dominant stock exchange market in developed countries, as these companies are more likely to adopt and implement environmental management accounting (Manitsornsak, 2013). This is consistent with the studies of Li (2004) and Jalaludin et al. (2011), who found that the understanding and adoption of environmental management accounting in Asian countries, such as China or Malaysia, were relatively low when compared with advanced countries on other continents.

Nevertheless, there is a lack of recent studies regarding the implementation of environmental management accounting in Small and Medium-Sized Enterprises (SMEs), especially in Thailand. Some studies were conducted a decade ago, but they do not provide a current picture of how environmental management accounting is being practiced.

Thus, the aim of this study was to explore the environmental management accounting practices among SMEs in Thailand, as well as to examine the relationship between environmental management accounting awareness and its implementation. Research participants were companies listed in the Market for Alternative Investment (MAI) in Thailand, which was established in 1999 and serves as an alternative stock market for small and medium-sized enterprises. The companies listed in MAI are novel and innovative SMEs with high growth potential.

A study of such companies may yield fruitful information about the current state of environmental management accounting practices, and the empirical evidence gained may be useful in formulating recommendations encouraging SMEs to adopt environmental management accounting.

## **Literature Review**

### ***Sustainable Development and Corporate Social Responsibility***

Sustainable development is a concept that has been developed for decades. The UN has defined sustainable development as development that meets the needs of the present, without compromising the ability of future generations to meet their own needs (United Nations, 2023). It aims to balance three key interests, namely economic development, environmental protection, and social well-being.

On the other hand, corporate social responsibility is a management concept in which companies put social and environmental considerations into their business strategy and operations, as well as into how they interact with their stakeholders. It is done rather on a voluntarily basis and is self-regulated by businesses. They attempt to be responsible for people, the planet, and profit, or the so-called triple-bottom line (Miller, 2020).

Nowadays, sustainable and environmental concerns have become a key responsibility in all countries. Increasing numbers of companies are recognizing the urgent need to act on a sustainable and socially responsible basis. Corporate Social Responsibility is becoming a business obligation. Hence, companies are required to deal with their stakeholders in an ethical manner. They have to integrate social and environmental concerns in their business operations and interactions with stakeholders, as well as to be responsible for both monetary and non-monetary profits.

### ***Environmental Management Accounting (EMA)***

Due to a growing interest in social responsibility and the environment, companies are making substantial efforts to incorporate social and environmental features into their regular operations. Companies must comply with environmental standards and manage in such a way that minimizes the environmental impact (International Federation of Accountants, 2005). Hence EMA, also known as green accounting or sustainable accounting, is increasingly encouraged in companies in order to minimize negative environmental impacts and costs.

Environmental management accounting complements management accounting approaches to financial accounting. It employs a conventional accounting framework, but also includes environmental preservation aspects. Such accounting aims to develop appropriate mechanisms that enable the identification and allocation of environmental costs, such as emissions treatment, disposal, environmental protection and management (Bennett & James, 1998; Wilmhurst & Frost, 2001).

The benefits of EMA are manifold. It supports the decision making process of the management team, as EMA may provide information regarding environmental impacts, which encompass economic drivers and also consequences of environmental issues. Environmental management accounting is also helpful in finding the causes of environmental problems, providing suggestions on how environmental improvements can be made, and exploring how these will affect the organization's economic performance. Thus, it shapes the strategies and actions of companies and encourages them to act responsibly (Wahyuni, 2009).

### ***Research on the Implementation of Environmental Management Accounting***

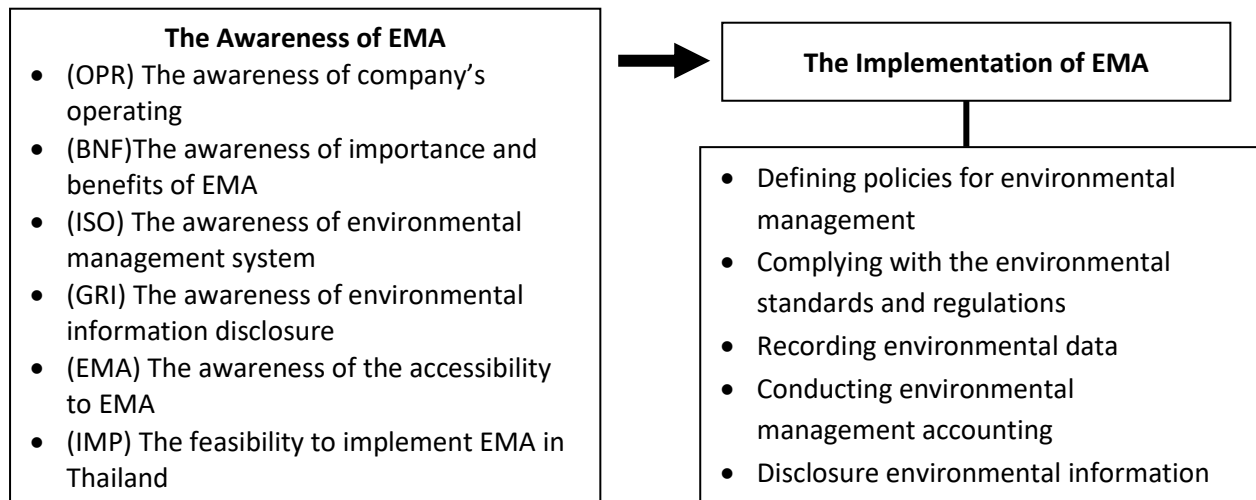
Despite increasing concern for the environment and the importance and benefits of EMA, the degree to which EMA is being practiced is weak in firms, especially in developing countries (Jamil et al., 2015). This is consistent with a previous study conducted by Li (2004) in China. He indicated that awareness of International Organization for Standardization standards (ISO 14001) enhanced the development of EMA. Despite this, the adoption rate of EMA was relatively low. The key challenge appeared to be a lack of quantitative measurement and a data retrieval system for environmental accounting information. This made EMA difficult to apply.

The challenges and factors affecting EMA implementation are diverse. Key barriers include incoherent government policies, unavailability of resources and technology, lack of expertise, and deficiencies in environmental reporting (Mukwarami et al., 2023). In a study conducted by Dinh et al. (2022), it was found that coercive pressure from governments, regulators, customers, suppliers, and investors had the greatest influence on EMA implementation in pulp and paper manufacturing enterprises in Vietnam. These results are aligned with a study conducted by Vu (2022) in a variety of manufacturing enterprises in Vietnam. Additionally, a study conducted by Jamil et al. (2015) in Malaysia revealed that coercion is a vital factor leading to EMA implementation among small and medium-sized manufacturing firms. A study by Setthasakko (2010) found that the major challenges in adopting EMA practices in pulp and paper companies in Thailand were a lack of organizational learning, focusing on short-term enterprise profits, and a lack of adequate EMA guidance.

Some EMA research has been conducted in recent years. But previous studies primarily focused on EMA practices in large enterprises or companies listed in the dominant stock exchange or specific industries. Hence, the current state of implementation of environmental management accounting in SMEs is unclear. The objective of this study was to examine the EMA practices among SMEs in Thailand, specifically the awareness and behavior of those involved in EMA implementation.

The study framework is illustrated in Figure 1 below.

**Figure 1 Study Framework**



*Code.* Awareness of Company's Operations (OPR), Awareness of Importance and Benefits of EMA (BNF), Awareness of Environmental Management Systems (ISO), Awareness of Environmental Information Disclosure (GRI), Awareness of Accessibility to EMA (EMA), and Awareness of Feasibility to Implement EMA in Thailand (IMP).

## Methodology

A quantitative research approach was employed in this study. Self-administered online questionnaires were used as the primary data collection tool from the 206 companies listed in the Market for Alternative Investment (MAI). The majority of companies were recently established small and medium-sized enterprises. They were divided into eight business groups, namely agricultural and food processing, technology, natural resources, finance, services, real estate and construction, industrial products, and consumer goods.

Those enterprises possessing background experience in environmental management accounting were asked to complete the questionnaires; executives or accounting managers were the targeted respondents. The questionnaire was divided into three sections. The first part dealt with respondents' demographic information, such as age, gender, education, years of service, etc. The second part focused on awareness of environmental management, which included awareness of a company's operations, awareness of the importance and the benefits of EMA, awareness of EMA systems

according to ISO, awareness about environmental information disclosures according to GRI standards, awareness of accessibility to EMA, and feasibility to implement EMA in Thailand. A 5-point Likert scale was used to assess awareness. The scores were interpreted as follows: 1.00–1.80 = *Very Low Awareness*, 1.81–2.60 = *Low Awareness*, 2.61–3.40 = *Moderate Awareness*, 3.41–4.20 = *High Awareness*, and 4.21–5.00 = *Very High Awareness*.

The third part of the questionnaire explored the behavioral intention or implementation action of environmental management accounting, which was divided into five behavioral dimensions, namely: (1) Defining policies for environmental management, (2) complying with the environmental standards and regulations, (3) recording environmental data and using it for business optimization, (4) conducting environmental management accounting, and lastly (5) disclosure of environmental information. Each dimension was allotted a full score of four, for a total score of 20. The average score of each dimension and the average total score were calculated, as these represented each behavioral dimension and overall implementation of environmental management accounting. The overall average scores were interpreted as follows: 0.00–4.00 = *Very Low Implementation*, 4.01–8.00 = *Low Implementation*, 8.01–12.00 = *Moderate Implementation*, 12.01–16.00 = *High Implementation*, and 16.01–20.00 = *Very High Implementation* or *Fully Implemented*. The scoring system and interpretations are illustrated in Table 1.

**Table 1** *Scoring System and the Score Interpretation*

Behavioral Dimensions	Total Average Score	Score Interpretation
1. Defining policies for environmental management	4	
2. Complying with the environmental standards and regulations	4	0.00–0.80 = Very Low Behavior 0.81–1.60 = Low Behavior
3. Recording environmental data	4	1.61–2.40 = Moderate Behavior
4. Use of data for business optimization	4	2.41–3.20 = High Behavior
5. Disclosing environmental information	4	3.21–4.00 = Very High Behavior
6. Total Averaged Score for All Dimensions (= Overall implementation of EMA)	20	0.00–4.00 = Very Low Implementation 4.01–8.00 = Low Implementation 8.01–12.00 = Moderate Implementation 12.01–16.00 = High Implementation 16.01–20.00 = Very High Implementation or Fully Implemented

A pilot test was conducted with companies listed in the Stock Exchange of Thailand (SET) that possessed similar characteristics as the target firms in this study. SET and the MAI are stock exchanges in Thailand, but the SET index is the oldest and the most cited equity index. It is designed for large and medium-size enterprises, while MAI is for small and medium enterprises. The reliability of the information gathered in the pilot survey returned a reliability score (Cronbach's Alpha Coefficient) of .891, which was within an acceptable range. Thus, the questionnaire was valid and reliable for use in the study.

Descriptive analysis, such as frequencies, means, and standard deviations were applied, as one of the objectives of the study was to assess the awareness of EMA in different aspects, such as its existence, benefits, accessibility and feasibility, and the ways in which EMA was being practiced. Moreover, a correlation analysis was conducted to identify the relationship between the awareness and implementation of environmental management accounting.

## Results and Discussion

In the study, the current situation was examined relating to the implementation of environmental management accounting (EMA) in small and medium enterprises listed in the Market for Alternative Investment (MAI), Thailand. The self-administered online questionnaires were sent to the target

companies with a request for those involved in environmental accounting, such as managers and accounting managers, to answer the questions. Out of 206 companies, 57 companies from eight industries completed and submitted questionnaires. This accounted for 27% of the companies listed in MAI. Macpherson and Wilson (2003) acknowledged that a low response rate was common when conducting research with small and medium-sized enterprises, as it was relatively difficult to engage SMEs owners to complete questionnaires. For this study, those who completed the questionnaires were in management positions, possessed a high level of education, and had working experience in excess of one year. Respondent profiles and demographic information indicated that they were active in their positions and possessed the necessary knowledge and experience, and thus were able to provide the requested information.

Firm profiles and respondent demographics are shown in Tables 2 and 3 (following page).

**Table 2** *Responded Companies Classified by Industry*

Industry	Number of Companies	Percentage
Agro & Food Industry	2	3.50
Technology	11	19.30
Resources	4	7.00
Financials	2	3.50
Services	11	19.30
Property and Construction	12	21.10
Industrials	8	14.00
Consumer Products	7	12.30
<b>Total</b>	<b>57</b>	<b>100.00</b>

**Table 3** *Respondent Demographics*

Items	Frequency (%)
Gender	
Male	33.30
Female	66.70
Age (years)	
> 30	14.00
30–40	35.10
41–50	33.30
< 50	17.60
Education	
Lower than Bachelor Degree	0.00
Bachelor Degree	50.90
Master Degree	45.60
Higher than Master Degree	3.50
Position	
Management Position or Equivalent	40.40
Accounting Manager or Equivalent	17.50
Finance Manager or Equivalent	3.50
Other Positions related to EMA	38.60
Working Experience	
< 1 year	1.80
1–3 years	24.60
3–5 years	19.30
> 5 years	54.30

The level of environmental awareness was assessed together with environmental behavior. Specifically, the level of EMA implementation within a company was examined. Additionally, the relationship between environmental awareness and behavior that resulted in EMA implementation was analyzed. The results are shown in Table 4 and the following tables.

**Table 4** *Level of Environmental Awareness*

Items	Mean	SD	Interpretation
Awareness of Company's Operating (OPR)	3.38	0.70	Moderate Awareness
Awareness of Importance and Benefits of EMA (BNF)	3.59	0.81	High Awareness
Awareness of Environmental Management System (ISO)	3.15	0.93	Moderate Awareness
Awareness of Environmental Information Disclosure (GRI)	3.76	0.78	High Awareness
Awareness of the Accessibility to EMA (EMA)	3.19	0.56	Moderate Awareness
Awareness of Feasibility to Implement EMA in Thailand (IMP)	3.44	0.94	High Awareness

Environmental awareness was assessed using a 5-point Likert scale. The scores were interpreted as shown in Table 4. Respondents had moderate awareness of some aspects, such as the company's operations, the environmental management system, and also their accessibility to environmental management accounting. This implied that companies knew that their operations may impact the environment somewhat. They also knew that some standards for environmental management such as ISO 14001 existed, and they were able to some extent to access information about environmental management accounting. Furthermore, responding companies had a high awareness about the important and benefits of EMA. They were also highly aware about environmental information disclosure standards such as GRI, and that it was possible to implement EMA in Thailand.

According to GRI Standard 2023, the level of environmental implementation may be classified under five behavioral dimensions varying from Defining Policies for Environmental Management, Complying with the Environmental Standards and Regulations, Recording Environmental Data, Conducting Environmental Management Accounting, and Disclosure of Environmental Information. The maximum score at each level was four, and an overall total score of 20 was possible, which indicated the level of implementation varying from Very Low Implementation (0.00–4.00) to Very High Implementation (16.01–20.00).

Results presented in Table 5 show that respondents adopted a moderate level of environmental implementation (an average score of 11.73). Companies strictly integrated environmental issues in their operations by defining policies—that is, they assessed environmental problems potentially caused by their operations and implemented policies to avoid or mitigate these problems. These policies were communicated among employees. Additionally, they exhibited a high level of compliance with environmental standards and also recorded environmental data. These findings were aligned with those previous study by Nguyen (2022), which revealed that institutional pressure plays an important role in enforcing EMA practice.

**Table 5** *Level of Environmental Implementation within Surveyed MAI Companies*

Behavioral Dimensions	Mean	SD	Interpretation
Defining Policies for Environmental Management	3.12	1.16	High Implementation
Complying with the Environmental Standards and Regulations	3.11	0.83	High Implementation
Recording Environmental Data	2.93	1.06	High Implementation
Conducting Environmental Management Accounting	0.82	1.37	Low Implementation
Disclosure Environmental Information	1.74	1.28	Moderate Implementation
Overall Implementation of Environmental Management Accounting	11.73	4.14	Moderate Implementation

Nevertheless, the group surveyed in this study were not likely to conduct environmental management accounting, since these scores indicated a low level of implementation. But they did disclose some environmental information to comply with regulatory requirements. To put it bluntly, implementation of EMA and environmental information disclosure was still limited among small- and medium- sized companies. The reasons for low implementation of EMA have been explained in some previous studies. These included a lack of quantification tools, complicated government policies, a lack of EMA guidance, unavailability of resources and technology, as well as internal factors such as a lack of expertise and knowledge and a short-term profit orientation (Li, 2004; Setthasakko, 2010; Mukwarami et al., 2023)

Additionally, factor analysis was conducted to examine relationships and patterns that emerged among the environmental awareness elements. The Kaiser-Meyer-Olkin coefficient obtained was .758 (above .60 required for adequacy), which indicated a satisfactory value to conduct factor analysis. Thus, all six factors, including the awareness of company operations, awareness of the importance and benefits of EMA, awareness of environmental management systems, awareness of environmental information disclosures, awareness of accessibility to EMA, and feasibility to implement EMA in Thailand were correlated and could be grouped into a new factor, Awareness of Environmental Management Accounting. Sphericity was not violated, as a Barlett's test returned a value significance at the .000 level.

**Table 6** *Factor Analysis*

Environmental Awareness Elements	Kaiser-Meyer-Olkin Coefficient
Awareness of Company's Operating (OPR)	.699
Awareness of Importance and Benefits of EMA (BNF)	.771
Awareness of Environmental Management System (ISO)	.653
Awareness of Environmental Information Disclosure (GRI)	.724
Awareness of the Accessibility to EMA (EMA)	.732
Awareness of Feasibility to Implement EMA in Thailand (IMP)	.826
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.758

Lastly, the relationship between the awareness and implementation of environmental management accounting was examined by conducting a Pearson's correlation analysis. This analysis is normally applied to identify linear relationships between two variables. The result obtained is shown in Table 7. The Pearson correlation coefficient (*R*) of .500 indicated that a moderate positive correlation existed between Awareness of Environmental Management Accounting and Implementation of EMA. This implied that the level of EMA implementation might be increased by greater awareness of the environmental impacts caused by business operations, awareness of the benefits of environmental management accounting, as well as knowledge about regulations and standards for environmental management, along with environmental disclosure. These results were aligned with previous studies conducted in a variety of manufacturing industries by Dinh et al. (2022) and Vu (2022).

**Table 7** *Pearson's Correlation between the Awareness and the Implementation of EMA*

Variable	Implementation	Awareness
Awareness	1	
Implementation	.500**	1

*Note.* \*\*Correlation is significant at the .01 level.



## Conclusion and Implications

A growing interest in social responsibility and the environment are forcing all sizes and types of companies to adopt and comply with environmental standards, not only at operational levels, but also in their accounting practices. Thus, environmental management accounting was proposed in the late 1980s, and since then business organizations and professional bodies have been highly encouraged to adopt them, as it is believed that EMA will help business organizations to identify and avoid environmental problems. These practices also may lead to environmental improvements and better economic performance.

Previous studies have revealed that EMA has been practiced in big corporations in leading advanced countries. For SMEs in developing countries, it is still in its early stages and little research exists. Thus, in this study, environmental awareness and the extent to which EMA has been implemented and practiced by small and medium-sized enterprises listed in the MAI was also explored. The aim also was to identify the relationship between these two factors by conducting a Pearson's correlation analysis.

The study has provided empirical evidence on the extent to which small and medium-sized enterprises listed in the MAI were aware of environment management accounting. This included awareness of its existence and its roles in managing and enhancing the environment, and also awareness about the accessibility of EMA information, as well as the feasibility of implementing EMA in their organizations. The level to which EMA was implemented was also assessed. This varied from just defining policies to serious implementation (i.e., recording environmental data and using it for business optimization, along with conducting environmental management accounting and disclosing environmental data to the public). Nevertheless, it was found that EMA was moderately implemented among SMEs in Thailand. Furthermore, the study confirmed a positive relationship between awareness and the implementation of EMA. This implied that EMA practices can be encouraged and fostered by creating greater EMA awareness, especially in areas in which awareness or knowledge were lacking or limited.

## Limitations and Suggestions for Future Studies

Last but not least, this study was limited to small- and medium-sized enterprises listed in the Market for Alternative Investment in Thailand. Together with the small sample size, this may limit the generalizability of the research findings to other settings. Another limitation of the research relates to the lack of depth of the information and insights captured by the questionnaire. Further, qualitative studies are highly encouraged, as these may provide better insights and identify key challenges why small and medium-sized enterprises, which are the backbone of the economy, could not fully implement environmental management accounting. Quantitative research with larger numbers of participants is also recommended, as this would increase the generalizability of the research findings.

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# The Impact of Digital Content Quality and Network Externalities on the Development of Young Consumers' Online Brand Trust and Loyalty

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## Abstract

Studies have shown that young consumers continue to be the target of digital marketing communications. They are also a source of revenues from online platforms that provide digital content. This research aimed to investigate whether young consumers' online brand trust and online brand loyalty would be significantly influenced by such independent variables as creators' digital content quality and network externalities. The study employed purposive sampling of 402 Thai undergraduate respondents who regularly view contents from their followed or subscribed channels. The research results were statistically analyzed using Structural Equation Modeling. The analysis revealed that creators' digital content quality (.745,  $p < .001$ ) and network externalities (.152,  $p < .001$ ) had a significant impact on online brand trust. Furthermore, online brand trust (.960,  $p < .001$ ) also had a significant impact on online brand loyalty. The findings provide empirical evidence for social media and digital marketing communications. In addition, the findings reveal that enhancing trust is still crucial to branding.

**Keywords:** *Digital quality, network externalities, brand trust, loyalty*

## Introduction

Digital content creation trend is on the rise. Social media users take time to view online content and some of them have become digital content creators. Brands or influencers have been using social media to establish relationships with customers or followers. Besides, digital content creators generate a lot of advertising revenues from the number of followers who view their content. However, creating quality content is a challenge as creators need to understand what drives follower or subscriber engagement and makes them loyal to their channels.

According to the Associated Press (2024), there are major trends of future digital content, namely artificial intelligence and machine learning (e.g., ChatGPT, a natural language processing model that can generate ideas, articles, titles, social media posts), mixed realities such as virtual reality (VR) and augmented reality (AR) that offer a computer-enhanced virtual space for users to consume and interact with content in entirely new ways, short-form video (e.g., TikTok, Instagram, and YouTube Shorts that encourage user participation, that are easy to produce and highly personalized), reactive content (real-time content or live cast), podcasting (on-demand audio shows on popular topics ranging from breaking news to sports, special interests, and more), and first-party data collection (i.e. content based on data collected from volunteered users).

## Scope of the Study

Young Thai consumers were the focal respondent group for this study, as they are becoming the main source of modern business revenues. According to Dewinatalia and Irwansyah (2022) and Tunsakul (2018), studies on young consumers have been increasingly conducted as they are targeted by many brands and digital content creators. From previous studies, the term "young consumer" is identified by age group rather than as a specific generation. Kowalska (2012) explained that young people can be divided into three groups: young teenagers (13–15 years old), older teenagers (16–18 years old), and young adults (19–24 years old). Chan and Zhang (2007) and Škrinjarić (2021) mention that young consumers are people who are not yet mature, and who are aged from 18–24 years old. In this study, the latter definition was adopted, and the respondents consisted of undergraduate students aged between 18–24 years old.

This study focused on online brand trust in and brand loyalty to digital content creators. After reviewing the related literature, two interesting factors were found, content quality and network externalities, which can influence brand trust and loyalty (Wang et al., 2013; Simanjuntak et al., 2022).

### ***Research Objectives***

This research study aimed to investigate the predictive power of creators' digital content quality and network externalities on young consumers' online brand trust, along with its impact on online brand loyalty.

### ***Significance of the Study***

This study's findings may benefit digital businesses—startups, as well as digital content creators—that produce digital contents in order to attract social media users, especially young consumers whose contributions to revenues are considerable. Furthermore, the research implications will add to academic knowledge and empirical evidence in the areas of digital marketing and modern business management. Increasing brand trust and brand loyalty means business growth. In addition, sources of brand trust and brand loyalty were identified and tested in this research.

### **Conceptual Framework and Hypothesis Development**

#### ***Independent Variables: Digital Content Quality and Network Externalities***

Digital content refers to bit-based objects, especially online information and knowledge, distributed through electronic channels (Rowly, 2008). The concept of content quality is based on information quality. Content quality is the degree to which content material has characteristics that are valuable for the audience or users (O'Brien & Marakas, 2013). According to Kotler and Armstrong (2018), quality is not only related to products but to whether customers return to a company. From different literature about quality of information or contents, dimensions of quality can be identified as consisting of three main parts (a) time: frequency, currency, and up-to-dateness; (b) content: reliability, usefulness, completeness, conciseness, and objectivity; (c) presentation: format and media (Elliot et al., 2013; O'Brien & Marakas, 2013; Zheng et al., 2013; Batini & Scannapieco, 2016).

The concept of network externalities or network effects is based on social influence theory by Kelman (1958). Social influence explains how individuals' behavior is affected by others' in social settings (Venkatesh & Brown, 2001). In a social group where there are norms, individuals may engage in a particular behavior to follow the expectations of other people (Gerow et al., 2010). Lin (2010) found that social norms have an important effect on loyalty behavior in virtual communities. Chan and Hahn (2007), as well as Dickinger et al. (2008), have pointed out that network externalities increase when more people use a particular product or service. Dickinger et al. (2008) also pointed out that social norms play an important role in driving individuals' perceived enjoyment and usefulness of highly interactive services. In conclusion, network externalities within a social setting increase when people influence one another to engage in a particular behavior.

#### ***Mediator: Online Brand Trust***

Trust is the willingness to rely on someone (Kotler & Armstrong, 2018). Berman and Evans (2012) noted that it has three components: (1) ability, (2) benevolence, and (3) integrity. Previous research shows that trust leads to willingness to disclose personal information (Mansur et al., 2021), make purchasing decisions (Ricardianto et al., 2022), and demonstrate brand loyalty (AlHaddad, 2015; Atulka, 2020).

Previous studies have also confirmed that both content quality (Elliot et al., 2013; Akoglu & Özbek, 2021; Simanjuntak et al., 2022) and network externalities have significantly affected brand trust (Chun & Hahn, 2007; Wang & Chen, 2012; Wang et al., 2013).

According to the information above, the research hypotheses  $H_1$  and  $H_2$  are formulated as follows:

$H_1$ : Creators' content quality has a significant impact on online brand trust.

$H_2$ : Network externalities have a significant impact on online brand trust.

### **Dependent Variable: Online Brand Loyalty**

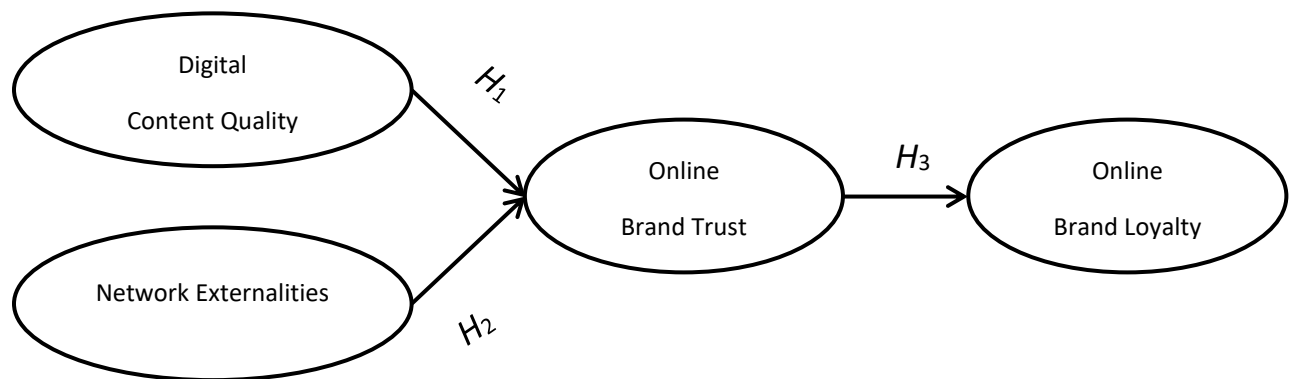
Brand loyalty is defined as “a situation which reflects how likely a customer will be to switch to another brand, especially when that brand makes a change, either in price or in product features” (Aaker, 1991, pp. 44–45). Oliver (1999, p. 36) defined brand loyalty as “a deeply held commitment to re-buy or repatronize a preferred product/service consistently in the future, thereby causing repetitive same-brand or same-brand set purchasing despite situational influences and marketing efforts having the potential to cause switching behavior.” According to Dick and Basu (1994), brand loyalty has two different components: attitudinal and behavioral loyalty. Attitudinal loyalty refers to the degree of individuals’ cognitive loyalty, while behavioral loyalty refers to continuous purchasing from the same seller by consumers, resulting in an enhanced relationship between the seller and the buyer (repurchase and advocacy). This research focuses on behavioral loyalty. Previous studies have revealed that a positive relationship exists between consumer trust and loyalty (Wang et al., 2013; AlHaddad, 2015; Atulka, 2020).

Thus, research hypothesis  $H_3$  is stated as follows:

$H_3$ : Online brand trust has a significant impact on online brand loyalty.

Figure 1 represents the conceptual model of this study, depicting relationships among all the hypotheses.

**Figure 1** The Conceptual Model



### **Research Methodology**

#### **Study Respondents and Sampling Procedure**

The target population was young consumers aged between 18–24 years old as defined by Chan and Zhang (2007). The target respondent’s attributes included university undergraduates from a private university, who followed or subscribed content creators and viewed the contents regularly. The selection of target respondents was based on a purposive sampling method based on the target population’s criteria so that the sample would be representative of it. As the target respondents were the researcher’s students, they were approached in classrooms using a QR code with a link to the questionnaire. They were asked before answering the questions if they met the study’s criteria.

#### **Research Instruments / Questionnaire**

This research study used both qualitative and quantitative methods. The qualitative method included exploratory study to identify the factors, as well as literature review. The quantitative method was the use of a questionnaire to collect data. The questionnaire consisted of two parts: the demographic profile (four closed-ended questions) and the research variables (14 five-point Likert scale questions).

Regarding the variables, the respondents were asked to indicate their response to all questions on a scale of 1 to 5, consisting of 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, and 5 = *Strongly Agree*. The measurements of digital content quality (five items, Cronbach’s  $\alpha = .821$ ) were

adapted from those of Zheng et al. (2013), O'Brien and Marakas (2013) and Elliot et al. (2013); network externalities (two items, Cronbach's  $\alpha = .858$ ) were adapted from those of Wang and Chen (2012). For online brand trust, the measurements were adapted from those of Swan et al. (1988), with four items (Cronbach's  $\alpha = .824$ ). And the measurements of online brand loyalty (three items, Cronbach's  $\alpha = .816$ ) were adapted from those of Chaudhuri and Holbrook (2001) and Jang et al. (2008).

Table 1 depicts the measurements of all variables, including the number of items and Cronbach's Alphas ( $\alpha$ ) coefficients. The Cronbach's Alpha ( $\alpha$ ) coefficients for all items ( $N = 402$ ) ranged from .816 to .858, which are considered as being reliable according to Maholtra (2007).

**Table 1** *Summary of Measures and Item Reliability (N = 402)*

Measures	Items	Cronbach's $\alpha$
<b>Digital Content Quality</b>	5	.821
1. Digital contents from the creators I follow are accurate.		
2. Digital contents from the creators I follow are useful for me.		
3. Digital contents from the creators I follow are unbiased.		
4. Digital contents from the creators I follow are concise.		
5. Digital contents from the creators I follow are up-to-date.		
<b>Network Externalities</b>	2	.858
1. The content creators have many followers including my friends.		
2. The content creators have many followers including people I know.		
<b>Online Brand Trust</b>	4	.824
1. I feel comfortable to view contents from the creators I follow.		
2. I view a lot of contents from the creators I follow.		
3. The content creators that I follow are trustworthy.		
4. The content creators I follow always deliver what they promise.		
<b>Online Brand Loyalty</b>	3	.816
1. I will keep viewing contents from the creators I follow.		
2. I will keep viewing contents from the creators I follow even though there are new creators.		
3. I will recommend the content creators I follow to others.		

### **Data Gathering Procedure**

Primary data were gathered via self-administered questionnaires from the respondents. A link to the online questionnaire was sent to all target respondents in classrooms through scanning a QR code. The process of data gathering took 5 days during December 2023. In total, 402 responses met the criteria, which was a number higher than the minimum requirement for an appropriate sample size as recommended by Berenson and Levine (1999). All questions were answered because they were required and could not be skipped.

## **Research Results**

### **Demographic Profile of Respondents**

The demographic profiles in this study were comprised of four main sections: gender, the social media platform most used by a respondent, the type of content most viewed by a respondent, and the device most used by a respondent to view digital content. The descriptive data, including frequency and percentage, are shown in Table 2.

According to Table 2, a majority of the 402 respondents were female (247 respondents, or 61.4 %), while 155 respondents (38.6%) were male. Regarding social media platform most used by respondents, a majority (201, or 50%) viewed content on TikTok. With respect to the type of social media content most frequently viewed by respondents, the majority, 148 or 36.8%, viewed entertainment content. Finally, smartphones were the devices most frequently used by a majority of the respondents (323, or 80%).

**Table 2** *Demographic Profile of Respondents (N = 402)*

Demographic Profile of Respondents		Descriptive Statistics	
		Frequency	Percent
Gender	Female	247	61.4
	Male	155	38.6
Social media platform most used by respondents	Tik-Tok	201	50.0
	Instagram	94	23.4
	YouTube	86	21.4
	Facebook	11	2.74
	X (Twitter)	10	2.48
Type of content most viewed by respondents	Entertainment (movie, music, funny clips)	148	36.8
	Food and travel reviews	87	21.6
	Technology and product reviews	55	13.7
	Sports and games	38	9.5
	Cooking/food recipes	33	8.2
	Education	25	6.2
	News and documentaries	11	2.7
	Pets/Animals	5	1.2
Device most used by respondents to view contents	Smartphone	323	80.3
	Tablet	57	14.2
	PC	22	5.5

**Confirmatory Factor Analysis**

Confirmatory Factor Analysis (CFA) was used in the study to determine the degree of model fit. Two types of goodness-of-fit measures were used, Absolute Fit and Incremental Fit, as suggested by Hair et al. (2006) and Ho (2006). The key indices of Absolute Fit measures used included Chi-square statistics, Goodness-of-Fit Index (GFI), and Root Mean Square Error of Approximation (RMSEA), which were used to assess whether the proposed model fit the data. The Incremental Fit measures included the baseline comparison fit indices of Normed Fit Index (NFI), Relative Fit Index (RFI), Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI), which were used to show improvement for the hypothesized model (default model).

Despite the rule of thumb which states that Chi-square statistics ( $\chi^2$ ) should not be more than two, Hair et al. (2006) and Ho (2006) noted that Chi-square ratio results increase with larger sample sizes, especially when the number of respondents is more than 200. Therefore, it is recommended to consider such key indices as GFI and RMSEA. The CFA results from this study (Table 3) with the use of modification fit indices showed that the model fit with the dataset,  $\chi^2(N = 402, df = 68) = 2.551, p < .05$ , and GFI showed an acceptable fit at 0.942, which was close to 1 (0 = poor fit, and 1 = perfect fit). For the RMSEA, the smaller values indicated a better model fit. Values ranging from .05 to .08 are considered acceptable, values from .08 to .10 indicate mediocre fit, and those greater than .10 indicate poor fit (Ho, 2006).

**Table 3** *Summary of CFA Fit Indices of Measurement Model*

	Measures of Absolute Fit			Measures of Incremental Fit				
	$\chi^2/df$	RMSEA	GFI	NFI	RFI	IFI	TLI	CFI
<b>Requirement</b>	< 2.0	Acceptable at .05–0.08	Close to 1	0.900	0.900	0.900	0.900	0.900
<b>Model</b>	2.551	0.062	0.942	0.941	0.921	0.963	0.951	0.963

For the Incremental Fit measures, the incremental fit indices should be above 0.90 (Hair et al., 2006; Ho, 2006); the baseline comparison fit indices of NFI, RFI, IFI, TLI and CFI for this study showed

improvement for the hypothesized model. When compared to the null model, from .037 (or 1–.963) to .079 (or 1–0.921) appeared to be so small as to be of little practical significance. Therefore, the model fits well with the dataset. Table 4 shows the Fit Indices of the path model, and also indicated that the model fit well with the dataset.

**Table 4** Summary of SEM Fit Indices of Measurement Model

	Measures of Absolute Fit				Measures of Incremental Fit			
	$\chi^2/df$	RMSEA	GFI	NFI	RFI	IFI	TLI	CFI
<b>Requirement</b>	< 2.0	Acceptable at .05–.08	Close to 1	.900	.900	.900	.900	.900
<b>Model</b>	2.414	.059	.944	.943	.925	.966	.955	.966

### Hypothesis Testing

Structural Equation Modeling (SEM) was used to test the hypotheses, and to investigate and explain the relationships among the independent and dependent variables.

The results of SEM as shown in Table 5 indicated that all the unstandardized regression weights were significant per the critical ratio test ( $CR > \pm 1.96$ ,  $p < .05$ ). From the results, creators' digital content quality and network externalities had a significant and positive impact on online brand trust as reflected by positive unstandardized and standardized regression weights, as well as  $p$ -values less than .05. Furthermore, online brand trust significantly and positively influenced online brand loyalty. These results were consistent with previous studies that were reviewed in this study.

**Table 5** Summary of Hypothesis Testing

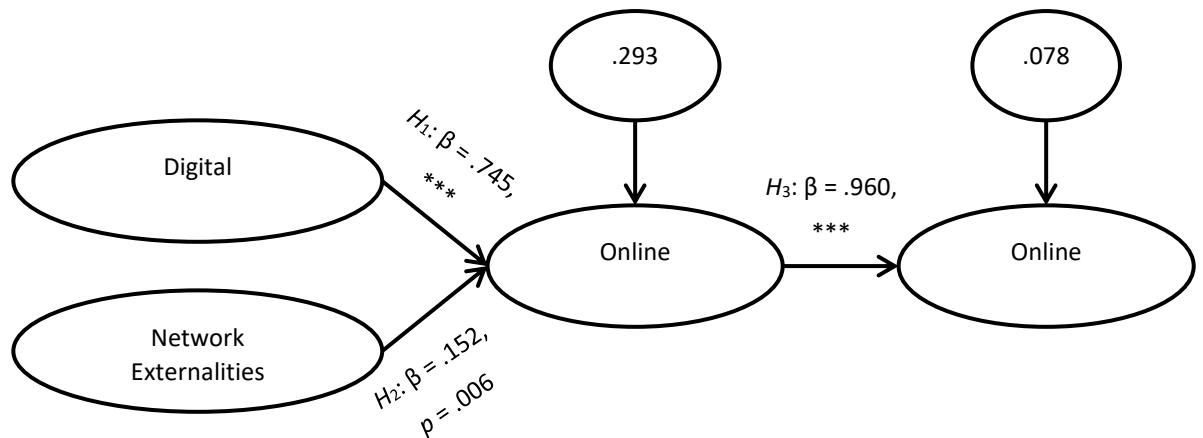
No.	Path of Relationship	Unstandardized Regression Weight (B)	Standardized Regression Weight ( $\beta$ )	Critical Ratio (CR)	$p$ Value	Hypothesis Supported
$H_1$	Creators' digital content quality has a significant impact on online brand trust.	0.731	0.745	8.846	.000	Yes
$H_2$	Network externalities have a significant impact on online brand trust.	0.095	0.152	2.729	.006	Yes
$H_3$	Online brand trust has a significant impact on online brand loyalty.	1.262	0.960	12.580	.000	Yes

### Discussion and Conclusion

This study fulfilled its objectives, which were to investigate the predictive power of creators' digital content quality and network externalities on young consumers' online brand trust, along with its impact on online brand loyalty. The research results showed that digital content quality and network externalities significantly influenced online brand trust and brand loyalty. Figure 2 shows the structural path model with Hypotheses 1 to 3. The lines represent the hypotheses supported by the findings. The arrows pointing to online brand trust and online brand loyalty represent unexplained (residual) variances for these two factors. For this hypothesized model, 29.3% of variation in online brand trust is unexplained (calculated by subtracting the factors' squared multiple correlations ( $R^2$ ) or explained variances), or 70.7% of the variance is accounted for by the joint influence of digital content quality and network externalities. Similarly, 7.8% of variation in online brand loyalty is influenced by other factors, so 92.2% of the variance is accounted for by the joint influence of the rest of variables.



**Figure 2** Structural Path Model with Summary of Findings



Notes. \*\*\*  $p < .001$

In conclusion, the explained variances for all independent variables are represented by the  $R^2$ . The percentage of variance explained ranges from 70.7% (online brand trust) to 92.2% (online brand loyalty). For all measurement variables, the residual variances ( $1-R^2$ ) ranged from 29.3% to 7.8%.

### Research Implications

This study provides some useful implications for enhancing online brand trust and brand loyalty. According to the research results, digital content quality and network externalities are quite meaningful for content creators. It is advised that all content creators, individuals or organizations, should develop digital contents with high accuracy (e.g. reliable information and without fake news), usefulness to the audience (worth the view), impartiality (e.g., avoiding content that causes high conflicts), conciseness (e.g. well-edited, not too intermittent), and timeliness (trendy and with updated information).

These findings were consistent with those of previous studies in that content quality significantly influenced brand trust (Elliot et al., 2013; Akoglu & Özbek, 2021; Simanjuntak et al., 2022). According to the author's observations, digital content with lots of viewers mostly met the criteria of content quality. Network externalities are also an important factor. Some people start following a content creator because of their friends, families, or reference groups. Content creators can develop their network externalities by paid or free communications, and also by enhancing their credibility, competence, and attractiveness as suggested by Eisend (2006). This is consistent with previous studies that network externalities significantly influenced brand trust (Chun & Hahn, 2007; Wang & Chen, 2012; Wang et al., 2013). Then brand trust can lead to future commitment and loyalty, consistent with the studies by Wang et al. (2013), AlHaddad (2015) and Atulka (2020). These results provide empirical evidence that adds to academic and business knowledge.

### Limitations and Suggestions for Further Research

The main limitation of this study was that it was conducted among young Thai consumers in a private university. Future research is encouraged to expand to other age groups or young consumers in different settings. Moreover, other factors such as influencer characteristics and platform quality may be further studied.

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## Effects of the Pandemic on the Financial Performance of Listed Readymade Garment Firms in Bangladesh

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### Abstract

This study examined how the COVID-19 pandemic impacted the financial performance of listed firms in the readymade garment (RMG) industry in Bangladesh. Out of 56 RMG companies listed in the Bangladesh Stock Exchange, 33 firms whose complete financial data from 2016-2021 was publicly available were selected as the sample. Through the use of descriptive, correlation, and regression analysis, the study explored the sector's financial well-being both before and during the pandemic, including the relationship between the pandemic and financial metrics, the extent of its impact, and other factors that influenced financial performance. The findings revealed a significant negative impact on RMG profitability indicators such as Return on Assets ( $-.032, p < .01$ ) and Return on Equity ( $-.067, p < .05$ ). Factors such as firm size, debt ratio, growth rate, and accounts receivable turnover were also identified as significant influencers of financial performance during the pandemic period. These findings underscored the pandemic-related challenges that RMG companies in Bangladesh faced, and emphasize the importance of proactive strategies for risk mitigation. They also highlight practical implications for strategic financial management and resilience-building measures within the sector.

**Keywords:** COVID-19, Bangladesh, ready-made garments industry, financial performance

### Introduction

The coronavirus SARS-CoV-2 was first identified as the causative agent for a series of atypical respiratory diseases in the city of Wuhan, Hubei Province, China in December 2019 (Pollard et al., 2020). On March 11, 2020, this novel Corona virus disease (COVID-19) was described as a pandemic by the World Health Organization (WHO) (Mishra et al., 2020). This forced many countries to implement a comprehensive closure of economic activities, which caused challenges that differed from previous economic crises. As the virus spread rapidly, the severity of its impact and inability to limit its spread were the main factors that caused a global economic crisis (Garad et al., 2021).

The pandemic led to a severe global recession with differential impacts within and across countries (Barrett et al., 2021). Emerging markets and developing economies suffered more than advanced economies. Hevia and Neumeyer (2020) examined the economic impact of the COVID-19 pandemic on emerging economies, where it resulted in sharp declines in employment across many countries. Frequent lockdowns restricted the mobility of labor, which adversely affected income levels as well as production capacity utilization, thereby reducing output capacity (Shah & Garg, 2023). Belhadi et al. (2021) indicated that government measures to contain the outbreak resulted in stricter border restrictions and complete nationwide lockdowns, thereby causing a negative short-term impact on consumer spending, investments, and disruptions to international trade and global supply chains. Rababah et al. (2020) pointed out further that supply chain based businesses and manufacturing firms faced issues such as decreases in demand, reductions in cash flows, lower sales revenues, limited availability of workforces, and marketing issues. Their futures depended mainly upon their ability to counter such challenges, although even after doing so, their financial futures might still hang in the balance.

The primary aim of this research was to examine the extent of the COVID-19 pandemic's impact on the financial health of the RMG sector in Bangladesh and the nature of its effects. The textile sector has a greater facet for growth and foreign exchange earnings than other sectors in Bangladesh. It makes a significant contribution to the national economy by creating plentiful employment

opportunities and reducing poverty through socioeconomic development (Fatema et al., 2018). Among developing economies such as Cambodia, Sri-Lanka, China, etc., Bangladesh has achieved a strong position as a global RMG supplier mainly due to having some of the cheapest labor costs among apparel manufacturing countries (Asgari & Hoque, 2013).

However, there has been a lack of studies exploring the determinants of financial performance in Bangladesh's textile sector (Mitra & Adhikary, 2017). The present study was conducted because of a need to fill this gap and learn more about the factors that affect the financial performance of RMG firms in terms of their overall financial health, profitability, and management. Given the unprecedented crisis of the COVID-19 pandemic and subsequent economic repercussions, the financial health and resilience of these firms needs to be examined. Understanding how the pandemic has affected their financial performance is crucial for devising strategies to mitigate future risks and uncertainties. Additionally, analyzing financial performance will help in identifying challenges, vulnerabilities and opportunities for future growth and sustainability.

This study may also provide a clearer understanding of the pandemic's financial impact on the sector, which can guide the formulation of contingency plans to boost the industry's recovery and build resilience against future crises. The importance of identifying financial challenges is necessary to formulate effective strategies for recovery, risk management, resilience building, and strategic planning for the future.

## **Literature Review and Hypothesis Development**

### ***Financial Performance***

The financial performance of companies is a topic that has attracted substantial attention and interest from financial experts, researchers, the general public, and corporate managers (Omondi & Muturi, 2013). Heikal et al. (2014) explained that investors are interested in companies with high returns on assets (ROA), as they can produce high levels of corporate profits. Omondi and Muturi (2013) reported that ROA is the accounting measure widely used in market analytics for measuring financial performance. Ahsan (2012) elaborated on the importance of return on equity (ROE), as it is a closely watched financial ratio among equity investors. The higher the ROE value, the higher the profits that the company can generate for shareholders; this makes investors more interested in purchasing their shares in order to receive attractive dividends (Mahzura, 2018).

### ***Impact of COVID-19 on Financial Performance***

The degree of COVID-19 consequences differed from one economy to another and from one firm to another (Atayah et al., 2022). A study by Rababah et al. (2020) revealed that the pandemic caused disruptions in global commerce, resulting in losses for many industrial sectors. Measures such as lockdowns, social distancing, and travel restrictions led to decreased demand, production halts, and a decline in economic activity. The study highlighted the adverse effects of COVID-19 on the financial performance of Chinese companies using financial indicators such as ROA and ROE with size, leverage ratio, growth rate, and total revenues as control variables. It revealed a decrease in overall profitability and investment, with significant impacts observed across industries. Another study by Achim et al. (2022) examined the financial performance of 218 Romanian companies from 2019 to 2020, focusing particularly on how the COVID-19 pandemic impacted their finances. They found that companies with higher levels of debt struggled more during the pandemic, experiencing lower profitability and returns on equity. Due to the pandemic, these companies faced financial constraints, limiting their ability to invest and adapt to changing market conditions. Additionally, higher debt levels increased financial risk, making these companies more vulnerable to economic downturns. Similarly, other studies also found that COVID-19 had a negative impact on the financial performance of Indonesian firms (Daryanto & Rizki, 2021; Demirhan & Sakin, 2021).

However, financial performance varied among firms, industries, and countries. During COVID-19, the consumer goods and pharmaceutical sectors saw an increase in profitability while other sectors such as property, real estate, building construction, and services experienced decreases in profitability

ratios (Devi et al., 2020; Droj et al., 2021). Atayah et al. (2022) noted that despite the challenges, the logistics industry experienced increased demand during the pandemic due to its essential nature, with many governments exempting logistics services from lockdown measures. This study showed that collaboration between governments and logistics companies helped maintain supply chains and facilitated the movement of essential goods. Nevertheless, in some countries, the COVID-19 had a negative impact on the financial performance of logistic firms (Atayah et al., 2022). According to Nguyen (2022) before the pandemic, the logistics industry was experiencing growth, driven in part by a rapid rise in e-commerce. However, the outbreak disrupted global manufacturing and supply chains, leading to a decline in financial performance for logistics enterprises. Chakraborty and Biswas (2020) indicated that the supply chain shock due to the pandemic caused a bullwhip effect in the fashion and RMG industries. As a result of the lockdown, firms belonging to the Bangladesh Garment Manufacturers and Exporters Association closed their factories in line with the government's lockdown instructions (Kabir et al., 2021). This disrupted Bangladesh's export of garments (Emran & Schmitz, 2023).

Based on the literature review, a hypothesis related to the impact of various factors on the financial performance of the RMG industry in Bangladesh during the COVID-19 pandemic may be formulated as follows:

*Hypothesis (H<sub>1</sub>):* The COVID-19 pandemic had a significant negative relationship on the profitability of listed RMG firms in Bangladesh.

### **Control Variables**

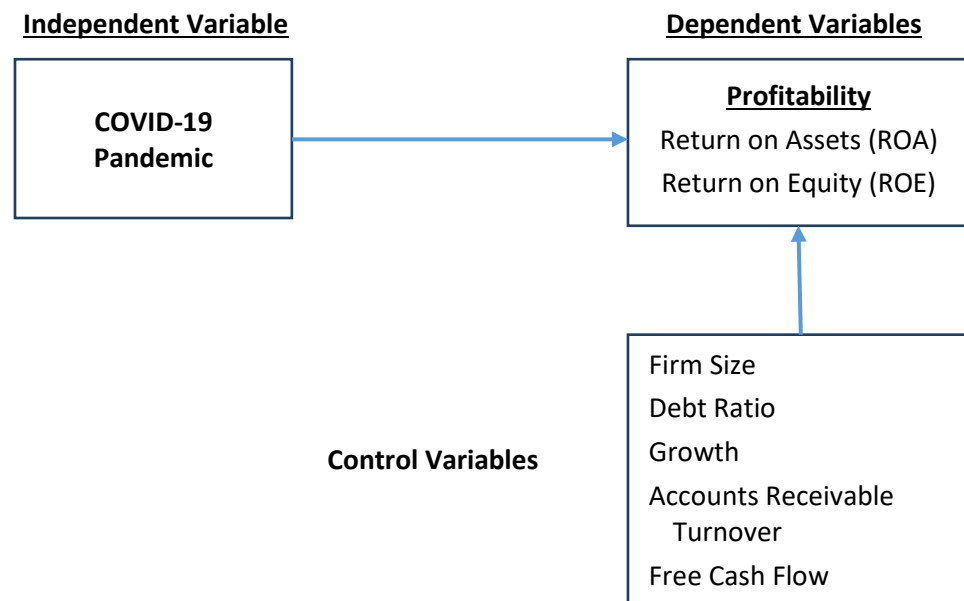
Doğan (2013) discovered a positive correlation between *Firm Size* and profitability among companies listed on the Istanbul stock exchange from 2008 to 2011. More specifically, larger firms, as indicated by total assets, total sales, and the number of employees, consistently demonstrated higher levels of profitability. This relationship suggested that larger firms may benefit from economies of scale, leading to more efficient operations and increased profitability. In addition, corporate debt policy is one of the most important determinants of how firms may be able to withstand economic and financial crises. Çitak and Ersoy (2012) revealed a significant negative relationship between firm profitability and a company's *Debt Ratio*. Its findings implied that firms might adjust their debt policies based on their profitability and dividend payout practices to navigate economic challenges effectively.

*Growth* is especially significant because a company can maintain its performance without running into financial problems (Rahim, 2017). Furthermore, the *Accounts Receivable Turnover Ratio* evaluates how long it takes to collect an organization's receivables (Binsaddig et al., 2023). A study by Amanda (2019) emphasized that a proficient receivables turnover rate reflects a company's adeptness in managing its operational activities, and effective management of this rate translates to enhanced profitability levels. Abughniem et al. (2020) found that *Free Cash Flow* had a negative and statistically significant effect on company performance. This indicated that a higher level of free cash flow was associated with poorer performance in terms of both profitability and market evaluation.

### **Conceptual Framework**

This study explored possible effects of the COVID-19 pandemic (the independent variable) on the profitability of listed RMG firms in Bangladesh, as shown below in Figure 1.

**Figure 1** *Effects of COVID-19 on Profitability*



*Source.* Adopted and modified from Linh & Mohanlingam (2018)

This examination focused on Return on Assets (ROA) and Return on Equity (ROE) as its dependent variables, serving as indicators of financial performance. Furthermore, the framework control variables included Size, Debt Ratio, Growth, Accounts Receivable Turnover (ART), and Free Cash Flow (FCF). These control factors were considered for their potential influence on the association between COVID-19 and financial performance measures.

## **Data and Methodology**

### ***Data and Sampling***

The study's population encompassed a total of 56 listed textile companies whose shares are traded on the Bangladesh Stock Exchange Market. From this pool, data were successfully collected from 33 companies spanning the years 2016 to 2021, which amounted to 198 observations. Before the regression analysis was conducted, descriptive statistics were used to check for errors or missing data that might affect the analysis. Firms with problematic or missing data were either removed from the sample before data analysis commenced, and explanatory notes were added to describe the reason for inclusion of unusually low or high values.

### ***Research Models and Variable Definitions***

The variable measurements and definitions used in this study are shown below in Table 1.

**Table 1** *Variable Measurements and Definition*

Variable	Abbreviation	Definition	Measurement
<b>Independent Variable</b>			
COVID-19	COVID-19	Indicator variable	Indicator variable that is equal to 1 from January 1, 2020, to December 31, 2021 (within-COVID), and 0 from January 1, 2016, to December 31, 2019 (pre-COVID).
<b>Dependent Variables</b>			
Return on Assets	ROA	A measurement of profitability shows how efficient management was in using assets to generate earning	Net Income/Total Assets
Return on Equity	ROE	Shows how much net income a company earned for each TAKA invested by the owners.	Net Income/Shareholders' Equity
<b>Control Variables</b>			
Size	SIZE	Size of firm in terms of sales revenue	Natural log of Sales
Debt Ratio	DEBT	Shows the proportion of assets financed by debts	Total Liabilities/Total Assets
Growth	GROWTH	Operating income growth ratio is the amount of profit realized from business operation.	Growth Rate of Net Income
Accounts Receivable Turnover	ART	Measures a company's effectiveness in collecting its receivables; it shows how well a company manages credit extended to customers, how quickly those accounts were collected/paid.	Net Credit Sales/Accounts Receivables
Free Cash Flow	FCF	Remaining cash available for distribution among all the shareholders of a corporate entity.	Cash Generated from Operating Activities—Capital Expenditures

Source: Adapted and modified from Linh & Mohanlingam (2018)

The following research models were adopted to investigate the effects of COVID-19 on the financial performance of the RMG industry in Bangladesh:

$$ROA_{it} = \beta_0 + \beta_1 \text{COVID-19} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{DEBT}_{it} + \beta_4 \text{GROWTH}_{it} + \beta_5 \text{ART}_{it} + \beta_6 \text{FCF}_{it} + \beta_7 \text{FirmFixedEffect} + e_{it}$$

$$ROE_{it} = \beta_0 + \beta_1 \text{COVID-19} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{DEBT}_{it} + \beta_4 \text{GROWTH}_{it} + \beta_5 \text{ART}_{it} + \beta_6 \text{FCF}_{it} + \beta_7 \text{FirmFixedEffect} + e_{it}$$

In the above models, COVID-19 is a variable that is equal to 1 during the period from January 1, 2020, to December 31, 2021 (within-COVID), and 0 from January 1, 2016, to December 31, 2019 (pre-COVID). ROA and ROE represent the financial performance of the company. SIZE, DEBT, GROWTH, ART (Accounts Receivable Turnover), FCF (Free Cash Flow) are the control variables. “*i*” represents the number of companies and *t* represents time period ranging from 2016 to 2020. *FirmFixedEffect* represents firm specified dummy that tells the unique effect firm specifies and time invariant unobservable are having on the regression.



## Results

### Descriptive Analysis

Table 2 reports descriptive statistics for financial performance variables from 33 listed textile companies on the Bangladesh Stock Exchange, covering 198 observations from 2016 to 2021. The mean value for ROE was 4.39% with a standard deviation of 18.93%, which reflects a significant amount of volatility in results. COVID-19 severely reduced the profitability of some firms, as shown by a minimum ROE of -121%. The ROA had a mean of 1.64% and a standard deviation of 6.468%, with a minimum of -31% and a maximum of 28%, reflecting the effects of COVID-19.

**Table 2** Descriptive Statistics

Feature	N	Minimum	Maximum	Mean	Std. Deviation
ROA	198	-31%	28%	1.64%	6.468%
ROE	198	-121%	147%	4.39%	18.93%
COVID-19	198	0%	100%	33%	47.3%
Size	197	6.61	10.12	9.18	0.52
Debt Ratio	198	2%	396%	52.88%	47.16%
Growth	198	-2,543%	1,383%	-15.76%	278.68%
ART	198	0	153.640	8.36	22.14
FCF	198	-3,014,592,929	1,727,659,337	-92,393,507	481,542,205

*Note.* ART – Accounts Receivable Turnover; FCF – Free Cash Flow

The mean value of operating income growth was -15.76%, showing an overall reduction in net income. A minimum value of -2,543% was recorded, with a maximum of 1,383%. The reason for these extreme figures -2,543% was because one company (Alltext Industries Ltd, 2020–2021, p. 22) in the sample reported a massive decrease in net income during 2021. In addition, the high maximum figure of 1,383% was because another company (Saiham Textile Mills Limited, 2018–2019, p. 46) reported a huge jump in net income from ₳109,175,887 in 2018 to ₳1,707,217,088 in 2019.

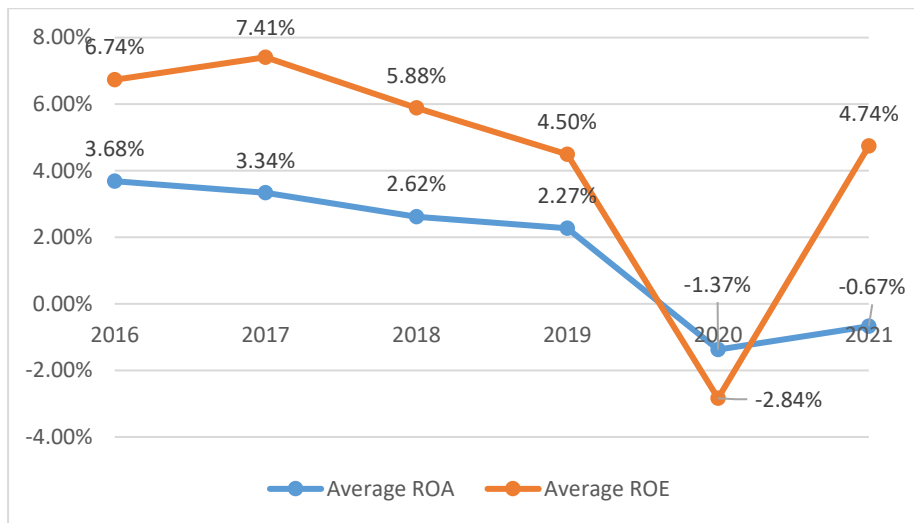
The Debt Ratio measures the extent of company's leverage (Hayes, 2024). In Table 2, the mean value of 52.88% shows that on average, total liabilities were about 52.88% of total assets. The maximum Debt Ratio of 396% was because one company (Dulamia Cotton Spinning Mills Limited., 2017–2021) had significantly more liabilities than assets for the years from 2017 to 2021. Moreover, the minimum of debt ratio of 2% reflected that one company (Generation Next Fashion Limited, 2016–2017) minimal debts the years 2016 and 2017.

Accounts Receivable Turnover (ART) measures how effective a company is in collecting its debts. The ARTs in Table 2 revealed that on average, the firms collected accounts receivable from sales about 8.36 times in a year. The minimum ART was 0 because one company (Desh Garments Limited, 2016–2017) reported no accounts receivable for the years of 2016 and 2017. The maximum of ART was reported as 153.64 times a year by one company (Alhaj Textile Mills Limited, (2016–2017, 2017–2018, p. 36), which had high turnover for the three consecutive years during 2016, 2017, and 2018.

Free cash flows (FCF) measures the remaining cash a company has generated after paying for capital expenditures and dividends. The mean value of FCF showed that the free cash flows had a balance of -₳92,393,507.61, indicating that companies did not have excess cash after spending on capital expenditures and dividends during the observed period.

The average ROA and ROE ratios of the 33 RMG firms are shown in Figure 2, and a substantial decrease in profitability may be seen during 2020 and 2021 when COVID-19 occurred. On average, ROA ratios dropped from 3.68% in 2016 to -1.37% in 2020. ROE ratios increased to 7.41% in 2017, but then steeply dropped to -2.84% in 2020.

**Figure 2** Financial Performance (Profitability) of Listed Firms in RMG Industry in Bangladesh from 2016–2021



### Correlation Analysis

Pearson's correlation was applied to understand the relationships among COVID-19 (the independent variable), the dependent variables ROA and ROE, and the control variables Size, Debt, Growth, ART, and FCF (as presented in Table 3). The Pearson's correlation analysis revealed several significant relationships among the variables studied. A notable positive correlation of .508 was found between return on assets (ROA) and return on equity (ROE), indicating a strong relationship between profitability measures. COVID-19 was negatively correlated with ROA (-.293) at a significant level, indicating an adverse impact on asset utilization during the crisis period.

**Table 3** Pearson's Correlation Coefficients

Factor	ROA	ROE	COVID-19	Size	Debt Ratio	Growth	ART	FCF
ROA	1.00							
ROE	.508**	1.00						
COVID-19	-.293**	-.129	1.00					
Size	.397**	.245**	-.047	1.00				
Debt Ratio	-.463**	.044	.112	-.419**	1.00			
Growth	-.419**	.203**	-.087	.170*	-.032	1.00		
ART	-.154*	.019	-.062	-.319**	.328**	.012	1.00	
FCF	.025	-.008	.010	-.221**	-.013	-.004	.055	1.00

Code. \*\* Correlation is significant at the .01 level (2-tailed); \* Correlation is significant at the .05 level (2-tailed).

No significant correlation was found between COVID-19 and the control variable Size. This implied that COVID-19 had an impact on firms regardless of their size. Table 3 also shows that Size had a significant positive association with ROA and ROE, which indicates that larger companies could earn higher income from their assets and equity. A negative significant correlation was found between Debt Ratio and Size, indicating that small companies had higher debt ratios to sustain their operations than larger firms. Free Cash Flow had a significant negative relationship with Size (-.221), which indicated that larger companies had lower free cash flows after covering their dividend payments and capital expenditures.

As shown in Table 3, the relationship between COVID-19 and the debt ratio was not significant; however, there was a significant negative correlation (-.463) between the Debt Ratio and ROA. This shows that the higher the debt ratio, the lower were the earnings generated on assets. On the other hand, positive and significant correlations were found between Growth and ROE (.203), ROA (.419)

and Size (.17). This meant that larger companies were more likely to experience positive outcomes on investments in assets, and in terms of the equity contributed by shareholders.

The accounts receivable turnover (ART) indicates negative significant correlations with ROA and SIZE (-.154, and -.319, respectively). This means that lower accounts receivable turnover brought a higher return on assets, and larger-sized company had a harder time collecting their accounts receivable. A moderate positive significant correlation to debt ratio (.328) indicates that companies with high account receivable turnovers also had high debt ratios.

### Regression Analysis

To examine the effects of COVID-19 on the financial performance of the listed RMG firms, regression analysis was utilized, and the results are displayed in Table 4. The effects of COVID-19 on financial performance are reported for Regression Model 1 (ROA) and Regression Model 2 (ROE).

**Table 4 Regression Model 1 (ROA)**

Feature	Coefficient	t	Significance
(Constant)	-.547***	-3.438	< .001
COVID-19	-.032***	-4.888	< .001
Size	.061***	3.887	< .001
Debt Ratio	-.019	-1.007	.316
Growth	.008***	6.359	< .001
Art	-.001**	-2.189	.030
Fcf	5.483E-12	0.728	.468
Firm Effect	Yes	Yes	
R Square	.660		
Adjusted R Square	.578		

Note. \*\*\*  $p < .01$ , \*\*  $p < .05$ , and \*  $p < .10$

In the ROA regression model, the Adjusted  $R$ -Square value of .578 indicated that 57.8% of the variability in ROA in Model 1 was explained by the COVID-19 independent variable. The coefficient for COVID-19 was -.032 with  $p$ -value of < .001, indicating a statistically significant negative relationship between COVID-19 and ROA. This suggests that the COVID-19 pandemic had harmful effects on ROA and reduced overall profitability. Additionally, a positive relationship was seen between the control variable SIZE and ROA. The coefficient for Size was .061 with  $p$ -value < .001, meaning that larger companies tended to have higher earnings on assets. The Debt Ratio (coefficient of -.019, and a  $p$ -value of .316), showed no significant effect on ROA. On the other hand, the Growth coefficient value of .008 with  $p$ -value of < .001 indicated a positive and significant relationship between Growth and ROA, which implied that when companies experienced higher growth, this contributed to higher return on assets. The coefficient for ART was -.001 with a  $p$ -value of .030, illustrating a significant negative relationship between ART and ROA. This suggested that companies with lower accounts receivable turnover tended to have higher return on assets.

In Table 5, regression results for return on equity (ROE), or Model 2, are shown. In the ROE regression model, the Adjusted  $R$ -Square value of .229 indicated that 22.9% of the variability in ROE in Model 2 was explained by the COVID-19 independent variable. The coefficient for COVID-19 was -.067 with a  $p$ -value of 0.012, indicating a statistically significant negative relationship between COVID-19 and ROE. The COVID-19 pandemic had a detrimental effect on ROE and reduced overall profitability. The coefficient for Size was .177 with a  $p$ -value of .005, indicating a significant positive relationship between Size and ROE. This suggested that the larger-sized companies in the sample tended to have higher returns on equity. There was also a significant positive relationship between Debt Ratio and ROE, with a coefficient value of .336 and a  $p$ -value of < .001. This suggested that firms

with higher total debt over assets tended to have higher returns on equity. The coefficients for Growth, ART and FCF were not statistically significant to ROE, as their  $p$ -values were all more than .10.

**Table 5** Regression Model 2 (ROE)

	Coefficient	<i>t</i>	Significance
(Constant)	-1.861***	-2.927	.004
Covid-19	-.067**	-2.532	.012
Size	.177***	2.835	.005
Debt Ratio	.336***	4.367	< .001
Growth	.008	1.633	.104
Art	6.327E-5	0.058	.954
Fcf	1.973E-11	0.656	.513
Firm Effect	Yes	Yes	
<i>R</i> Square	.379		
Adjusted <i>R</i> Square	.229		

Note. \*\*\*  $p < .01$ , \*\*  $p < .05$ , and \*  $p < .10$

All things considered, the regression analysis suggested that the presence of COVID-19, Size, Growth and ART significantly influenced Return on Assets (ROA). It also suggested that the presence of COVID-19, Size, and Debt Ratio significantly influenced Return on Equity (ROE), while other variables such as Growth, ART, and FCF did not have significant effects on ROE.

## Discussion

This study delved into the financial performance of listed RMG companies in Bangladesh amidst the COVID-19 pandemic. The findings underscored the significant negative impact of COVID-19 on firm profitability. These results were aligned with similar conclusions of other researchers (Daryanto & Rizki, 2021; Demirhan & Sakin, 2021; Rababah et al., 2020). However, a few studies showed opposite results. For example, Devi et al. (2020) discovered that the consumer goods sector experienced an increase in financial performance during COVID-19. Febriantika et al. (2021) found that profitability improved during COVID-19 when examining 108 listed manufacturing companies in Indonesia. The consistency and contrast in findings across studies enhances the understanding of the pandemic's impact on financial performance in different sectors and regions. Other factors like sustainable business models and long term corporate social responsibility strategies might enhance firms' ability to go through such crises (Mattera et al., 2022).

Moreover, firm Size, Debt Ratio, Growth rate, and accounts receivable turnover emerge as pivotal factors influencing financial performance, indicating the complex interplay of many variables during crisis periods. These findings provide significant implications for managers and administrators in Bangladesh's RMG sector, particularly in light of the COVID-19 pandemic. In response to the unprecedented challenges posed by the pandemic, RMG companies must prioritize cost optimization strategies and implement measures such as linear programming to enhance resource utilization and profitability. Additionally, developing comprehensive strategies for asset utilization and debt management is crucial to navigating the adverse effects of COVID-19. Proactive debt management, including refinancing existing debts and diversifying revenue streams beyond traditional textile products, could contribute to sustainable financial health and resilience in the face of economic uncertainties. Policymakers, academics, stakeholders, and investors are encouraged to support initiatives that promote diversification, innovation, and effective debt management within the RMG sector to ensure long-term success and resilience.

## Conclusion

### Summary of the Study

This research study investigated the financial performance of the ready-made garment industry in Bangladesh amidst the COVID-19 pandemic, utilizing data from 33 RMG firms listed on the Bangladesh Stock Exchange from 2016 to 2021. The analysis revealed a significant downturn in financial health during the pandemic, with companies experiencing reduced ROA and ROE. Interestingly, larger companies appeared to fare better financially, possibly due to their greater resources or other advantages. Overall, the findings underscored the need for RMG companies to adapt their strategies in response to the pandemic's financial challenges in order to remain resilient.

### Limitations of the Study

While this research offers valuable insights into the financial performance of the RMG industry in Bangladesh during the COVID-19 pandemic, it has several limitations. The data was limited to 33 listed RMG firms, which may not fully represent the entire sector of 56 companies. The study mainly focuses on ROE and ROA, neglecting other important financial aspects like liquidity and cost efficiency. The timeframe from 2016 to 2021 may not have fully captured the pandemic's prolonged impact, and potential confounding variables were not accounted for. Despite these constraints, the findings provide useful insights for stakeholders and policymakers and lay the groundwork for future research.

### Directions for Future Research

Future research in the RMG industry in Bangladesh should address several key limitations identified in this study. Expanding the sample size to include a more diverse range of companies within the RMG sector would mitigate potential biases and provide a broader perspective on financial performance. Additionally, incorporating a wider range of financial indicators beyond ROA and ROE, such as working capital management, could offer a more comprehensive assessment. Longitudinal analyses extending beyond the study period would capture the evolving impact of the pandemic on financial performance over time. Moreover, future studies could explore a broader range of variables, including government policies, market conditions, and consumer behavior, to better understand the complex interplay between external influences and financial outcomes.

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## Influence of the Technology Acceptance Model on Customer Engagement: The Case of a Travel Booking Mobile Application in China

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### Abstract

This study based on the Technology Acceptance Model (TAM) investigated the influence of mobile application attributes on customer engagement with travel booking apps in China. Data were collected from 453 Chinese users of travel booking apps through an online questionnaire; descriptive statistics and structural equation modeling were used to analyze the data. The results showed that mobile app attributes such as perceived usefulness ( $\beta = .193, p < .001$ ), relative price advantage ( $\beta = .253, p < .001$ ) and interface design ( $\beta = .225, p < .001$ ) had a positive influence on consumer engagement with the travel app. Furthermore, app attributes including perceived usefulness ( $\beta = .246, p < .001$ ), perceived ease of use ( $\beta = .245, p < .001$ ), relative price advantage ( $\beta = .281, p < .001$ ) and interface design ( $\beta = .209, p < .001$ ) were positively and significantly associated with satisfaction. In addition, satisfaction ( $\beta = .204, p < .001$ ) was found to positively influence customer engagement with the travel booking app. Finally, satisfaction played a mediating role in the relationship between app attributes and customer engagement. This study contributes to the TAM and travel booking application literature.

**Keywords:** *Customer engagement, satisfaction, TAM, attributes booking app*

### Introduction

With the advent and widespread adoption of mobile access to the Internet, the tourism sector has undergone significant transformations. Mobile access to the Internet, unrestricted by time and space, aligns naturally with the tourism industry. Travel applications (apps) offer considerable convenience to travelers, particularly for independent explorers. By simply downloading necessary travel apps onto their smartphones, tourists can access a range of services without constraints of time or location.

Travel booking apps offer a comprehensive suite of services and benefits that enhance the travel experience for users. From ease of booking, convenient access to deals (Davis, 1989; Venkatesh & Davis, 2000), relative price advantages, a visually appealing interface design (Cyr et al., 2006), and real-time updates (Wang et al., 2012), these applications provide invaluable assistance to travelers, making their journeys more enjoyable and stress-free. These apps cater to diverse travel needs, including pre-trip activities such as booking travel products and planning itineraries, seeking destination information during travels, and sharing travel experiences online post-trip. Due to these advantages, tourism apps have gained favor among travelers. By December 2023, China's online travel booking penetration rate reached 46.6%, with 509 million Internet users (Blazyte, 2024). Consequently, major players in the tourism industry have commenced launching various travel apps to capture this market.

However, amidst intensifying competition in China's mobile Internet sector, the cost of customer acquisition for online travel firms is escalating, making it challenging to solely rely on aggressive subsidies to rapidly expand user numbers. Generally, acquiring new customers proves costlier than retaining existing ones. Hence, online travel companies focus on retaining their current user bases while enhancing user engagement and purchase frequency. With the expansion of WeChat's public platform functionalities, many travel-oriented platforms now feature booking capabilities, diverting some users away from dedicated travel booking apps. Additionally, WeChat introduced "mini programs" in 2016 which do not require downloads and are easily accessible, gaining widespread popularity. Following WeChat's lead, competitors like Baidu and Alipay also introduced similar mini programs, triggering a surge in similar tourism mini programs. As a result, some users have uninstalled travel booking apps in favor of these mini programs, further diverting users from dedicated apps. Despite offering additional sales channels for online tourism enterprises, WeChat public platforms and mini programs suffer from low retention rates and poor user experiences compared to dedicated apps



and cannot replace them. Overall, amidst the current macro and competitive environments, the focus for online travel companies lies in enhancing user retention and increasing purchase frequency.

Much current research on tourism apps centers on their conceptualization, classification (Wang & Xiang, 2012; Pan, 2017; Zhang et al., 2015), user behavior (Young & Hancer, 2014; Trakulmaykee & Benrit, 2015; Albayrak et al., 2021), influence on tourists' decision-making (Chuang, 2020), evaluation (Li, 2017), development, and design (Li, 2013; Dickinson et al., 2015; Han, 2016; Bu, 2019). While valuable, most studies predominantly focus on user behavior, overlooking crucial psychological aspects. Consumer engagement is a multifaceted concept that investigates how consumers emotionally, cognitively, and behaviorally interact with brands, products, or services. Thunderhead (2014) asserted that customer engagement, rooted in service marketing theory, fosters a value-driven, long-term relationship between customers and enterprises, enhancing emotional and behavioral investments and promoting interaction. Although some research has indicated that travel booking mobile apps attributes such as ease of use (Davis, 1989; Venkatesh & Davis, 2000), personalization (Kang & Kim, 2020), functionality (Chen & Tsai, 2019), user interface design (Cyr et al., 2006), content quality (Gretzel & Yoo, 2008), social interaction features (Ayeh et al., 2013), and security (Luo et al., 2010) play critical roles in enhancing customer engagement, few studies have examined the impact of price advantage on consumer engagement. Only a few studies have investigated potential mediating variables between travel booking app attributes and characteristics and customer engagement. To address this gap, this study explored how app attributes, including price advantage, influenced customer engagement in travel booking apps through the mediating variable of satisfaction, using the Technology Acceptance Model. This study aimed to address four research questions:

1. How do the attributes of mobile travel booking apps affect customer engagement?
2. How do these app attributes influence user satisfaction?
3. How does user satisfaction impact customer engagement?
4. Finally, does satisfaction mediate the relationship between mobile travel booking app attributes and customer engagement?

The findings may elucidate the mechanisms of customer engagement in travel booking apps, including the mediating effect of satisfaction, thereby contributing to academic understanding. Additionally, they may offer practical guidance for online travel enterprises and marketers to enhance app functionality, service quality, customer satisfaction, user retention, and repurchase rates.

## **Literature Review**

### ***Technology Acceptance Model (TAM)***

The Technology Acceptance Model, developed by Davis in 1986, is grounded in the notion that our perceptions of technology are shaped by two fundamental elements: perceived usefulness, and perceived ease of use. Perceived usefulness pertains to people's belief in how much a technology can enhance performance or help people achieve their objectives, whereas perceived ease of use relates to the perception of how effortless and straightforward it is to use the technology. According to TAM, these two factors serve as the primary influencers of users' intention to adopt a technology, which subsequently predicts actual usage behavior. Put simply, if people perceive a technology as both useful and easy to use, they would be more inclined to adopt and utilize it.

### ***Travel Booking App Attributes***

Tian et al. (2021) defined a travel booking app as a digital application enabling users to access tourism-related information and seamlessly book tourism products or services such as hotels, air tickets, and scenic area admissions via mobile phones, tablets, or electronic devices. Building on the TAM, Wu (2014) investigated determinants of acceptance behavior towards mobile apps for self-guided tours, finding that perceived interaction, perceived ease of use, perceived usefulness, and subjective norms significantly influenced behavioral willingness. Support conditions and perceived ease of use directly impacted behavior, with behavioral willingness acting as a mediator. Xu and Li (2016) highlighted advantages of travel booking apps, including cost savings, time efficiency, and

convenience; price was a crucial determinant of user behavior. Moreover, Dix et al. (2004) emphasized the significance of designs that are intuitive, aesthetically pleasing, and conducive to fostering user engagement. Thus, this study posits that travel booking apps attributes encompass four key factors: perceived usefulness, perceived ease of use, relative price advantage, and user interface design.

### ***App Attributes and Travel Booking App Customer Engagement***

Gui (2016) developed a model to examine factors influencing users' willingness to continue using tourism apps, revealing a significant positive impact of perceived usefulness on continuous usage intentions. Zheng (2018) also explored continuous usage intentions of travel booking apps and found a significant positive relationship between perceived usefulness and users' willingness to continue usage. Han et al. (2018) studied customer engagement in travel virtual communities, finding that perceived usefulness positively influenced cognitive and emotional engagement. Likewise, Huang (2019) observed a significant positive effect of perceived usefulness on cognitive and emotional engagement in tourism virtual communities. From these analyses, clearly perceived usefulness plays a crucial role in influencing travel booking app customers. Thus, the following hypothesis was examined:

*H<sub>1a</sub>*: Perceived usefulness has a significant positive effect on customer engagement with travel booking apps.

Perceived ease of use refers to the user's perception of how easy it is to comprehend and operate a technology, reflecting the level of effort required to learn it (Davis, 1989). In this study, perceived ease of use is defined as the user's perception of the ease of using a travel booking app. Complexity in usage increases the difficulty for users, leading to a less satisfactory experience and hindering ease of use (Huang et al., 2012). According to Davis's TAM (1989), empirical research has shown that perceived ease of use influences users' attitudes and behavioral intentions towards using a technology. Gui (2016) and Zheng (2018) both found a significant positive impact of perceived ease of use on users' intentions to continue using travel booking apps. Based on these findings, perceived ease of use influences the attitudes and intentions of tourism app users. Thus, the following hypothesis was examined:

*H<sub>1b</sub>*: Perceived ease of use has a significant positive effect on customer engagement with travel booking apps.

Amaro and Duarte (2015) investigated how compatibility, complexity, and relative advantage influence consumers' purchases of online travel products. Relative advantage, complexity, and compatibility significantly and positively affected perceived attitudes, while relative advantage and compatibility positively influenced consumers' purchase intentions. Kang et al. (2015) examined the impact of perceived innovation features on users' intentions to download and use apps, focusing on compatibility, complexity, and relative advantage. They discovered that perceived interactivity and compatibility within relative advantage had a significant positive impact on user involvement, which positively influenced users' intentions to download and use apps. Furthermore, Xu and Li (2016) identified money-saving, time-saving, and convenience as relative advantages of travel booking apps. They determined that relative price advantage significantly and positively impacted users' attitudes and usage behavior towards travel booking apps. Thus, the following hypothesis was examined:

*H<sub>1c</sub>*: Relative price advantage has a significant positive effect on customer engagement with travel booking apps.

User interface design involves an app's visual layout, aesthetics, and interactive elements. A well-designed interface can captivate users, enhancing their interaction with the app. Aesthetically pleasing and intuitively designed interfaces may lead to higher engagement levels (Nielsen, 1993). Cyr et al. (2006) demonstrated that a visually appealing and user-friendly interface significantly improved user satisfaction and engagement. Tuch et al. (2012) stressed that interface design and aesthetics play a crucial role in enhancing user engagement with travel apps. Thus, the following hypothesis was tested:

*H<sub>1d</sub>*: Interface design has a significant positive effect on customer engagement with travel booking apps.

### ***App Attributes and Satisfaction***

According to TAM, users' attitudes toward a technology are influenced by perceived usefulness and perceived ease of use (Davis, 1989). Since satisfaction reflects users' attitudes toward using travel booking app products and services, perceived usefulness and perceived ease of use may impact satisfaction. Gui (2016) investigated the continuous usage behavior of travel app users and found a significant positive effect of perceived usefulness and perceived ease of use on user satisfaction. Similarly, Zheng (2018) examined factors influencing willingness to use travel booking apps from a user experience perspective, revealing that perceived usefulness and perceived ease of use significantly and positively impacted satisfaction. Lee and Kim (2018) analyzed factors driving user intentions to continue using travel booking apps, using Ctrip as an example, and identified perceived usefulness and perceived ease of use as significant drivers of continued usage. Thus, perceived usefulness and perceived ease of use may influence user satisfaction. Johnesue et al. (2019) explored factors influencing users' intentions to continue using a travel booking app (Ctrip), and highlighted economic factors as important determinants of user satisfaction. Consequently, perceived price advantage may also affect user satisfaction. Moreover, Tuch et al. (2012) investigated the impact of visual complexity and prototypicality on user perceptions of website design, highlighting the importance of aesthetics in shaping user satisfaction. Thus, the following research hypotheses were examined:

*H<sub>2a-2d</sub>*: App attributes (perceived usefulness, perceived ease of use, relative price advantage and user interface design) have a significant positive effect on satisfaction.

### ***Satisfaction and Travel Booking App Customer Engagement***

Satisfaction serves as a crucial indicator of relationship quality (Smith, 1998), with higher satisfaction levels indicating a stronger user-platform relationship quality. Additionally, customer engagement reflects the robustness of the user-platform relationship (Vivek, 2009). Hollebeek (2011) contended that relationship quality plays a pivotal role in shaping customer engagement, suggesting that enhancing satisfaction contributes to the establishment of engaged customer relationships. Van Doorn (2010) emphasized the significance of satisfaction in influencing customer engagement, while Shao et al. (2014) identified satisfaction as a key driver of customer engagement behavior. Therefore, the following research hypothesis is examined:

*H<sub>3</sub>*: Satisfaction has a significant positive effect on customer engagement with travel booking apps.

### ***The Mediating Role of Satisfaction***

Mehrabian and Russell (1974) proposed the Stimulus-Organism-Response (S-O-R) Theory, which suggests that external stimuli prompt psychological responses within individuals, leading to behavioral reactions. In the context of travel booking apps, app properties serve as external stimuli, eliciting cognitive and emotional responses within users, which in turn influence their behavioral responses such as engagement or avoidance. These app properties impact users' internal states, particularly satisfaction levels, thereby affecting their perception of the travel booking category. Consequently, app attributes as external stimuli affect users' satisfaction, which subsequently influences the alignment of users with travel booking apps. Thus, the following hypotheses were examined:

*H<sub>4a-4d</sub>*: Satisfaction mediates the effect of app attributes (perceived usefulness, perceived ease of use, relative price advantage, and user interface design) on customer engagement with travel booking apps.

## **Research Methodology**

### ***Population and Sample***

The sample group comprised of Chinese users aged 18 or above who had utilized a travel booking app within the past year. An e-questionnaire link was disseminated via the "WeChat" app, the world's largest standalone mobile app, and potential respondents were furnished with a QR code to access the questionnaire. Due to unknown population size, the sample size was determined using the Cochran formula with a margin of error of .05, resulting in a sample size of 385 (Cochrane, 1977). Data were collected from a total of 478 respondents. Among these, 25 questionnaires from respondents were

deemed unreliable (e.g., giving the same answers to all questions) and were subsequently excluded from the analysis. Consequently, 453 valid questionnaires were utilized for data analysis, surpassing the minimum required sample size.

### **Measurement**

The research instrument was developed based on a comprehensive literature review, incorporating measures from relevant studies. All items were assessed using a five-point Likert scale. The perceived usefulness construct was evaluated using a scale adapted from Gui (2016) and Pan (2017b), comprising four items. Perceived ease of use was measured using a scale adapted from Tian (2020), consisting of three items. Relative price advantage was assessed using three items adapted from studies by Amaro and Duarte (2015). Interface design was examined using four items adapted from studies by Lewis (2002) Laugwitz et al. (2008), and Chin et al. (1988). Satisfaction was measured using a scale from Pan (2017a) comprising three items. Lastly, customer engagement was evaluated using instruments from Razmus (2021), encompassing six items.

### **Data Collection and Analysis**

The questionnaire and QR code were distributed to Chinese users who had utilized a travel booking app within the past year via the WeChat application. Upon completion of the questionnaire, participants were encouraged to share the survey with other Chinese users who met the specified criteria. This snowball sampling approach was employed to broaden the sample pool. Data collection commenced in March 2024. As the respondents were Chinese, the questionnaire was crafted in Chinese. To ensure the feasibility and accuracy of the Chinese version, a back-translation method was utilized. An Item Objective Congruence test and Cronbach's alpha were conducted using data from 30 respondents as a pilot test. The Cronbach's alpha values for each variable surpassed the minimum requirement of .70, and the IOC values for each variable exceeded .50. These findings suggested that the questionnaire demonstrated good reliability and validity during the pilot test.

After collecting data, the first step involved inspecting the demographic data using descriptive statistics. Subsequently, the measurement model was analyzed, incorporating confirmatory factor analysis (CFA), which is essential for establishing validity and reliability (Schreiber et al., 2006). This was followed by structural equation modeling (SEM) analysis to test the hypotheses.

### **Research Findings**

#### **Descriptive Analysis**

Among the 453 respondents, over half (57.4%) of the total sample were female. The largest age group comprised individuals aged 18 to 30, accounting for 77.5% of the respondents. Furthermore, a significant majority (68.9%) had attained a Bachelor's degree. In terms of employment, more than half of the respondents were employed in the private sector (52.5%), followed by government sector officials (29.8%). Regarding monthly income, the majority of respondents fell within the range of RMB 3,001-5,000, representing 33.8% of the total sample.

#### **The Measurement Model**

Construct reliability of the measurement model was assessed using three criteria: Cronbach's Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE). Generally, for constructs to be considered reliable, CA and CR values should exceed .70, while the AVE value should be .50 or higher (Hair et al., 2017). As indicated in Table 1, the reliability assessments for the measurement model (CA, CR, and AVE) were found to be appropriate and met the specified criteria. The assessment of discriminant validity, depicted in Table 2, was conducted by comparing the square root of each AVE on the diagonal with the correlation coefficients (off-diagonal) for each construct within the corresponding rows (Fornell & Larcker, 1981). It was observed that the square root of AVE values exceeded the correlation matrix values, indicating that the variables under study could be considered acceptable for the measurement model, thus supporting discriminant validity (Hair et al., 2017).

The model fit indices suggest that the proposed model aligned well with the data based on the evaluation of key criteria. The summary of fit statistics for the measurement model were as follows:  $\chi^2/df = 2.614$ , RMSEA = .046, SRMR = .051, GFI = .932, AGFI = .902, CFI = .961, and TLI = .951. These values exceeded the threshold criteria for model fit indices as suggested by Hair et al. (2010).

**Table 1** Construct Reliability, Validity, and Factor Loadings

Construct	Item	Loadings	CR	AVE	CA
Perceived Usefulness (PU)	PU1	0.847	.903	.701	.902
	PU2	0.830			
	PU3	0.823			
	PU4	0.848			
Perceived Ease of Use (PEU)	PEU1	0.851	.880	.710	.879
	PEU2	0.830			
	PEU3	0.846			
Relative Price Advantage (RPA)	RPA1	0.858	.891	.732	.890
	RPA2	0.852			
	RPA3	0.857			
Interface Design (ID)	ID1	0.731	.913	.726	.912
	ID2	0.869			
	ID3	0.895			
	ID4	0.902			
Satisfaction (SAT)	SAT1	0.850	.886	.722	.885
	SAT2	0.843			
	SAT3	0.856			
Customer Engagement (CE)	CE1	0.855	.944	.739	.943
	CE2	0.813			
	CE3	0.870			
	CE4	0.883			
	CE5	0.871			
	CE6	0.863			

**Table 2** Discriminate Validity

Feature	AVE	PU	PEU	RPA	ID	SAT	CE
PU	.701	<b>.837</b>					
PEU	.710	.412	<b>.843</b>				
RPA	.732	.361	.396	<b>.856</b>			
ID	.726	.448	.426	.409	<b>.852</b>		
SAT	.722	.447	.346	.412	.446	<b>.850</b>	
CE	.739	.377	.498	.519	.578	.487	<b>.860</b>

Note. Diagonal numbers are AVE square root values

### Hypothesis Testing

The results of hypotheses testing, as illustrated in Table 3, indicated that app attributes such as perceived usefulness ( $\beta = .193, p < .001$ ), relative price advantage ( $\beta = .253, p < .001$ ) and interface design ( $\beta = .225, p < .001$ ) positively influenced consumers' engagement toward travel booking Apps. However, perceived ease of use ( $\beta = .129, p > .05$ ) shows no significant relationship with consumers' engagement. Therefore,  $H_{1a}$ ,  $H_{1c}$  and  $H_{1d}$  were supported, while  $H_{1b}$  was not supported. Furthermore, the findings suggested that app attributes, including perceived usefulness ( $\beta = .246, p < .001$ ), perceived ease of use ( $\beta = .245, p < .001$ ), relative price advantage ( $\beta = .281, p < .001$ ), and interface design ( $\beta = .209, p < .001$ ) were positively and significantly associated with satisfaction, supporting  $H_{2a}$ ,  $H_{2b}$ ,  $H_{2c}$  and  $H_{2d}$ . Lastly, satisfaction was found to positively influence customer engagement with in travel booking apps ( $\beta = .204, p < .001$ ). Hence,  $H_3$  was supported.

**Table 3 Results of Hypothesis Testing**

Hypothesis	Path	$\beta$	Ustd.	SE	CR	$p$	Result
H1a	PU→CE	.193	0.208	0.061	3.409	***	Accepted
H1b	PEU→CE	.129	0.132	0.074	1.784	.12	Rejected
H1c	RPA→CE	.253	0.261	0.058	4.503	***	Accepted
H1d	ID→CE	.225	0.228	0.061	3.732	***	Accepted
H2a	PU→SAT	.246	0.280	0.053	5.322	***	Accepted
H2b	PEU→SAT	.245	0.289	0.057	5.097	***	Accepted
H2c	RPA→SAT	.281	0.317	0.055	5.816	***	Accepted
H2d	ID→SAT	.209	0.233	0.069	3.385	***	Accepted
H3	SAT→CE	.204	0.223	0.050	4.440	***	Accepted

Code. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

### Testing of Mediating Effect

In this study, the mediating effect test was conducted using the Bootstrap method of SPSS 25.0 PROCESS, with a sample size of 5000 selected and a confidence interval set at 95%. Firstly, the indirect coefficient of satisfaction in the process of perceived usefulness influencing travel booking app customer engagement was 0.059, with a confidence interval of [0.028, 0.076]. Since the confidence interval does not include zero, it indicated that the mediating effect of satisfaction was significant, thereby supporting  $H_{4a}$ . Similarly, the indirect coefficients of satisfaction in the process of perceived ease of use, relative price advantage, interface design on the customer engagement were 0.051, 0.072 and 0.085, respectively, and the confidence interval of these three paths do not include zero, it indicated that the mediating effect of satisfaction was significant, supporting  $H_{4b}$ ,  $H_{4c}$  and  $H_{4d}$ .

**Table 4 Analysis of Mediating Effect**

Paths	Effect	Bootstrap 95% CI		Result
		Lower	Upper	
$H_{4a}$ : PU → SAT → CE	0.059	0.028	0.076	Supported
$H_{4b}$ : PEU → SAT → CE	0.051	0.027	0.085	Supported
$H_{4c}$ : RPA → SAT → CE	0.072	0.053	0.106	Supported
$H_{4d}$ : ID → SAT → CE	0.085	0.058	0.111	Supported

### Discussion

Based on TAM, this study elucidates the relationship between app attributes, satisfaction, and customer engagement of travel booking apps. The details are as follows:

Firstly, the direct effect of app attributes on travel booking app customer engagement is examined. It is found that perceived usefulness, relative price of app and interface design attributes significantly positively affect travel booking app customer engagement. The effect strength is highest for relative price advantage followed by interface design and perceived usefulness, while perceived ease of use does not significantly impact travel booking app customer engagement. Previous studies have also affirmed that perceived usefulness can influence customer engagement (Han et al., 2019; Mclean et al., 2018). The lack of significant impact of perceived ease of use on travel booking App customer engagement may be attributed to users' high proficiency in utilizing travel booking Apps due to prolonged usage. Additionally, the study results demonstrate that relative price advantage significantly positively influences travel booking app customer engagement, corroborating the importance of pricing in shaping users' attitudes and behaviors, consistent with Xu and Li's (2016) findings. Moreover, Interface design is found positive influence customer engagement, which is line with the research of Tuch et al. (2012). Secondly, satisfaction is found to have a significant positive effect on customer engagement. Customer satisfaction serves as a crucial precursor of customer engagement (Van Doorn et al., 2010; So et al., 2014; Shao et al., 2017), and this study's results corroborate the views of these scholars. Thirdly, the direct effect of App attributes on satisfaction is confirmed. Perceived usefulness, perceived ease of use, relative price advantage, and interface design of travel booking app attributes

all significantly positively impact satisfaction. This outcome aligns with the findings of Gui (2016), Zheng (2018), Lee and Kim (2018) and Tuch et al. (2012). Lastly, satisfaction mediates the relationship between perceived usefulness, perceived ease of use, and relative price advantage on travel booking app customer engagement, indicating that perceived usefulness, perceived ease of use, and relative price advantage indirectly influence travel booking app customer engagement through satisfaction.

### Implications

Firstly, enterprises should prioritize enhancing the ease of use of travel booking apps. While ease of use may not directly impact customer engagement in travel booking apps, it can indirectly influence it by affecting satisfaction. Therefore, it's imperative to improve the user-friendliness of travel booking apps. Simplifying the interface design, providing clear navigation, and avoiding unnecessary details can facilitate users in accessing travel information swiftly and effortlessly. Additionally, highlighting crucial information while minimizing clutter is crucial for user attention.

Secondly, enterprises should strive to improve the usefulness of travel booking apps. Given that perceived usefulness significantly influences customer engagement and indirectly impacts satisfaction, enhancing the functionality of travel apps is crucial. Regular user research and analysis can help in understanding user needs better, allowing companies to gradually enhance app functions to align with user requirements, especially focusing on features like instant search and booking functionalities.

Thirdly, firms should concentrate on cost-effective travel products and promotional strategies. Since relative price advantage significantly affects customer engagement and indirectly influences customer satisfaction, improving perception of product affordability is vital. Strengthening integration within the tourism product chain, offering cost-effective products, and implementing strategic online marketing, especially during peak tourism seasons, can attract users and enhance their engagement.

Lastly, enterprises should prioritize improving user satisfaction. Increasing customer service personnel during peak periods, establishing robust service remediation systems, actively addressing user complaints, and providing personalized and attentive services are essential strategies to enhance user satisfaction. By actively engaging with users, addressing their concerns, and providing exceptional service, travel booking app enterprises can foster trust and loyalty among users, ultimately enhancing customer engagement and loyalty.

### Conclusion

This study aimed to elucidate the influence of app attributes on customer engagement in travel booking apps, exploring factors affecting customer engagement from an enterprise perspective. By delving into the influence of app attributes and satisfaction on customer engagement with travel booking apps, this study not only elucidated the internal workings of customer engagement, but also enriched the theoretical framework of customer engagement. It holds significant implications for enhancing the service quality of online travel enterprises, fostering customer engagement and user stickiness among existing users, and thereby boosting repurchase and bolstering retention rates.

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## A Meta-Synthesis of Effective Practices and Outcomes in the Use of Manipulatives for Teaching Mathematics

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### Abstract

Use of manipulatives in mathematics classes has yielded compelling evidence of their value in improving several aspects of mathematics education. This report endeavored to gain a clearer picture of their benefits by using a meta-synthesis technique by integrating findings from 12 previous qualitative or mixed methods studies. They were evaluated using the Critical Appraisal Skills Programme and summarized using a PRISMA diagram. Content analysis identified five main themes: (a) activation of classroom engagement and participation, (b) building of confidence and motivation, (c) enhancement of mathematical proficiency, (d) availability and accessibility of varied resources as manipulative, and (e) teachers' competency and careful planning. A meta-theme that emerged was *Optimizing Mathematics Learning with Effective Classroom Resources through Manipulatives*. Thematic study revealed that strategically integrating manipulatives into classroom instruction has a favorable influence on student engagement, confidence, motivation, and mathematical ability. By incorporating manipulatives into mathematics instruction, educators may create inclusive, engaging, and dynamic learning environments that encourage deeper conceptual comprehension.

**Keywords:** *Mathematics, manipulatives, meta-synthesis, systematic review*

### Rationale

The use of various kinds of manipulatives has become integral to primary classroom instruction, as teachers recognize their positive effects on student learning (Agodu, 2016; Vizzi, 2016). Research studies have demonstrated that integrating manipulatives into math education provides students with valuable visual aids to grasp abstract mathematical concepts effectively (Sulistyaningsih et al., 2017; Monte, 2021). Mathematics is acknowledged as vital to development, contributing significantly to various economic sectors and prioritized on many national educational agendas. Despite Filipino students' proficiency in knowledge acquisition, there is a concerning trend of poor performance in sessions demanding higher-order thinking skills. Mathematics is thus an essential part of school curricula, fostering critical thinking skills necessary across various subjects (Angco, 2021).

Mathematics education, particularly at the primary and secondary levels, is undergoing substantial changes, making teaching both challenging and exciting (Bungao-Abarquez, 2020). These levels are crucial because they set the foundation for students' future mathematical learning and growth. New insights and the rapidly changing cultural landscape necessitate innovative approaches to mathematics education. The National Council of Teachers of Mathematics endorses the use of manipulatives, citing both learning theory and considerable classroom data. Manipulatives help students transition from concrete experiences to abstract reasoning, thereby facilitating a deeper understanding of mathematical principles. Karten and Murawski (2020) emphasized that these tools provide tangible representations that bridge theoretical arithmetic with real-world applications, enhancing students' comprehension and retention. Research indicates that employing manipulatives benefits students in various ways, including improved recall of learned concepts and problem-solving skills (Kabel et al., 2021).

Manipulatives are commonly used tools in mathematics teaching and learning, benefiting students in inclusive classrooms by addressing diverse learning needs and styles (Bouck & Park, 2018;

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Muammar & Suhartina, 2018). These tools include objects such as base-ten blocks, fraction circles, algebra tiles, and geometric solids. By providing physical representations of abstract concepts, manipulatives make mathematics more accessible (Carbonneau et al., 2020). By engaging students actively and fostering problem-solving skills, manipulatives cultivate critical thinking essential for independent learning (Liggett, 2017). Tjandra (2023) emphasized the benefits of manipulatives for students' grasp of mathematical ideas and active engagement in the learning process. Lange (2021) illustrated that manipulatives offer novel ways for students to interact with mathematical concepts, enriching their overall learning experience. Mathematics education, as Angco (2021) pointed out, involves more than rote calculations and formulas; it encompasses investigation, experimentation, and the development of problem-solving abilities essential at all educational levels. The purposeful use of manipulatives not only improves immediate learning outcomes, but also prepares children for lifelong mathematical thinking and application.

Hidayah et al. (2018) argued that employing manipulatives assists students to better observe and focus on their teacher. Because of the manipulatives, students' ability to think critically and memorize information increased. Their research study found that students were more enthusiastic to participate in learning activities, while other pupils stated that group learning and in-class demonstrations helped them better understand the material.

There is a dearth of studies conducted that synthesizes both teachers' and students' experiences using manipulatives in the classroom, particularly through meta-synthesis. The purpose of this study is to provide a thorough knowledge of how manipulatives are used in mathematics education. It integrates findings from various studies to examine how manipulatives impact student engagement, understanding, and retention of mathematical concepts. By synthesizing this information, the study seeks to offer evidence-based insights and practical recommendations for educators aiming to enhance their instructional practices through the effective use of manipulatives. Although new primary data is not presented in this paper, it offers valuable insights by combining findings from multiple sources, highlighting the overall effectiveness and benefits of manipulatives in education. This synthesis is crucial for understanding their broader impact and guiding future research and practice in the field.

## **Methodology**

### ***Design***

In this study, meta-synthesis was employed to integrate findings from several qualitative and mixed-methods studies. This meta-synthesis aims to provide a comprehensive understanding of the use of manipulatives in mathematics education by conducting a systematic review of previous studies and integrating qualitative research findings into their major themes.

### ***Search Strategy***

Relevant research studies published between 2020 and 2024 were downloaded and analyzed. The software employed two descriptors or keywords: "manipulatives" and "mathematics teaching." These keywords were chosen to extract relevant articles. The screened data was then organized and filtered using a flow diagram in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 principles. The Publish or Perish software was used to search Google Scholar, Semantic Scholar, Crossref, and OpenAlex for research on the use of manipulatives in mathematical education.

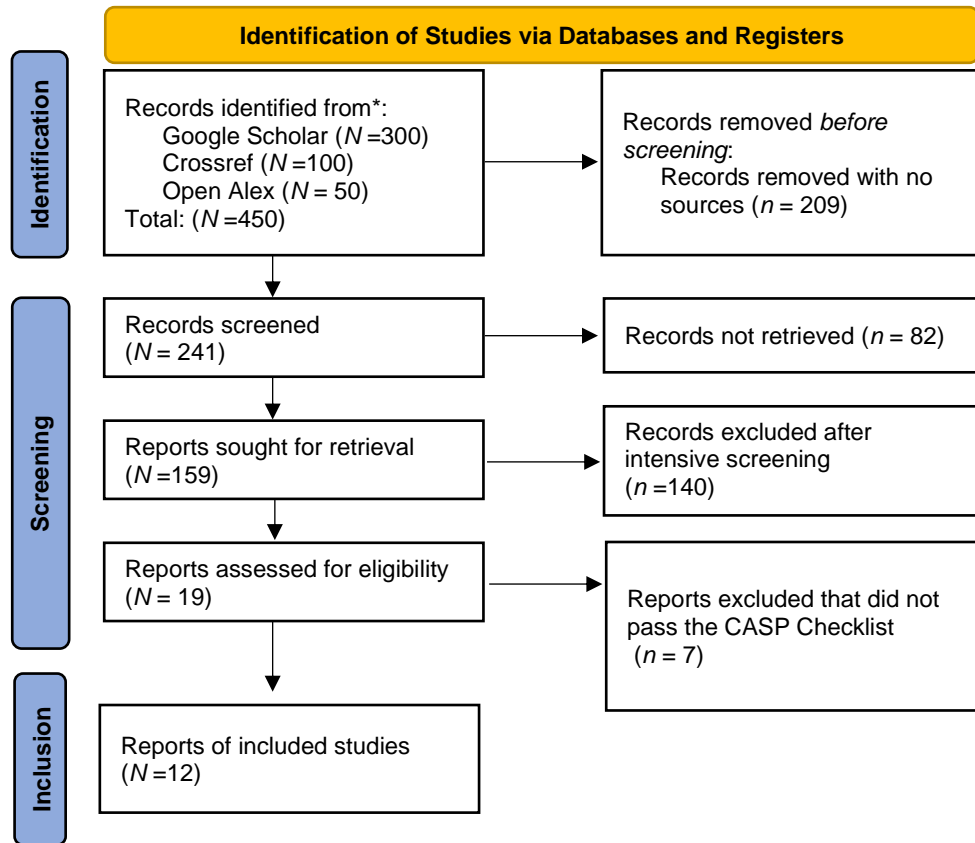
### ***Selection Criteria***

Selection criteria were adopted to guide the choice of articles for analysis; this was done in an effort to improve the quality and applicability of the themes that would emerge. Included studies were based on the following criteria: (a) the use of manipulatives, (b) utilization of qualitative or mixed-method designs, (c) written in English, (d) published between 2020 and 2024, and (e) meeting the

standards of the Critical Appraisal Skills Programme (CASP). Papers that met these criteria were then screened for inclusion.

The selection of research papers followed three stages using the PRISMA 2020 Flow Diagram: Identification, Screening, and Inclusion. During the Identification stage, 200 studies were found on Google Scholar, 100 studies on the Crossref database, and 50 studies on the OpenAlex database. A total of 450 studies were screened using the Publish or Perish software.

**Figure 1** Search Strategy Using PRISMA



**Table 1** Profile of Articles Selected about Use of Manipulatives in Teaching Mathematics

Seq. No.	Authors/Year	Setting	Nature	Initial Codes for the Use of Manipulatives
1	Chiphambo et al., 2020	South Africa	Mixed	<ul style="list-style-type: none"> <li>Enhance learners' mathematical proficiency</li> <li>Active participation; engaging</li> <li>Able to work as a team</li> </ul>
2	Maboya et al., 2020	Africa	Qualitative	<ul style="list-style-type: none"> <li>Need to improve teacher mathematical content mastery, pedagogical content knowledge</li> </ul>
3	Tan, 2020	Sydney, Australia	Qualitative	<ul style="list-style-type: none"> <li>Unsure of school expectations</li> <li>Engaging but distracting</li> <li>Educate teachers on how to use manipulatives</li> </ul>
4	Cole, 2020	London, England	Qualitative	<ul style="list-style-type: none"> <li>Builds confidence</li> <li>Manipulatives as a tool for sense-making</li> <li>Offered opportunities for active engagement with manipulatives</li> </ul>
5	Gresham, 2021	Florida, USA	Mixed	<ul style="list-style-type: none"> <li>Used physical manipulatives to teach mathematical concepts in elementary school could reduce math anxiety.</li> <li>Need math confidence in using manipulatives</li> </ul>

6	Schumacher, 2021	Not identified	Qualitative	<ul style="list-style-type: none"> <li>• Developed self-confidence</li> <li>• Deeper level thinking</li> <li>• Mathematical language evolves</li> </ul>
7	Quane, 2022	Australia	Mixed	<ul style="list-style-type: none"> <li>• Reluctant to use</li> <li>• Fosters positive attitude towards math</li> </ul>
8	Ünlü, 2022	Not identified	Mixed	<ul style="list-style-type: none"> <li>• Choosing of appropriate manipulatives</li> <li>• Should know when/how to use manipulatives</li> <li>• Feedback is important</li> </ul>
9	Butcher, 2023	Bahamas	Qualitative	<ul style="list-style-type: none"> <li>• Manipulatives can be beneficial or harmful, depends on how they are used in the classroom</li> <li>• Overreliance</li> <li>• Practice makes perfect</li> <li>• Grades get better when using manipulatives</li> </ul>
10	McMahon, 2023	Florida, USA	Qualitative	<ul style="list-style-type: none"> <li>• Improved confidence in math</li> <li>• Increased performance</li> </ul>
11	Tjandra, 2023	Jakarta, Indonesia	Mixed	<ul style="list-style-type: none"> <li>• Effectively supports students with diverse needs</li> <li>• A need to provide sufficient resources</li> <li>• Training on usage of manipulatives effectively</li> </ul>
12	Jagnandan & Jagnandan, 2024	Georgetown, Guyana	Mixed	<ul style="list-style-type: none"> <li>• Positive mindset</li> <li>• Eagerness</li> <li>• Motivated</li> </ul>

Content analysis of the 12 studies about use of manipulatives in mathematics instruction was conducted to generate initial codes. Table 1 presents a profile these studies' titles, origin, and accompanying authors, as well as the codes that were generated and utilized for thematic analysis. This study synthesizes current knowledge to provide evidence-based insights and useful recommendations for educators, even if no new primary data is presented.

## Results and Discussion

Table 1 displays the codes generated that were used in the search for themes. These general codes were analyzed and categorized, resulting in five themes and one meta-theme. The identified themes are: (a) activation of classroom engagement and participation, (b) building confidence and motivation, (c) enhancement of mathematical proficiency, (d) availability and accessibility of varied resources/manipulatives, and (e) teacher competency and careful planning.

### *Success Using Manipulatives in Teaching Mathematics*

This section highlights positive and successful experiences of using manipulatives in teaching mathematics. The themes discussed under this category are as follows:

#### *Theme 1: Activation of Classroom Engagement and Participation*

To make mathematics more engaging and entertaining for students, teachers must physically engage students in hands-on activities (Allen, 2007). Engaging students in learning is a challenging task that requires collaboration between teachers and students to prevent disengagement and maintain interest. Wong et al. (2022) defined learning engagement as comprising active participation in educational activities, emotional support, and effective communication with both peers and educators.

The effective use of manipulatives, combined with engagement and problem-solving, can help students understand abstract mathematical concepts (Monte, 2021). Manipulatives allow students to interact with mathematics at a deeper level, promoting hands-on learning, discussion, and cooperation. Studies have found that manipulatives can be an effective educational tool for problem-solving exercises, with results showing improved student motivation, involvement, and excitement throughout the learning process (Kwon & Capraro, 2023).

The increased use of manipulatives in the classroom has greatly enhanced engagement and involvement by translating abstract concepts into real experiences, especially for students who find mathematics challenging. Golafshani (2013) noted that manipulatives helped differentiate instruction, respond to different learning styles, and promote deeper conceptual knowledge. This hands-on approach not only makes learning more interactive and dynamic, but also encourages collaborative learning, enhancing students' communication and teamwork abilities. The positive influence on student motivation and instructor enthusiasm fosters a dynamic classroom atmosphere that promotes active learning and inclusive education.

Moreover, manipulatives provide a tangible connection to mathematical concepts, helping students visualize and internalize notions that might otherwise be abstract and difficult to grasp. This connection supports a more comprehensive understanding and better retention of material. By incorporating manipulatives into their teaching strategies, educators can create an environment where students are more likely to participate actively and maintain sustained interest in the class. Therefore, they are a crucial tool in making mathematics accessible, engaging, and enjoyable, ultimately leading to a more productive and inclusive educational experience.

### *Theme 2: Building of Confidence and Motivation*

Teachers' attitudes towards manipulatives in the classroom are linked to their perceptions of the effectiveness of these tools in helping students learn. According to research, teachers who employ manipulatives in the classroom have higher levels of confidence, which leads to less anxiety about mathematics (Vinson 2001). This confidence can be conveyed to students, resulting in an improved learning atmosphere.

Motivation is a powerful force in academic achievement (Unamba & Njoku, 2023). Goracke (2009) found that using manipulatives significantly boosted student attitudes towards math lessons. As students gained confidence in their understanding of the content, their attitudes towards math improved. Additional research has indicated that pupils become more engaged and motivated to learn when manipulatives are used effectively. This engagement is crucial for fostering a positive learning experience.

Using manipulatives in mathematics lessons can lead to a positive attitude towards the subject. Studies by Enki (2014), Gürbüz (2007), and Yağcı (2010) supported this view, showing that students developed a more favorable attitude towards math when manipulatives were part of the instruction. These tools help demystify complex concepts, making them more accessible and less intimidating, which in turn boosts student confidence.

Manipulatives not only enhance understanding but also contribute to a sense of accomplishment. As students successfully manipulate and solve problems with these tools, they build self-assurance in their mathematical abilities. This increased confidence can translate to greater motivation and persistence in tackling challenging problems, further reinforcing a positive cycle of learning and achievement. Moreover, when students see tangible progress through their use of manipulatives, their intrinsic motivation increased. They are more likely to participate actively in class, take on more complex tasks, and exhibit a sustained interest in mathematics. This positive feedback loop, where confidence builds motivation and motivation fosters further confidence, is essential for long-term academic success.

Finally, the strategic use of manipulatives in the mathematics classroom not only supports conceptual understanding but also plays a crucial role in building student confidence and motivation. This holistic approach to teaching mathematics can lead to more enthusiastic attitudes towards learning and improved student outcomes.

### *Theme 3: Enhancement of Mathematical Proficiency*

The strategic use of manipulatives in the classroom significantly enhances mathematical aptitude. Tools such as blocks, counters, and geometric shapes serve as powerful instruments for transforming abstract mathematical concepts into concrete, participatory experiences. Teachers use these hands-

on resources to create an engaging and accessible environment that caters to diverse learning styles and promotes a deeper comprehension of the concepts. This not only improves students' problem-solving skills and conceptual understanding, but it also fosters a positive attitude toward mathematics, building a foundation for academic success and future application of mathematical skills.

Research supports the notion that manipulatives contribute to increased math achievement (Boggan et al., 2010). Liggett (2017) suggested that using mathematical manipulatives to solve problems can significantly improve students' learning and development. Furthermore, Allen (2007) found that students who used manipulatives demonstrated higher achievement levels, enhanced understanding, and developed a more favorable attitude towards mathematical concepts with which they had previously struggled.

Hidayah et al. (2018) discovered that including manipulatives with a topic, combined with some questions, significantly improved students' knowledge of the concept followed a predetermined written plan. This implied that strategically using manipulatives in lesson planning can lead to better learning results. Furthermore, Donovan and Alibali's (2021) research found that individuals who used manipulatives as mathematical tools had better scores than those who did not use them. This emphasizes the significance of viewing manipulatives as necessary rather than optional instruments for mathematical learning.

Finally, the utilization of manipulatives in mathematics instruction not only facilitated conceptual understanding, but also promoted higher levels of achievement, problem-solving skills, and positive attitudes towards the subject. By strategically incorporating manipulatives into lesson plans and instructional practices, educators can enhance students' mathematical proficiency and set them on a pathway towards academic success.

### ***Challenges and Limitations of Using Manipulatives in Teaching Mathematics***

This section highlights challenges experienced when utilizing manipulatives to teach mathematics. The following themes from this category are covered below.

#### ***Theme 4: Availability and Accessibility of Varied Manipulative Resources***

Ensuring the availability of necessary tools is essential for teachers to effectively support student learning, particularly in mathematics, where concepts can be abstract. Research highlights the utility of specific tools called manipulatives in this regard.

The availability of manipulatives is crucial for their utilization in classrooms. Teachers may face challenges in implementing manipulatives if these resources are not readily accessible. Agodu (2016) underscores this point, noting that teachers often resort to improvisation by using everyday materials such as buttons, spools, shapes, colors, and bean-sticks to create simple yet effective manipulative projects. This improvisation allows teachers to provide hands-on experiences despite resource constraints, emphasizing the importance of ingenuity in instructional practices.

Furthermore, Gaylo and Dales (2017) underline the need of teachers to use a variety of instructional methods and approaches to improve students' learning outcomes, particularly when dealing with low accomplishment in mathematics. This includes using a variety of manipulative resources to accommodate different learning styles and promote deeper knowledge of mathematical ideas.

Educators may create a more inclusive and engaging learning environment that meets the requirements of various learners and promotes mathematical proficiency by guaranteeing the availability and accessibility of a variety of manipulative resources. This emphasizes the significance of resource management and novel teaching practices in supporting effective mathematics instruction.

#### ***Theme 5: Teachers' Competency and Careful Planning***

The effective utilization of manipulatives in the classroom demands careful planning and competency from teachers. While manipulatives offer immense benefits to students, it is crucial that they are used correctly to facilitate meaningful learning experiences. Learners must not only engage



with manipulatives but also comprehend the mathematical concepts being taught (Unamba & Njoku, 2023). Selecting appropriate math manipulatives tailored to students' needs and aligned with the goals of mathematical programs is paramount (Boggan et al., 2010).

Maboya (2014) defines manipulatives as tangible or visual objects explicitly designed to represent mathematical ideas, concepts, or techniques. The decision to incorporate manipulatives in primary school mathematics classrooms, and the manner in which they are used, depends on various factors including teachers' expertise in mathematics, their perceptions of classroom practice, and the perceived importance of manipulatives. Teachers play a pivotal role in effectively utilizing manipulatives to facilitate students' understanding of mathematical concepts (Hidayah et al., 2018). However, the utilization of manipulatives may be hindered by common misconceptions among mathematics teachers.

Teacher professional development emerges as a critical component when assessing the correct use of manipulatives during instruction. The level of instructional support provided by teachers, when utilizing manipulatives, significantly impacts student learning and math achievement. Research suggests that high levels of instructional assistance are more effective than low levels when incorporating manipulatives into instruction (Laski et al., 2015). Active mentoring of students allows for error correction, detailed explanations, and constructive feedback. It is imperative for teachers to explicitly elucidate the relationship between a manipulative and a mathematical concept, especially for young learners who may struggle to make connections without explicit guidance.

Teachers' competency and careful planning are indispensable for the effective integration of manipulatives into mathematics instruction. By prioritizing professional development and employing instructional strategies that promote meaningful engagement with manipulatives, educators can harness the full potential of these tools to enhance students' mathematical understanding and achievement.

### ***Meta-Theme: Optimizing Math Learning with Effective Classroom Resources through Manipulatives***

The use of manipulatives in mathematics education is an effective method for improving learning by offering tangible and interactive resources that aid conceptual understanding. Manipulatives such as blocks, counters, and geometric shapes provide children with a hands-on method to exploring abstract mathematical topics, bridging the gap between tangible and abstract reasoning. This practical engagement helps students build a deeper understanding of mathematical ideas since they can physically manipulate objects to envision and solve difficulties. By introducing manipulatives into classroom education, educators may create an engaging and dynamic learning environment that accommodates different learning styles and encourages active involvement.

The incorporation of manipulatives into mathematics classrooms is a critical meta-theme for improving learning outcomes through effective classroom tools. Manipulatives promote conceptual understanding, problem-solving abilities, and differentiated instruction by turning abstract concepts into tangibles and allowing for interactive investigation. As educators look for new ways to improve mathematics education, manipulatives emerge as an indispensable resource that may revolutionize the learning experience, making mathematics more engaging, accessible, and pleasant for students of all ages.

### **Conclusion and Recommendations**

This meta-synthesis of studies on the use of manipulatives in mathematics education found persuasive evidence that they are effective in improving different areas of mathematical education. Thematic analysis revealed that strategically integrating manipulatives into classroom instruction has a favorable influence on student engagement, confidence, motivation, and mathematical ability. These findings highlight the value of using manipulatives as dynamic tools to bridge the gap between abstract mathematical notions and concrete, practical learning. It is recommended that educators prioritize the use of manipulatives in their teaching approaches in order to maximize mathematical learning. To achieve success, teachers may need professional development to improve their ability to

use manipulatives effectively and integrate them into well-planned lesson structures. Furthermore, efforts should be made to increase the availability and accessibility of a wide range of manipulative tools, allowing educators to meet the different requirements and learning styles of their pupils.

By incorporating manipulatives into mathematics instruction, educators may create inclusive, engaging, and dynamic learning environments that encourage deeper conceptual comprehension and academic performance. Finally, the results of this meta-synthesis show how beneficial manipulatives are when teaching mathematics. Further empirical studies involving primary data collection through classroom experiments and observations are nevertheless necessary. To further confirm the usefulness of manipulatives and investigate their potential uses in instructional strategies, future research studies should further test these findings in authentic learning environments. Such empirical research will help improve instructional tactics to optimize the benefits of manipulatives, and offer verifiable proof of their influence on student learning outcomes.

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### Conflict of Interest

The authors declare that they have no conflicts of interest related to this research. There has been no financial, personal, or professional involvement with any organization or entity that could be perceived to influence or bias the outcomes of this study.

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## Exploring the Potential of $k^n$ -Tree for Efficient Representation of $n$ -ary Relations

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### Abstract

The objective of this experimental study was to investigate the scalability of  $k^n$ -trees, a compact data structure designed for representing  $n$ -ary relations, compared to a baseline based on a plain representation of adjacency lists. A literature review of compact data structures was conducted, focusing on  $k^n$ -trees and their potential for efficient  $n$ -ary data representation. To assess scalability, experiments comparing  $k^n$ -tree performance against the baseline using set intersection as a benchmark were conducted. Results demonstrated superior  $k^n$ -tree scalability in terms of time and memory, especially for high-dimensional and clustered datasets. On average,  $k^n$ -trees were eight times faster and consumed 35 times less memory than the baseline. The study also analyzed the impact of the order parameter  $k$  on performance, revealing a trade-off between space efficiency and query time. This study provides valuable insights into the practical applicability of  $k^n$ -trees for managing and querying high-dimensional data.

**Keywords:** Compact data structures,  $k^n$ -tree,  $n$ -ary relations, scalability

### Introduction

The exponential growth of high-dimensional and multi-attribute data necessitates efficient data management solutions. Traditional data structures often incur significant memory overhead, hindering the scalability of processing and analysis. Compact data structures, which aim to minimize space while maintaining query efficiency, have emerged as a promising approach to tackle this challenge. The  $k^n$ -tree, a compact representation for  $n$ -ary relations, holds potential for modeling multi-dimensional data, particularly in scenarios where space efficiency is crucial.

Previous work has explored the  $k^2$ -tree, a specific case of the  $k^n$ -tree for 2-ary relations, but further investigation is needed to assess the scalability of  $k^n$ -trees for higher dimensions and varying data distributions. This research addresses this gap by delving into the scalability of  $k^n$ -trees, focusing on their performance in set intersection – a critical operation in data analysis. To evaluate the scalability of  $k^n$ -trees, a series of experiments were conducted comparing their performance against a baseline using a plain representation of adjacency lists. The set intersection operation served as a benchmark to assess the efficiency of both representations. The insights gleaned from these experiments shed light on the practical applicability of  $k^n$ -trees for managing and querying high-dimensional data in real-world scenarios.

### Literature Review

Compact data structures have emerged as a powerful paradigm for representing data with minimal space that makes them particularly valuable for handling the ever-growing amount of data. This section provides details on these data structures, dissecting their design, implementation basis, operations, and complexity. While not comprehensive, this review focuses on the foundational compact data structures found in the literature.

### Fixed-Size Arrays

The traditional approach of using a fixed-size array  $A$  with  $n$  elements encoded in  $w$  bits can be wasteful if the data requires less than  $w$  bits for representation. To address this problem, Navarro (2016) proposed determining the minimum number of bits, denoted by  $\ell$ , required to encode the elements in an array, where  $\ell \leq w$ . Then, the data can be packed within words of  $w$  bits.

The implementation utilizes a virtual bit array  $B$  that stores actual data elements, with a total size of  $\ell n$  bits to accommodate all elements of  $A$ . Each element in  $B$  is encoded using  $\ell$  bits. Additionally,

a word array  $W$  of integers of  $w$  bits is used, large enough to pack all encoded elements from  $B$ . The packing strategy utilizes bit-level operations. Individual elements in  $B$  are placed in  $W$ , starting from the most significant bit. The specific location within a word in  $W$  depends on the element's position  $j$  in  $B$ . The formula  $r = ((j - 1) \bmod w) + 1$  is used to calculate this starting position ( $r$ ) within a word in  $W$   $\left\lceil \frac{j}{w} \right\rceil$ .

This design allows for reading and writing individual elements. On the one hand, reading a bit at position  $j$  in  $B$  involves calculating the word index in  $W$  and performing bitwise operations to isolate the desired bit. On the other hand, reading a whole encoded integer within a single word in  $W$  requires calculating the chunk to be read, and performing bitwise operations to extract the relevant  $\ell$  bits. If the encoded integer spans two words in  $W$ , additional calculations are needed to handle bits across words. Writing a value involves clearing the existing data in  $W$  before writing the new value. The clearing process also utilizes bitwise operations and mechanisms to handle bits across words.

In summary, the space of a fixed size array is  $O\left(\left\lceil \frac{\ell n}{w} \right\rceil w\right)$ , and time for reading and writing is  $O(c)$ .

### Variable-Size Arrays

Variable size arrays (Raman et al., 2007) address the limitation of fixed size arrays by allowing elements to have different bit lengths in  $B$ . There are two main design approaches for variable size arrays. The first uses a separate array  $P$  to store the length information for each encoded element. Then,  $P$  is used to determine the starting and ending positions of elements within  $B$ . The other approach is using a strategy for self-describing length. This approach embeds the length information within the encoded element itself. This eliminates the need for a separate data structure for storing lengths. However, it might introduce some overhead for encoding/decoding lengths.

In both approaches, the element locations in  $B$  differ from fixed size arrays. Instead of fixed intervals, the starting position of  $A[i]$  depends on the sum of encoded lengths  $\ell$ , i.e.,  $\sum_{j=1}^{i-1} \ell_j$ . The implementation involves a main bit array  $B$ , and a pointer array  $P$ . The array  $B$  stores the actual encoded data elements, with each element  $i$  using variable bits  $\ell_i$ . The array  $P$  acts as an index of  $B$ .

There are two variations for  $P$ . The first one is implementing  $P$  as an array of sampled pointers. This approach partitions the array  $A$  into consecutive blocks of  $k$  elements. Then,  $P$  stores the starting position for each block in  $B$ . To access  $A[i]$ , the block that it belongs to is calculated and then the corresponding pointer in  $P$  is used to find the starting position in  $B$ . The last step is looking for the target element within that block. Additionally, if the encoding in  $B$  uses  $\gamma$ -coding (Elias, 1975), this property can be leveraged to efficiently skip to the desired element within a block by reading only the codeword headers. The other variation is implementing  $P$  along with another array  $P'$  of dense pointers (Ferragina & Venturini, 2007; Raman et al., 2007) to avoid the need for calculating the sum of preceding lengths during access.  $P'$  stores offsets within  $B$ , directly pointing to the starting position of each  $A[i]$ .

This design supports reading and writing individual elements. However, accessing requires additional computation to look up starting bits; this can be reduced by using dense pointers. In summary, for variable size array with sampled pointers and  $\gamma$ -coding, the time cost is  $O(k \lg(x))$ , where  $x$  is a  $\gamma$ -coded element. Its space cost is  $O(n \lg(w))$  bits, with  $k \cong \ln(2)$ . For variable size array with dense pointers, the time cost is  $O(c)$ , and space is  $O(n \lg(w))$ .

### Bitvectors

The bitvector (Jacobson, 1989) is a bit array designed to use space close to its zero-order empirical entropy, i.e.  $n\mathcal{H}_0(B)$  bits. It achieves this by dividing the bit array into blocks of size  $b$  and encoding them as a pair  $(c_i, o_i)$ , where  $c_i$  is the class (number of 1s) of the block, and  $o_i$  is the offset within  $c_i$  that identifies a specific permutation among what is allowed by  $c_i$ .

The implementation uses an array  $C$  for classes, and an array  $O$  for corresponding offsets. The lengths of the offsets are determined by the class and stored in an array  $L$ , where  $L[c]$  gives the number of bits needed to encode a class  $c$  offset.

The bitvector supports  $access(B, i)$  to retrieve the  $i$ -th bit in  $B$ ;  $rank(B, i)$  to count the number of occurrences of a specific bit (0 or 1) up to position  $i$ ; and,  $select(B, j)$  to find the position of the  $j$ -th occurrence of a specific bit (0 or 1).

The space is  $n\mathcal{H}_0(B) + \frac{n}{b}\lg(b) + O\left(\frac{n}{b}\right) + wb^2$  bits (Raman et al., 2007; Pagh, 2001), where  $n$  is the number of bits, and  $w$  is the word length. The worst-case time for all operations is  $O(b)$ , but it can be improved (Clark, 1997; Jacobson, 1989) by using precomputed tables for encoding and decoding. In practice, the  $O(b)$  time cost is often sufficient, as the block size  $b$  is typically chosen to be small.

### Wavelet Trees

Wavelet trees (Grossi et al., 2003) are designed to represent and query sequences over larger alphabets. They hierarchically decompose the alphabet, creating a binary tree structure where each node corresponds to a range of symbols. The tree's root represents the entire alphabet, and each leaf represents a single symbol. Internal nodes store bitvectors that indicate whether a symbol in the sequence belongs to the left or right half of the alphabet range at that level.

Wavelet trees support  $access(S, i)$  to retrieve the symbol at position  $i$  in the sequence  $S$ ;  $rank_c(S, i)$  to count the number of occurrences of symbol  $c$  up to position  $i$  by traversing the path from the root to the leaf of  $c$ , accumulating the counts from the bitvectors along the way; and,  $select_c(S, j)$  to find the position of the  $j$ -th occurrence of symbol  $c$  by traversing the tree from the leaf of  $c$  to the root, using the bitvectors to determine the position at each level.

The space cost is  $n \lg(\sigma) + o(n \lg(\sigma)) + O(\sigma w)$  bits, where  $n$  is the length of the sequence,  $\sigma$  is the alphabet size, and  $w$  is the word size. The  $o(n \lg(\sigma))$  term is on account of the extra space required for  $rank$  and  $select$ . The worst-case time complexity for all operations is  $O(\lg(\sigma))$ .

The wavelet tree can use compressed representations for the bitvectors, achieving space close to  $n\mathcal{H}_0(S)$ , while maintaining the same time cost (Barbay & Navarro, 2013; Golynski et al., 2008).

### Sequences

The sequence  $S[1, n]$  is designed as a generalization of bitvectors. It supports  $access$ ,  $rank$ , and  $select$  operations while minimizing space usage. Two primary approaches are employed. One uses a permutation-based representation (Golynski et al., 2006) along with bitvectors to achieve efficient operations. It is particularly suitable for large alphabets. The other uses wavelet trees (Grossi et al., 2003), enabling efficient operations through binary  $rank$  and  $select$  on bitvectors. When using permutation-based representation, the sequence is divided into chunks. Each one is represented using a permutation and a bitvector. The bitvectors store the frequency of each symbol within the chunk, while the permutation encodes symbols' order. This enables efficient  $rank$  and  $select$  operations within chunks.

When using wavelet trees, it recursively partitions the alphabet into halves, creating a binary tree structure. Each node is associated with a bitvector that indicates whether a symbol belongs to the left or right half at that level. This enables efficient operations on account of the structures used.

Both implementations support  $access(S, i)$  to retrieve the symbol at position  $i$  in the sequence;  $rank_c(S, i)$  to count the number of occurrences of symbol  $c$  up to position  $i$ ; and,  $select_c(S, j)$  to find the position of the  $j$ -th occurrence of symbol  $c$ .

In summary, for permutation-based representation, the space cost is  $n \lg(\sigma) + n o(\lg(\sigma))$  bits. The time cost (Grossi et al., 2010) is  $O(\lg(\lg(\sigma)))$  for  $access$ ,  $O(\lg(\lg(\sigma)))$  for  $rank$ , and  $O(c)$  for  $select$ . For a representation using wavelet trees, space using a plain approach is  $n \lg(\sigma) + o(n \lg(\sigma)) + O(\sigma w)$  bits, and  $n\mathcal{H}_0(S) + o(n \lg(\sigma)) + O(\sigma w)$  bits for a compressed approach (Barbay and Navarro, 2013). Time cost is  $O(\lg(\sigma))$  for  $access$ ,  $O(\lg(\sigma))$  for  $rank$ , and  $O(\lg(\sigma))$  for  $select$  both approaches. In practice, wavelet trees are often preferred for small to moderate alphabet sizes due to its lower space overhead. For larger alphabets, permutation-based representation can be more space-efficient, especially when combined with alphabet partitioning techniques.

### Level-Order Unary Degree Sequence (LOUDS)

The Level-Order Unary Degree Sequence (LOUDS) representation, first reported by Jacobson (1989) and implemented in Delpratt et al. (2006), is designed to encode the topology of an ordinal tree by using a bitvector to store the unary degree sequence of the tree in a level-wise order. The unary degree sequence is made of 1s followed by 0, where the number 1s are the number of children of a node.

The implementation uses a bitvector. The first two bits are set to 10, and then the tree is traversed in level-order, appending the unary degree sequence of each node to the bitvector. The bitvector results of  $n + 1$  0s (one 0 per node, plus the initial one), and  $n$  1s (one 1 per edge –  $n - 1$  –, plus the initial one). Therefore, the bitvector length is  $2n + 1$ .

LOUDS supports operations such as *root*( $v$ ) to retrieve the root of the tree; *isleaf*( $v$ ) that checks if a node  $v$  is a leaf; *parent*( $v$ ) that returns the parent of a node  $v$ ; *child*( $v, t$ ) that returns the  $t$ -th child of a node  $v$ ; *childrank*( $v$ ) that returns the *rank* of a node  $v$  among its siblings; *fchild*( $v$ ) and *lchild*( $v$ ) that return the first/last child of a node  $v$ ; and, *nsibling*( $v$ ) and *psibling*( $v$ ) that return the next/previous sibling of a node  $v$ .

The space cost is  $2n + 1$  bits. If the bitvector uses constant time *rank* and *select*, the time cost for all operations is constant (Clark, 1997), but using  $3.6n$  additional bits. If compressed counterparts are used,  $2.65n$  of extra bits are added only at expense of speed.

The cardinal variation of LOUDS is designed to represent cardinal trees, where each node has a fixed set of child types ( $\sigma$  in total), and a node might have a child of each type. This variation represents each node using  $\sigma$  bits in the bitvector. The  $k$ -th bit indicates whether the node has a child of type  $k$  (1) or not (0). For example, in a binary tree with  $\sigma = 2$ , a node with two children is 11, a node with only a left one is 10, a node with only a right one is 01, and a leaf is 00.

LOUDS supports operations of ordinal LOUDS plus *labeledchild*( $v, l$ ) that returns the child of node  $v$  with label  $l$ , if it exists (equivalent to *child*( $v, t$ ) in cardinal trees); *childrenlabeled*( $v, l$ ) that checks if the child of node  $v$  with label  $l$  exists (returns *true* or *false*); and *childlabel*( $v$ ) that returns the label of the edge leading to node  $v$ .

The space cost of cardinal LOUDS is  $\sigma n$  bits. The time cost of most operations is  $O(c)$ , assuming constant-time *rank* and *select* on the bitvector. However, for large values of  $\sigma$ , the space overhead can be significant. In such cases, compressed representations of the bitvector can be used to reduce the space to  $n \lg(\sigma) + O(n)$  bits, but this may increase the time of some operations to  $O(\lg(\sigma))$ .

### Balanced Parenthesis (BP)

The Balanced Parenthesis (BP) representation (Jacobson, 1989) is designed to encode ordinal trees using a balanced sequence of parentheses. Each node is represented by a pair of matching parentheses, with the opening parenthesis marking the node's first visit in a depth-first traversal and the closing parenthesis marking the completion. This representation captures the hierarchical structure of the tree, where the nesting of parentheses corresponds to the parent-child relationships.

BP is implemented using a bitvector, where 1 is an opening parenthesis and 0 is a closing one. The bitvector is preprocessed to support parenthesis queries, such as *close* (where an opening parenthesis closes), *open* (where an closing parenthesis opens), *enclose* (index of the parent node), *fwsearch* (next index of a given value), *bwdsearch* (previous index of a given value), *rmq* (range minimum query – used to find the position of the minimum value within a given range), *rMq* (range maximum query – used to find the position of the maximum value within a given range), *mincount* (it counts how many times the minimum occurs within a given range), and *minselect* (position of a given minimum), which are used to navigate and query the tree structure efficiently.

BP additionally supports navigation operations (*root*, *fchild*, *lchild*, *nsibling*, *psibling*, *parent*, *ancestor*); structure operations (*isleaf*, *nodemap*, *nodeselect*, *preorder*, *preorderselect*, *postorder*, *postorderselect*); depth- and subtree-related operations (*depth*, *subtree*, *isancestor*, *levelancestor*); leaf-related operations (*leafnum*, *leafrank*, *leafselect*); and the hierarchy operator *lca* (lowest common ancestor).



The space cost is  $2n + o(n)$  bits (Munro & Raman, 2001), where  $n$  is the number of nodes in the tree. The time cost for all the operations is  $O(\lg(n))$ .

### Depth-First Unary Degree Sequence (DFUDS)

The Depth-First Unary Degree Sequence (DFUDS) representation (Benoit et al., 2005), similarly to ordinal LOUDS, is designed to encode the topology of an ordinal tree. However, it uses a depth-first unary degree sequence. Each node is represented by a sequence of 1s (indicating the number of children) followed by a 0. This sequence is concatenated in depth-first order to form a bitvector. The key property of DFUDS is that all nodes in a subtree are contiguous in the bitvector, and the net excess (Benoit et al., 2005; Jacobson, 1989) within any subtree is  $-1$ .

The first three bits of the bitvector are set to 110, and then the tree is traversed in preorder, appending the unary degree sequence of each node to the bitvector. The bitvector results of  $n + 1$  0s (one 0 per node, plus the initial one), and  $n + 1$  1s (one 1 per edge  $- n - 1$  - plus the two initial ones). Therefore, the bitvector length is  $2n + 1$  bits.

DFUDS supports navigation operations (*root*, *fchild*, *lchild*, *nsibling*, *psibling*, *parent*); structure-related operations (*isleaf*, *nodemap*, *nodeselect*, *preorder*, *preorderselect*); subtree-related operations (*subtree*, *isancestor*); leaf-related operations (*leafnum*, *leafrank*, *leafselect*); and the lowest common ancestor operator (*lca*).

The space cost is  $2n + 1$  bits. Time of most operations is  $O(\lg(n))$ , assuming constant-time operations on balanced parentheses. However, *child* and *children* can be performed in constant time, making DFUDS particularly efficient for navigating towards specific children.

### $k^2$ -Tree

The  $k^2$ -tree (Brisaboa et al., 2014) is designed to represent clustered graphs, where nodes can be divided into subsets of as many edges as possible. It recursively partitions the adjacency matrix of the graph into  $k^2$  submatrices, representing it as a  $k^2$ -ary tree. Empty submatrices are not represented, leading to space savings. The tree structure is encoded as cardinal LOUDS bitvector. Each internal node in the tree is represented by  $k^2$  bits, indicating the presence or absence of its children. Leaf nodes are either 1 (representing an edge) or 0 (no edge). The bitvector is preprocessed to support *rank* and *select*, enabling efficient navigation and querying.

The choice of the order parameter,  $k$ , involves a trade-off between space efficiency and query performance. A higher  $k$  typically leads to better space efficiency, as it results in a shallower tree with fewer internal nodes. However, it also increases the fan-out of each node, potentially increasing the time required to traverse the tree during queries.

For smaller matrices with side size  $s = 2^m$ , where  $m \in \mathbb{Z}$ , a smaller  $k$  value ( $k = 2^i$ , with  $i \in \mathbb{Z}$  and  $i = 1$ ) might be more suitable, as the space savings from a higher  $k$  may be insignificant compared to the increased query time. Conversely, for larger matrices, with side size of the form  $s = 4^m$ , where  $m \in \mathbb{Z}$ , a higher  $k$  value ( $k = 2^i$ , with  $i > 1$ ) could be advantageous. The space savings from a shallower tree can become more significant as the matrix size grows, outweighing the potential increase in query time. Moreover, if a dataset is clustered, a higher  $k$  value can effectively capture the clustered structure, leading to further space savings and potentially faster query times due to reduced tree traversal. The  $k^2$ -tree supports *adj*( $G, v, u$ ) that checks if there is an edge between nodes  $v$  and  $u$ ; *neigh*( $G, v$ ) that returns the list of neighbors of node  $v$ ; and *rneigh*( $G, v$ ) that returns the list of reverse neighbors of node  $v$ .

The space cost is influenced by different factors, such as number of nodes and edges, distinct paths and nodes, representation of the bitvector, and grid size. For instance, using a sparse bitvector, the space could result of  $O\left(e \lg\left(\frac{n^2}{e}\right) + e \lg(k)\right)$  bits, where  $n$  is the number of nodes,  $e$  is the number of edges, and  $k$  is the tree order. In practice, the space is often much lower for clustered graphs due to unrepresented empty submatrices. For that reason, several studies have explored the alternative of graph clustering and partitioning (Hernández & Navarro, 2014; Chierichetti et al., 2009; Maserrat & Pei, 2010; Boldi et al., 2011; Claude & Ladra, 2011; Grabowski & Bieniecki, 2014).

The time cost is  $O(\lg_k(n))$  for  $adj(G, v, u)$ ,  $O(n)$  for  $neigh(G, v)$ , and  $O(n)$  for  $rneigh(G, v)$ . The  $O(n)$  time cost for  $neigh$  and  $rneigh$  is a worst-case bound.

### **$k^n$ -Tree**

The  $k^n$ -tree (de Bernardo et al., 2013; de Bernardo, 2014) is designed to represent  $n$ -ary relations encoded in  $n$ -dimensional matrix (hypermatrix). It extends the  $k^2$ -trees to higher dimensions by recursively partitioning a hypermatrix into  $k^n$  equal-sized sub-hypermatrices. This hierarchical partitioning allows for efficient representation of clustered data, where most of the 1s are concentrated in a few partitions. The tree is encoded using a cardinal LOUDS bitvector, following the same principles of the  $k^2$ -tree. However, each internal node is represented by  $k^n$  bits.

The  $k^n$ -tree supports  $checkcell(C)$  that checks if the cell at coordinate  $C$  contains a 1; and  $range(S, E)$  that reports all the cells within the range defined by starting coordinate  $S$  and ending coordinate  $E$  that contain a 1.

Similarly to  $k^2$ -tree, the  $k^n$ -tree space cost is influenced by different factors (number of nodes and edges, distinct paths and nodes, representation of the bitvector, and grid size). For instance, using a sparse bitvector, the space is  $O\left(r \lg\left(\frac{s^n}{r}\right) + n r \lg(k)\right)$  bits, where  $r$  is the number of relations (1s in the hypermatrix),  $s$  is the standardized size of the hypermatrix ( $s = 2^{\lceil \lg(s_{max}) \rceil}$ , with  $s_{max}$  as the largest dimension), and  $k$  is the tree order. The time cost of  $checkcell(C)$  is  $O(h) = O(\log_k(s))$ . For  $range(S, E)$ , it depends on the hypermatrix distribution. In the worst case, it can be as high as  $O(s^n)$ , but for clustered data it can be much lower, as the  $k^n$ -tree can efficiently skip empty partitions.

### **Graphs**

The representation of general graphs provides efficient support for various operations while minimizing space. Two approaches are proposed. The first approach represents each row of the graph's adjacency matrix as a sparse bitvector (Navarro, 2016) that optimizes space usage, especially for graphs with fewer edges. The other approach uses a permutation-based sequence (Claude & Navarro, 2011) for storing the matrix's adjacency lists as a concatenation of each node's neighbor list into a single sequence.

When using sparse bitvectors, 1 indicates the presence of an edge and 0 indicates its absence. Operations like  $adj$  (checking for an edge),  $neigh$  (retrieving neighbors), and  $outdegree$  (counting outgoing edges) are implemented using bit-vector *access*, *rank*, and *select*. When using sequence, a bitvector is used to mark the starting position of each node's neighbor list within the sequence. This allows for efficient *access* on the sequence, and *rank* and *select* on the bitvector. Additionally, reverse neighbors and indegree can be computed efficiently using *rank* and *select* on the sequence.

Both representations support  $adj(G, v, u)$  that checks if there is an edge from node  $v$  to node  $u$ ;  $neigh(G, v)$  that returns the list of neighbors of node  $v$ ; and  $outdegree(G, v)$  that returns the outdegree of node  $v$ . The sequence representation additionally supports  $rneigh(G, v)$  that returns the list of reverse neighbors of node  $v$ ; and  $indegree(G, v)$  that returns the indegree of node  $v$ .

The space of a bitvector representation is  $e \lg\left(\frac{n^2}{e}\right) + O(e)$  bits (worst-case entropy for directed graphs), and the time complexity of  $adj$  is  $O(\lg(n))$ ,  $O(c)$  for  $neigh$ ,  $O(\lg(n))$  for outdegree. The operation  $rneigh$  is not space-efficiently supported.

For a sequence, the space is  $e \lg(n) (1 + o(1)) + O(n)$  bits. The time of  $adj$  is  $O(\lg(\lg(n)))$ ,  $O(\lg(\lg(n)))$  for  $neigh$ ,  $O(c)$  for outdegree,  $O(c)$  for  $rneigh$ , and  $O(\lg(\lg(n)))$  for indegree.

Note that the time costs for sequence assume constant-time *rank* and *select* on the bitvector. In practice, these operations can be implemented efficiently, resulting in fast graph operations.

### **Findings**

Compact data structures efficiently handle various data types. Fixed-size arrays suit numeric datasets with narrow ranges, while variable-size arrays cater to wider ranges. By combining these

structures, one can efficiently encode  $n$ -ary relations like geographic data (latitude, longitude, and altitude) or customer purchases (customer ID, product ID, and purchase amount).

Bitvectors serve as fundamental building blocks for compact data structures and can encode binary relations, such as friendships in a social network. Wavelet-trees represent  $n$ -ary relations as strings over a larger alphabet, enabling efficient queries but potentially impacting space efficiency if the alphabet becomes too large (Barbay et al., 2014). The  $k^n$ -tree is a promising structure for representing  $n$ -ary relations in GIS, recommender systems, and RDF data. However, scalability concerns exist regarding its exponential space growth with dimensionality (de Bernardo et al., 2013; de Bernardo, 2014; Navarro, 2016), especially for non-clustered data.

To validate scalability concerns, experiments were conducted to compare the time and space performance of a specific query on synthetic  $n$ -ary datasets represented as  $k^n$ -trees against plain representations of adjacency lists as baseline. Synthetic datasets were chosen for their controlled nature, allowing systematic variation of parameters to isolate the effects of individual factors on scalability.

Multiple datasets were generated with varying sizes ( $s \in [12, 32, 64, 128]$ ), dimensions ( $n \in [2, 3, 4]$ ; while 2-ary relations are common, many applications involve 3-ary or higher-order relations), and densities ( $d \in [0.125, 0.25, 0.5, 0.75]$ ; this wide range of sparsity levels helps to reflect the variability of real-world datasets), distributed randomly (to simulate scenarios where relationships between entities are uniformly distributed), randomly along the main diagonal, and in clusters (it helps to simulate scenarios where relationships are grouped together in specific regions with  $c \in [1, 2, 4, 8]$ ). Those parameter ranges were chosen to simulate various real-world scenarios and to stress-test the  $k^n$ -tree under different conditions. A systematic variation of them, with two samples per variation, yielded 576 different samples. Experiments were conducted on pairs of samples with equivalent size, dimension, and order  $k \in [2, 4]$ , resulting in 6,912 baseline and 10,368  $k^n$ -tree experiments.

To measure the scalability, the set operator intersection was used as benchmark, since it is a relevant operation that requires traversing the entire data, thus revealing advantages and disadvantages in terms of space and time efficiency of each type of encoding. This choice aligns with the work of Quijada-Fuentes et al. (2019), where the authors focused on set operations to evaluate the performance and scalability of  $k^2$ -trees on 2-ary relations.

The intersection algorithm for  $k^n$ -tree is shown in Algorithm 1. The algorithm receives two  $k^n$ -trees  $A$  and  $B$ , along with other related parameters, and returns a  $k^n$ -tree  $C$  as the intersection between  $A$  and  $B$ . The algorithm recursively traverses the trees  $A$  and  $B$  level by level, comparing corresponding bits in the bitmaps. For each level, it iterates through the potential  $k^n$  child positions, recursively finding the intersection of children if they exist. If there are no more levels, it directly compares leaves (actual relation values). Pointers  $p_A$  and  $p_B$  are used to navigate the bitmaps, skipping over non-existent children (empty sub-hypermatrices). The results are accumulated in a bitmap  $C$  representing the intersection at each level. Ultimately, the algorithm returns whether  $t$  is not empty (negation of the flag  $\varepsilon$ ) used to set bits in earlier recursion levels as the algorithm returns.

**Algorithm 1** Set Intersection for  $k^n$ -Tree

Inputs:  $k^n$ -tree bitmaps  $A$  and  $B$ ;  $p_A$  is an array of pointers to bits in  $A$ , one per level of  $A$ ;  $p_B$  is an array of pointers to bits in  $B$ , one per level of  $B$ ;  $C$  is an array of  $h$  bitmaps that represents the intersection between  $A$  and  $B$  at each level; constants  $k$  and  $h$  related to the input  $k^n$ -trees;  $l$  is the current visited level in both  $k^n$ -trees  $A$  and  $B$ ;  $A$  and  $B$  have the same height  $h$ ;  $A$  and  $B$  have the same size  $s$ ;  $A$  and  $B$  have the same order  $k$ .

Output:  $k^n$ -tree  $C$  as the intersection of  $A$  and  $B$ .

```

Function intersection( $A, B, p_A, p_B, C, k, h, l$ )
     $t \leftarrow \emptyset$  // Variable  $t$  is a bitmap that keeps a result for the current level  $l$ .
     $\varepsilon \leftarrow 1$  //  $\varepsilon$  is a flag to mean that  $t$  does not contain any 1.
    For  $i \in [0, k^n - 1]$  do
        If  $l < h$ 
            If  $A_{p_A(l-1)} \wedge B_{p_B(l-1)}$  then
                 $t_i \leftarrow \text{intersection}(A, B, p_A, p_B, C, k, h, l + 1)$ 
            Else
                 $t_i \leftarrow 0$ 
                skip_node( $A, p_A, l + 1, A_{p_A(l-1)}, k^n, h$ )
                skip_node( $B, p_B, l + 1, B_{p_B(l-1)}, k^n, h$ )
        Else
             $t_i \leftarrow A_{p_A(l-1)} \wedge B_{p_B(l-1)}$ 
             $\varepsilon \leftarrow \varepsilon \wedge \neg t_i$ 
             $p_A(l - 1) \leftarrow p_A(l - 1) + 1$ 
             $p_B(l - 1) \leftarrow p_B(l - 1) + 1$ 
    If  $\neg \varepsilon$  then
         $C_{l-1} \leftarrow C_{l-1} \parallel t$  // Concatenate  $C_{l-1}$  with bitmap  $t$ .
    Return  $\neg \varepsilon$ 

```

The skip-node function used in Algorithm 1 helps skip subtrees of a  $k^n$ -tree (represented as a bitmap) that are not part of an intersection. If a node in the tree has children, the function skips over the parts of the bitmap representing those children using rank1 function to count 1s within a range of the bitmap to determine if there are any existing children.

The set intersection algorithm for adjacency lists is shown in Algorithm 2. It finds the intersection of two sorted adjacency lists  $A$  and  $B$ . It iterates through both lists simultaneously, comparing the current elements from each list. If they match, the element is added to the result; if not, the algorithm advances the pointer of the list with the smaller element. This continues until one of the lists is exhausted, ensuring that all common elements are identified and returned.

**Algorithm 2** Set Intersection for Adjacency Lists

Inputs:  $k^n$ -tree bitmaps  $A$  and  $B$ ;  $p_A$  is an array of pointers to bits in  $A$ , one per level of  $A$ ;  $p_B$  is an array of pointers to bits in  $B$ , one per level of  $B$ ;  $C$  is an array of  $h$  bitmaps that represents the intersection between  $A$  and  $B$  at each level; constants  $k$  and  $h$  related to the input  $k^n$ -trees;  $l$  is the current visited level in both  $k^n$ -trees  $A$  and  $B$ ;  $A$  and  $B$  have the same height  $h$ ;  $A$  and  $B$  have the same size  $s$ ;  $A$  and  $B$  have the same order  $k$ .

Output:  $k^n$ -tree  $C$  as the intersection of  $A$  and  $B$ .

Function intersection( $A, B$ )

Let  $C$  the result, initially empty.

$\alpha \leftarrow \beta \leftarrow \text{True}$

Loop

    If  $\alpha \wedge \text{has\_more}(A)$  then

$a \leftarrow \text{next}(A)$  // next returns the next  $n$ -dimensional tuple.

$\alpha \leftarrow \text{False}$

    If  $\beta \wedge \text{has\_more}(B)$  then

$b \leftarrow \text{next}(B)$  // next returns the next  $n$ -dimensional tuple.

$\beta \leftarrow \text{False}$

    If  $\neg\alpha \wedge \neg\beta$  then

$\alpha \leftarrow \text{True}$  if  $a < b \vee a = b$  else *False*

$\beta \leftarrow \text{True}$  if  $a > b \vee a = b$  else *False*

        If  $a = b$  then  $C \leftarrow C \parallel a$

    Else Break

Return  $C$

**Results**

Figures 1, 2, and 3 present summarized results for  $s \in [16, 64]$ , which are compatible with  $k = 4$ . Results for  $s \in [32, 128]$  (not compatible with  $k = 4$ ) follow the same trend.

Figure 1a shows that the  $k^n$ -tree consistently outperformed the baseline approach in terms of execution time for the intersection operation. This advantage was particularly pronounced for higher dimensional datasets ( $n > 2$ ) and denser datasets (Figure 3a). On average, the  $k^n$ -tree performed eight (8) times faster than the baseline.

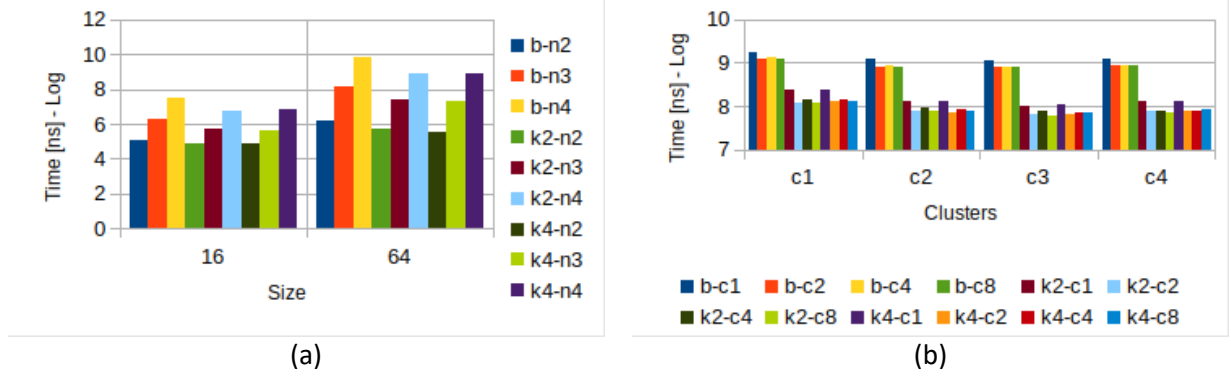
Regarding memory, Figure 2a demonstrated a superior memory scalability of  $k^n$ -tree compared to the baseline. This was evident in the lower memory usage of its main data structure across various dataset sizes, dimensions, and densities (Figure 3b). On average, the  $k^n$ -tree consumed 35 times less memory than the baseline.

The distribution of data points significantly affected the performance of both the  $k^n$ -tree and the baseline. Clustered data distributions were most favorable for the  $k^n$ -tree (as expected), leading to the best performance in terms of both time (Figure 1b) and memory usage (Figure 2b). However, even with scattered data distributions, the  $k^n$ -tree with  $k = 4$  often outperformed the baseline.

**Discussion**

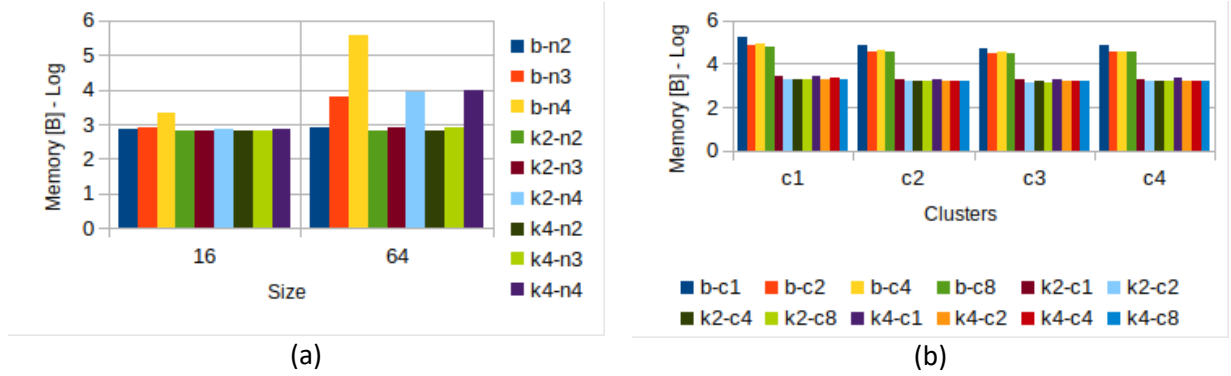
The experimental results align with previous studies (Brisaboa et al., 2014; de Bernardo et al., 2013; de Bernardo, 2014), highlighting the impact of dimensionality and data distribution on  $k^n$ -tree performance. Memory usage notably increased with dimensionality, particularly for denser datasets. However, the  $k^n$ -tree consistently outperformed the baseline in terms of both time and memory efficiency for higher dimensions, especially with clustered data ( $c > 1$ ). This underscores the  $k^n$ -tree's effectiveness in compressing and navigating clustered data, even in high-dimensional spaces. This observation is aligned with the findings of Quijada-Fuentes *et al.* (2019) who observed that for  $k^2$ -trees.

**Figure 1** Comparison of (a) Time to Size, and (b) Time to Clusters.



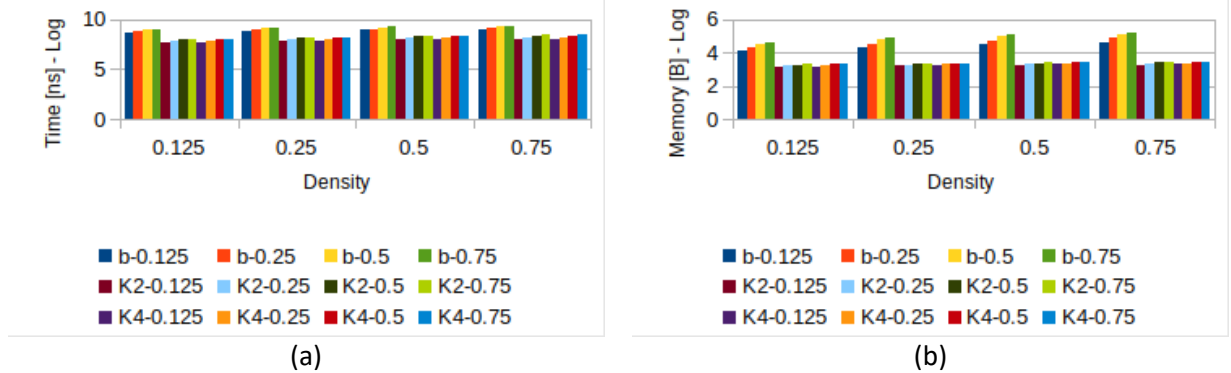
Note. Results in logarithmic scale. Abbreviations: *b* for baseline; *ni* for  $n = i$ ; *ki* for  $k^n$ -tree with  $k = i$ ; and *ci* for  $c = i$ .

**Figure 2** Comparison of (a) Memory to Size, and (b) Memory to Clusters.



Note. Results in logarithmic scale. Abbreviations: *b* for baseline; *ni* for  $n = i$ ; *ki* for  $k^n$ -tree with  $k = i$ ; and *ci* for  $c = i$ .

**Figure 3** Comparison of (a) Time to Density, and (b) Memory to Density.



Note. Results in logarithmic scale. Abbreviations: *b* for baseline; *ki - j* for  $k^n$ -tree with  $k = i$  and  $d = j$ .

Experiments confirmed the trade-off between space and time efficiency with varying order parameter ( $k$ ) values. While a higher order ( $k > 2$ ) generally led to better space efficiency, it wasn't always optimal. For lower dimensional and sparser datasets,  $k = 2$  proved more time and space efficient. However, for clustered and denser data,  $k = 4$  was superior. This aligns with findings by Quijada-Fuentes et al. (2019), where  $k^2$ -trees with compression of 1s (akin to higher  $k$  values) were more efficient for denser datasets, while the original  $k^2$ -trees (akin to lower  $k$  values) excelled with sparser data.

## Conclusion

The empirical evidence from our experiments demonstrated the  $k^n$ -tree's effectiveness in handling set intersection operations on high-dimensional or clustered data, showcasing an average of eight (8) times faster execution and 35 times less memory consumption compared to the plain representation of adjacency lists as baseline. These findings highlight the importance of considering dataset characteristics and application requirements when selecting compact data structures. The superior scalability of the  $k^n$ -tree for high-dimensional and clustered data suggests its potential for efficient data management in various domains. For instance, in Geographic Information Systems (GIS) dealing with multi-dimensional spatial data or recommender systems modelling user-item interactions as high-dimensional relations, the  $k^n$ -tree could offer significant advantages in storage and query processing.

Furthermore, this research confirms the impact of the order parameter  $k$  on  $k^n$ -tree performance as mentioned by Navarro (2016). Lower  $k$  values are more efficient for lower-dimensional or sparser datasets, while higher  $k$  values are better suited for clustered and denser data.

However, this study is limited to experiments on synthetic datasets, which may not fully capture the complexities and nuances of real-world data. Additionally, it is focused solely on the set intersection operation, leaving the performance of the  $k^n$ -tree for other set operations unexplored. Finally, the range of parameters explored in the experiments was limited.

Future work should evaluate the  $k^n$ -tree on real-world datasets, explore its performance for other set operations, and conduct a more comprehensive parameter analysis. Additionally, comparing the  $k^n$ -tree with alternative compact data structures (Benoit et al., 2005; Delpratt et al., 2006; Quijada-Fuentes et al., 2019) for  $n$ -ary relations would provide a more complete understanding of its strengths and weaknesses. Furthermore, investigating the impact of different clustering algorithms on  $k^n$ -tree performance could further enhance its real-world applicability.

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## **Roles of NGOs and Local Government Units: The Case of Pasil, Cebu City**

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### **Abstract**

This research delved into the critical roles played by non-governmental organizations (NGOs) in supporting anti-poverty programs of Local Government Units (LGUs) in Barangay Pasil, Cebu City. It involved three NGOs that were selected based on their experience, collaboration agreements, and poverty-fighting program designs. Employing a qualitative approach, the experiences and perspectives of the participating NGOs were examined through semi-structured interviews. Thematic analysis was then utilized to extract key themes from the rich qualitative data. The NGOs' profiles, programs, and strategies were explored, revealing their crucial roles in tackling the complex issues of poverty. The findings revealed that these NGOs provide significant contributions to community development, and were strongly dedicated to enhancing marginalized communities' well-being through varied missions, funding sources, and innovative programs. Furthermore, collaboration between the NGOs and LGUs supported governmental efforts, shaped local policies, and improved service provision, underscoring the value of strategic partnerships for sustainable development. The strategic sharing of resources underscored the importance of a unified approach in effectively addressing multifaceted community needs. Persistent collaboration and joint endeavors between NGOs and LGUs can help establish resilient, empowered communities, promoting inclusive development and a promising future for Pasil, Cebu City residents.

**Keywords:** *Non-governmental organizations, poverty alleviation programs, Philippines*

### **Introduction**

In the Philippines, poverty remains a significant challenge, with 13 million families identified as poor and an additional 1.9 million classified as 'new poor' as of July 2023 (Philippine OCTA Research, 2023). The Philippine population in 2023 was estimated at 117,337,368 people, based on elaboration of United Nations data. Intergenerational poverty persists, affecting between 300 and 420 million people worldwide (Chronic Poverty Report, 2004), trapping families in a cycle of deprivation with limited access to basic needs such as food, shelter, and medicine (Chen, 2009).

Despite recent economic progress in the Philippines, poverty remains a persistent issue. The 2021 Family Income and Expenditure Survey (FIES) reported a poverty prevalence rate of 18.1%, indicating that 19.99 million Filipinos live below the poverty line (Philippine Institute for Development Studies, 2022). This figure underscores the urgent need for enhanced financial management and assistance. Compared to the 2018 Philippine Statistics Authority data, the poverty incidence increased from 16.7% to 18.1% in 2021, reflecting a concerning rise in poverty levels (Philippine Statistics Authority, 2022). The Pantawid Pamilyang Pilipino Program (4Ps), implemented since 2008, aims to address poverty, but many families continue to struggle (Ranario, 2012). Therefore, both individual efforts and systemic changes are crucial to break the poverty cycle.

Barangay Pasil, an impoverished area in Cebu City, exemplifies these challenges. Known for its fish market and high crime rates (Cabatingan, 2010), Pasil experiences intergenerational poverty due to factors such as limited education, unemployment, and inadequate social services (Fernandez & Abocejo, 2014). Non-governmental organizations (NGOs) play a vital role in poverty alleviation in Pasil by offering education, employment, and microfinance to help break the cycle of poverty.

This study, conducted by senior political science students from Cebu Normal University, aimed to describe the roles of NGOs in Pasil, Cebu City, in reducing poverty. By examining NGO initiatives in partnership with the local government, the study sought to highlight their effectiveness at the

grassroots level and suggest avenues for enhancing their impact. Through a comprehensive analysis of NGO programs and their collaboration with LGUs, this study aimed to provide valuable insights into how these partnerships can be further strengthened to drive positive socio-economic transformation and foster inclusive development in Pasil, Cebu City.

### **Objective of the Study**

This study aims to describe the roles of NGOs in LGU anti-poverty programs in Pasil, Cebu City. Specifically, the study sought to answer the following queries:

1. What is the profile of the selected NGOs in Pasil, Cebu City in terms of mission, sources of funding, and primary beneficiaries of the NGO's programs and projects (PAPs)
2. What are the NGOs anti-poverty programs/interventions?
3. How are the NGOs anti-poverty programs/interventions implemented?

### **Literature Review**

***Enabling Role of NGOs.*** Maslang (2022) highlighted the diverse roles of NGOs, including service delivery, consultative functions, and capacity building. NGOs have driven social change by providing education and training, filling gaps left by governments, and serving marginalized populations. Stromquist (2002) identified three key tasks of NGOs: delivering direct services, offering educational programs, and advocating for public policies. These efforts have significantly contributed to poverty reduction and community empowerment.

***Anti-Poverty Programs and Interventions.*** Anti-poverty programs and interventions designed to combat poverty seek to eliminate it by addressing its underlying causes and enhancing the welfare of the community. NGOs, banking institutions, government entities, and semi-government groups have established Business Development Programs (BDPs) to assist micro-entrepreneurs in reducing poverty and promoting development (World Bank, 2004; Verrest, 2013). Baruah (2007) discussed the challenges and opportunities NGOs face in implementing anti-poverty programs, emphasizing the importance of partnerships with public and private sectors to enhance effectiveness.

***NGO-LGU Partnerships.*** Under decentralization, local governments have organized, developed policies, and provided services in partnership with civil society and non-governmental organizations. According to Nikkhah and Redzuan (2010), NGOs have helped develop good governance by improving management, social capital, and human resources. The 1987 Philippine Constitution and the 1991 Local Government Code emphasize the government's obligation to include NGOs in development. Mitchell et al. (2015) argued that NGOs and governments may benefit from collaboration—NGOs can expand their operations, influence, and contribute to national development by working with governmental agencies. Conversely, governments may cooperate with NGOs to obtain moral legitimacy, recover control over donor finances, eliminate opposition, and implement policies more efficiently and cost-effectively. NGOs have often been seen as portals to local governments because their involvement in local governance has improved communities and assisted poor residents. NGOs are community-based and understand people's need, which helps to improve public policies.

***Role of NGOs on Policy Development.*** Desai (2014) asserted that NGOs have emerged as significant actors in the realms of developmental politics and economics since the 1950s. Banks and Hulme (2012) also found that NGOs have gained importance because their inventive, community-focused entities are committed to inclusive and citizen-oriented development approaches. Despite their innovative approaches, NGOs face structural challenges in implementing community empowerment projects, including political, legal, internal, economic, and budgetary limits (Ariti et al., 2018). Barnes and Laerhoven (2015) highlighted that NGOs' collaborative initiatives are essential because they frequently help facilitate community discourse on these issues.

***Role of NGOs in Poverty Reduction.*** NGOs play a crucial role in poverty reduction by providing education, vocational training, and employment support (Dahie, 2019; Liu et al., 2021). While education and skill development programs are vital for economic progress, financial challenges can

hinder access. Overall, NGOs' commitment to education, advocacy, and cooperation makes them essential partners in the fight against poverty and for sustainable development.

## **Methods and Materials**

**Design.** The study utilized qualitative research methodologies, incorporating thematic analysis. An advantageous characteristic of qualitative research is its capacity to explain complex human behavior processes and patterns (Foley & Timonen, 2015). The goal was to accurately depict each organization's approach and prevalent themes observed by the participants. Employing thematic analysis facilitated a comprehensive understanding of non-government organizations' roles.

**Locale.** The research was conducted in Barangay Pasil, which is located along the coast of Cebu City, Philippines. According to a recent report (PhilAtlas, 2020), the prevalence of poverty in Pasil was 18.7%, or 187 individuals per 1,000 inhabitants. Pasil was among the most populous and impoverished barangay districts in Cebu City given that their income levels were below the poverty threshold. The selection of this specific location was based on the fact that it exhibited economic and social challenges, insufficient facilities, and restricted educational chances.

**Participants.** The primary respondents of this research were two representatives from each of three different NGOs, selected based on their years of experience working within the respective organizations. Participants were chosen according to pre-established criteria. First, the NGOs must have a Memorandum of Agreement (MOA) in place with the barangay, outlining the scope of collaboration, responsibilities of each party, duration of the agreement, financial arrangements, reporting mechanisms, and dispute resolution procedures. Second, the programs and interventions of the NGOs must be designed to combat poverty directly or indirectly.

**Instrument.** The instrument used in the data collection consisted of a semi-structured interview guide. Wengraf (2018) described semi-structured interviews as having prepared open-ended questions, with subsequent ones being improvised cautiously. Semi-structured interviews were conducted with NGO representatives to collect ideas on the roles, programs, projects, and activities that were implemented through the NGO-LGU partnership. The interview data was recorded in audio format using smartphones after obtaining consent from the participants.

**Data Gathering.** The data-gathering procedure of this study was rigorous and ethical. The Local Government Unit of Pasil and non-governmental organizations, the researchers have prioritized the following procedures and guidelines. Priority number one was obtaining the informed consent of respondents, which included informing them of the nature of the study and their legal rights. The researchers prepared permission letters, strictly adhered to local regulations, and reviewed the interview transcripts with great attention to detail to ensure the protection of participants' identities.

**Data Analysis.** The interviews were first transcribed, and then thematic analysis was used to analyze the qualitative data acquired in the study. Following Braun and Clarke's (2006) Six Phase Framework for Thematic Analysis, the research went through a six-step iterative process: First, become familiar with the data; second, generate codes; third, through the codes, generate themes; fourth, review the themes; fifth, define and name the themes; and lastly, locate exemplars. This approach ensures a thorough and organized analysis process, which makes it possible to find and understand important trends in the qualitative data and, ultimately, contribute to a sophisticated and discerning investigation of the roles of NGOs.

**Ethical Consideration.** In conducting this study, ethical considerations were prioritized at every stage. The researchers recognized the potential risks to participants, particularly concerning privacy and psychological well-being, and implemented stringent measures to ensure that no foreseeable or potential risks of harm or discomfort for individuals and/or groups who participated in this study would arise. A comprehensive consent process prior to the study emphasized voluntariness and guaranteed participants' rights and confidentiality. The data management plan adhered to stringent standards, safeguarding data through secure storage, anonymization, and adherence to data protection regulations, ensuring the utmost confidentiality for all participants.

## Results

This section presents an overview of the key findings and interpretations regarding the varied roles and approaches of NGOs in Pasil, Cebu City, based on the perspectives of the interviewees. Information was gathered from interviews, with two representatives from each of the three NGOs.

### NGOs Mission

Each mission of the three selected NGOs in Pasil is depicted in Table 1. The table distinguishes between two functions of NGOs based on their missions: "service providers" and "advocates" for the impoverished. The majority of the NGOs in Pasil primarily function as service providers.

**Table 1** *Each Mission of the Three Non-Government Organizations (NGOs) in Pasil*

	<b>Mission</b>	<b>Significant Statements</b>	<b>Role</b>
NGO 1	Strive to teach preschoolers in economically disadvantaged parts of Cebu City the fundamentals of math and logic with the help and support of their parents.	"Our goal is to empower parents to become their child's first teacher. We help parents become more involved in their children's early education by teaching them early learning techniques and activities and providing them with free early learning resources. Our target age group for this program is children between the ages of three and five. The focus of our organization is really to educate not only the students but also their parents on how to tutor their children." (NGO Representatives)	Service Provider
NGO 2	Committed to working for continuing holistic education, strengthening families, protecting and caring for women and children, empowering communities towards sustainable development, disaster preparedness, and emergency response and rehabilitation.	"Our mission is based on the name of our organization, and we aim for a fullness of life in a transformative society." (NGO Representative 1)  We aim to give education services like our alternative learning school to strengthen disadvantaged families; we aim to provide sustainable services, community empowerment, and development activities." (NGO Representative 2)	Service Provider
NGO 3	Aims to support the most vulnerable children and families within impoverished communities. Ensure equal access, opportunities, and a sense of optimism for the most marginalized children, families, and communities.	"Our first mission is to organize and empower the urban poor sector here in our City. Then along the way we specified our mission, which is to empower families and their children. We aim to give hope to families, especially children who belong to poverty". "We aim to uplift and empower our fellow Filipino people, especially the disadvantaged families, including their children." (NGO Representatives)	Service Provider

NGOs as "service providers" and "advocates," as per Banks and Hulme (2012), use one of two approaches to development—Big-D and little-d development. In the Big-D approach, development is seen as a project-based and intentional activity, with tangible project outputs, while little-d development views development as an ongoing process. In Pasil, the majority of NGOs are predominantly engaged in service delivery. With the explicit purpose of tackling social issues such as poverty and inequality, these organizations implement technical and management solutions via

service provision and welfare assistance. This means that NGOs in Pasil that focus on providing services are aligned more closely with the 'Big-D' approach to development. These organizations are often more structured and project-based, with a clear focus on achieving specific goals.

On the other hand, NGOs that advocate for the poor and focus on systemic change and ongoing processes are aligned more closely with the 'little-d' approach. These organizations may not always have tangible project outputs, but they seek to challenge and change societal institutions and arrangements. They may work towards radical, systemic alternatives that aim to reorganize the economy, social relationships, and politics in ways that promote equity and sustainability. Their approach is more holistic and focused on long-term, systemic change.

Interest in the role of NGOs in providing services has increased, not just because governments cut back on services, but also because NGOs have been seen as better at delivering services. They are perceived as being more adaptable and innovative, capable of initiating new programs without delays (Lewis & Kanji, 2009). However, in the case of Pasil, service delivery alone may not be sufficient to resolve the frequent systemic and structural causes of poverty and inequality. Failure to tackle these underlying factors may result in the continued demand for services, thereby impeding the achievement of long-term sustainability goals. Although service delivery is of utmost importance, it should be accompanied by advocacy efforts that tackle the underlying factors contributing to poverty and inequality, foster transformative shifts within systems, empower communities, and guarantee enduring and sustainable changes.

### ***NGOs Sources of Funding***

NGOs that are active in particular barangays of Cebu City, as well as their sources of funding utilized by these NGOs, with an emphasis on both conventional and non-conventional approaches, are shown in Table 2. The difference between conventional and non-conventional sources lies in their origin and nature, with conventional sources being more traditional, such as government grants and individual donations, while non-conventional sources are typically from international organizations and foundations (Anheier & Themudo, 2005).

**Table 2** *Funding Sources of Non-Government Organizations*

	<b>Funded Barangays</b>	<b>Source of Funding</b>	<b>Type of Sources</b>
NGO 1	Barangay Pasil, Suba, Ermita	The Green Leaf Foundation (Switzerland), ICM Foundation (India and Hong Kong), Ramon Aboitiz Foundation, Inc. (RAFI)	Conventional and Non-Conventional
NGO 2	Carreta, Tinago, San Roque, Mabolo, Pasil	Individual sponsors (Germany, Netherlands, Australia), Aboitiz Group (for some housing projects)	Non-Conventional
NGO 3	Looc, Mandaue City, Pasil Cebu City	International donors (Belgium, Germany, Netherlands)	Non-Conventional

NGO 1 received funding from international NGOs such as The Green Leaf Foundation and the ICM Foundation, in addition to local support from the Ramon Aboitiz Foundation Inc., which represented a combination of conventional and non-conventional sources. The target group involved the marginalized urban poor in Barangay Pasil, Suba, and Ermita. NGO 2 development efforts targeted impoverished families in Carreta, Tinago, San Roque, Mabolo, and Pasil, Cebu City. The organization emphasized non-conventional funding sources by securing support from the Aboitiz Group for housing initiatives and attracting individual benefactors from Australia, Germany, and the Netherlands. NGO 3 had operations in the Central Visayas, particularly in Cebu, Negros Oriental, Bohol, and Siquijor. However, NGO 3 focused on providing assistance in Looc, Mandaue City, and Cebu City, including

Barangay Pasil. It relied on funding from various international donors from Belgium, Germany, and the Netherlands, showcasing a reliance on non-conventional sources. NGO 3 explored innovative or alternative approaches to fundraising to reach potential donors and diversify their income streams.

The funding sources of NGOs in Barangay Pasil, including conventional and non-conventional donors, have significant implications for LGUs. Conventional funding from local organizations like the Ramon Aboitiz Foundation, Inc. provides stability and continuity for projects targeting marginalized urban poor. On the other hand, non-conventional funding from international donors and individual sponsors brings diversity and additional resources that can support innovative programs and address specific community needs. This mix of funding sources enables LGUs to leverage external support while maintaining local partnerships, ultimately enhancing their capacity to address social issues and implement sustainable development initiatives in Barangay Pasil (Anheier & Themudo, 2005).

### ***NGOs Primary Beneficiaries***

NGOs play crucial roles in society by providing specialized services, advocating for policy change, mobilizing resources, and empowering communities. They contribute to addressing social inequalities and improving the well-being of marginalized groups (Anheier & Themudo, 2005). Table 3 provides an overview of three NGOs that serve in Barangay Pasil and their target groups, highlighting their roles in serving disadvantaged or marginalized populations. NGO 1 focuses on street children from families classified as urban poor who were unable to afford tutoring for their children, targeting children aged 3-5. NGO 2 serves street families, children, and youths between the ages of 7 and 28 who have never attended school. NGO 3 assisted families and children who were disadvantaged and marginalized, out-of-school adolescents, and young people aged 18 to 24 who have suffered abuse and exploitation. The number of beneficiaries for each NGO was not specified, but they have a considerable number of participants from various barangays.

**Table 3** *Primary Beneficiaries of Non-Government Organizations (NGOs) in Pasil*

	Target Groups	Age Range
NGO 1	Street children/children from families classified as urban poor, unable to afford tutoring.	3–5
NGO 2	Street families, children, and youth who have never been to school	7–28
NGO 3	Disadvantaged/Marginalized Children and families, out-of-school youths, and abused and exploited children.	18–24

The outlined roles of NGOs can have significant implications for LGUs and Barangay Pasil. NGOs can complement the services provided by LGUs and barangays by addressing specific needs of marginalized groups that may not be fully met by government programs. This can lead to improved outcomes in education, livelihoods, and overall well-being for residents in Pasil (Anheier & Themudo, 2005). NGOs advocating for policy changes that benefit their target populations can influence local policies and programs, leading to more responsive and effective governance. By mobilizing resources and building partnerships, NGOs can enhance LGUs capacity to deliver services, benefiting a larger segment of the population in Pasil. Moreover, NGOs that facilitate community engagement in decision-making can fortify local governance frameworks by guaranteeing that marginalized groups' concerns are acknowledged, and their perspectives are expressed in local development plans.

### ***Anti-Poverty Programs/Interventions***

The majority of NGOs in Pasil, Cebu City primarily focused on implementing educational programs, as shown in Table 4. The emphasis on education was consistent with the larger involvement of NGOs in Pasil as service providers, as noted in Table 1.

**Table 4** *Programs Implemented by Non-Government Organizations (NGOs) in Pasil*

	<b>Program</b>	<b>Description</b>	<b>Type of Program Services</b>
NGO 1	Free Parent-Child Coaching	Offers every family access to 30 hours of free math coaching every 3 months, along with free early learning resources and instruction in a variety of learning strategies. Aims to decrease learning disparities and socioeconomic inequities, has helped 8,000 families by teaching preschoolers' fundamental math and logic.	Educational Services
NGO 2	Mobile School and Library	Serves as an alternative learning school, targeting indigent individuals, particularly street children, and underprivileged youth in Cebu City. By focusing on those aged 7–28 who are school leavers or have never attended school, the program delivers essential education resources directly to marginalized communities in barangays. Their main goal is to bring them back to school and at the same time encourage them that going to school will help them learn a lot of things that are beneficial for their lives. This program also offers sponsorship from elementary to college.	Educational Services
NGO 3	Enhancing Self-Wage Economic Opportunities (ESWEO)	Provides 1-year vocational training, job-hunting support, and assistance with starting businesses to their beneficiaries. This program equips individuals with skills for both employment and entrepreneurship, promoting lasting financial security.	Livelihood and Employment Services

These NGOs viewed organizational change in the education sector as a 'bottom-up' process, beginning with the school as the fundamental unit of change, and possibly affecting higher levels of education (Ulleberg, 2009). This approach was backed by evidence from a case study of NGOs in India, which found that NGOs brought value to the educational system through local-level innovation (Sequeira, 2007). For example, the Indian NGO Centre for Education Management and Development concentrated on enhancing teaching techniques and teacher training, with significant managerial backing for these advances. Similarly, the Canadian NGO Canadian Organization for Development through Education sought to improve reading and writing abilities in elementary schools by increasing institutional capacity (Sequeira, 2007).

In Pasil, NGO 1 has benefited 8,000 families through its programs, while NGO 3 has supported 500 households in Cebu City. However, there was no specified number of beneficiaries for NGO 2's Mobile School and Library Program. The focus on educational programs in Pasil could have significant implications for the community, including improving literacy rates, enhancing teaching methodologies, and promoting a literate environment to end the cycle of poverty. This emphasis on education underscores the critical role of NGOs in addressing social issues through grassroots initiatives, local innovation, and community engagement.

### ***Implementations of Anti-Poverty Programs/Interventions***

NGO 1, NGO 2, and NGO 3 are strongly committed to alleviating poverty through strategic partnerships and innovative programs. The NGOs used a systematic approach that combined house-

to-house coaching sessions, mobile schools, and vocational training to tackle the diverse challenges in their target communities as shown in Table 5.

**Table 5** *Implementation of NGO Programs*

	<b>Partnerships and Regulatory Bodies</b>	<b>Program Implementation</b>	<b>Program Outcome</b>
NGO 1	<ul style="list-style-type: none"> <li>The NGO collaborates with various partners, including international and local NGOs like GLEAF, ICM Foundation, RAFI, and UBS Optimus.</li> <li>Registered with the Securities and Exchange Commission (SEC) and Department of Social Welfare &amp; Development (DSWD).</li> </ul>	NGO 1 implements its programs through a combination of house-to-house and center-based coaching sessions, aiming to overcome challenges such as parental motivation and security concerns in target areas. Strategies include partnering with daycare centers for referrals and community immersion to understand local dynamics and needs. Through these approaches, AELF ensures effective delivery of its early childhood education initiatives to marginalized urban communities.	Since 2012, NGO 1 has significantly impacted Cebu City, benefiting 8,000 families. Its free, research-backed parent-child coaching programs empower parents as their children's first teachers, enhancing early math/logic skills in preschoolers. Successfully expanded across multiple barangays, the program aims to continue growing. Collaboration with local government and international partners ensures sustainability, reducing learning gaps and social inequalities in underprivileged communities.
NGO 2	NGO 2 is registered with regulatory bodies such as the Securities and Exchange Commission (SEC), Bureau of Internal Revenue (BIR), and Department of Social Welfare & Development (DSWD). Its partners include the Department of Education, international organizations like KKS, Aboitiz, Netherlands, Australians, and various LGUs.	NGO 2 implements antipoverty programs primarily through education initiatives like the Mobile School & Library, offering access to education for qualified children from low-income families. Challenges include addressing client mindsets towards instant money and ensuring consistent school attendance among children. Strategies to overcome these challenges include providing incentives, engaging in enjoyable activities, and fostering approachable relationships with communities	NGO 2's program has significantly impacted low-income families, particularly through its mobile school initiative, which has improved educational access and academic success for many children. Engaging activities and strong partnerships sustain participation and motivation. Additionally, NGO 2's housing projects have provided shelter to numerous families, with specific projects in areas like San Pio Village and Miramar. Overall, their efforts have contributed to community development and poverty reduction.
NGO 3	<ul style="list-style-type: none"> <li>NGO 3 collaborates with various partners such as commercial sectors, educational institutions like UCLM, private companies like Ayala, and potentially</li> </ul>	Among the anti-poverty initiatives carried out by NGO 3 is Enhancing Self-Wage Employment Opportunities (ESWEO), which offers opportunities for employment, career development, and job readiness. They face challenges	NGO 3's program equipped disadvantaged youth and families from 500 households with employable skills through vocational training and job readiness support. Collaborating with private sector partners, they created job opportunities



DOLE for labor-related support. •The organization is registered with regulatory bodies like DSWD, TESDA, and the Security and Exchange Commission.	in finding suitable training venues and partners willing to accept individuals with past issues. However, they navigate these challenges by finding supportive partners like Ayala and UCLM. Additionally, they aim for sustainability through social enterprises like Saraban and digital printing, involving beneficiaries in income-generating activities. Their approach emphasizes empowerment, teaching individuals to become financially independent rather than relying solely on government aid.	and reduced dependency on government aid, fostering self-reliance and financial stability. Despite challenges like delayed training and workplace discrimination, they sustained efforts through international funding and social enterprises, contributing significantly to poverty reduction.
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By leveraging partnerships with private companies, educational institutions, local and international organizations, as well as other non-government organizations, these three NGOs were able to customize their interventions to meet the specific needs of the communities they served. This process emphasized not only the delivery of services, but also the cultivation of sustainable solutions that empower individuals to achieve long-term self-sufficiency. Furthermore, these NGOs actively engaged in advocacy initiatives at both the local and national scale to enhance public understanding of poverty-related matters and to exert influence on policy-making processes that could bring about beneficial changes for marginalized communities (Asian Development Bank, 2022). By working together with governments and other stakeholders, they made sure that their initiatives aligned with existing programs and made a significant contribution to wider strategies for reducing poverty.

A potential research implication could involve investigating the scalability and replicability of the innovative program implementation methodologies employed by the three NGOs. This could include assessing the feasibility of adapting these strategies to different contexts and evaluating the potential for broader dissemination across regions with similar socio-economic challenges. Scholars may provide significant insights for governmental bodies, NGOs, and foundations seeking to maximize the impact of their interventions through an examination of the factors that facilitate or hinder the expansion of effective poverty reduction models.

## Discussion

This study aimed to describe the roles of NGOs in supporting Local Government Unit anti-poverty programs in Pasil, Cebu City, by addressing key aspects of their operations and impacts. The profiles of the NGOs, as revealed through their missions, sources of funding, and primary beneficiaries, illustrated a diverse yet focused approach to tackling poverty. The majority of NGOs in Pasil primarily function as service providers, aligning with a Big-D development approach. This involves structured, project-based activities aimed at delivering specific services to address immediate community needs, such as education and vocational training. Their missions emphasize both technical and managerial solutions to social issues like poverty and inequality. Financially, these NGOs rely on a mix of conventional sources (local foundations like the Ramon Aboitiz Foundation, Inc.) and non-conventional sources (international donations from organizations and individuals), enabling them to sustain and expand their programs effectively. The primary beneficiaries are typically marginalized groups, including street children, out-of-school youth, and disadvantaged families, highlighting the NGOs' commitment to improving the well-being of the most vulnerable populations in Pasil.

The anti-poverty programs and interventions implemented by these NGOs are varied but predominantly focus on education and capacity-building. These programs aim to address immediate needs while fostering long-term self-sufficiency among beneficiaries. For example, educational programs targeting street children and out-of-school youth provide not only basic literacy and numeracy skills, but also vocational training to enhance employability. Such initiatives are crucial in breaking the cycle of poverty and creating pathways for a better future. Moreover, these NGOs actively engage in advocacy work, aiming to influence local policies and address systemic issues that perpetuate poverty and inequality. This dual approach of direct service provision and systemic advocacy ensures a comprehensive strategy for tackling the multi-faceted nature of poverty.

The implementation of these anti-poverty programs and interventions is characterized by strategic partnerships and innovative methodologies. NGOs in Pasil leverage collaboration with private companies, educational institutions, and international organizations to enhance the reach and effectiveness of their programs. For instance, house-to-house coaching sessions, mobile schools, and vocational training are some of the tailored interventions designed to meet specific needs of the communities they serve. Additionally, a blend of local and international funding sources allows for financial stability and the capacity to innovate. These programs are systematically executed, often involving community engagement, to ensure that interventions are culturally relevant and effectively address local needs. By combining direct service delivery with advocacy and strategic partnerships, these NGOs contribute significantly to LGU efforts to combat poverty in Pasil, creating a more sustainable and empowered community.

## Conclusion

Given the thorough analysis of NGOs' involvement in LGU anti-poverty initiatives in Pasil, Cebu City, this study reaffirms the vital contributions of non-governmental organizations towards addressing poverty and fostering community development. Through an in-depth analysis encompassing the profile, programs, and implementation strategies of NGOs, several key insights have emerged. Firstly, the varied profiles of NGOs in Pasil, including their missions, funding sources, and primary beneficiaries, underscored the diversity of approaches employed in combating poverty. Secondly, the array of anti-poverty programs and interventions offered by these NGOs exemplified their commitment to addressing multifaceted challenges faced by disadvantaged communities. Thirdly, the meticulous implementation of these programs, characterized by strategic partnerships and innovative methodologies, highlighted the effectiveness of NGOs in catalyzing positive change at the grassroots level.

Notably, the collaborative partnership between NGOs and LGUs was evident, with NGOs complementing government initiatives, influencing local policies, and enhancing service delivery. By leveraging both conventional and non-conventional funding sources, NGOs and LGUs can synergize their efforts, thereby amplifying the impact and fostering sustainable development.

The findings of this study offer valuable insights for shaping future research endeavors and policy interventions aimed at poverty alleviation. By adopting a multifaceted approach that combines service delivery with advocacy, stakeholders can strive towards addressing the systemic issues underlying poverty and inequality more effectively.

In conclusion, the unwavering dedication of NGOs in Pasil to synergize with government initiatives underscores their pivotal role in driving positive socio-economic transformation. Through concerted efforts and collaborative endeavors, NGOs and LGUs can continue to work towards realizing their shared vision of building resilient and empowered communities, ultimately fostering inclusive development, and improving the quality of life for all residents of Pasil, Cebu City.

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## **Physical Activity and Sleep Lessons Learned from Disruptions at a Residential University in Thailand: A Basis for Future Health Interventions**

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### **Abstract**

Existing research shows COVID-19 pandemic restrictions led to widespread disruptions in health-related behaviors, including physical activity (PA) and sleep patterns among university students, faculty and staff. The specific impact of pandemic restrictions and the lack of crisis preparedness at educational institutions are not well documented. This cross-sectional pilot study ( $n = 48$ ) used a self-administered questionnaire to investigate the impact of restrictions on PA and sleep to identify the health impact, possible modifiable behaviors, and policies to target for change in future crises to improve health, academic, and work outcomes, especially for institutions with natural green spaces. It was hypothesized the restrictions reduced adults' PA levels and negatively impacted sleep. Statistical analyses revealed significant differences ( $p < .05$ ) in the time spent doing medium- and high-intensity PA, walking, length of time to fall asleep, and hours slept before and during the pandemic. Concentration on infection prevention and spread rather than on health maintenance for those not acutely ill inadvertently discouraged using outdoor spaces for exercise while gym and sports facilities remained closed. These findings indicate the negative impact lockdown restrictions may have on general health, and how organizations can promote behaviors to maintain basic physical and sleep health.

**Keywords:** *Physical activity, sleep, disruption, COVID-19, cross-sectional, walking*

### **Introduction and Literature Review**

The global pandemic due to COVID-19 had widespread implications for people's health. Many aspects of life were impacted, including education. Lui and colleagues (2020) stated that the COVID-19 virus had become a great challenge and was a growing public health concern. As the number of confirmed cases continued to increase, restrictions and other measures were implemented to limit infections and the spread of the virus at the national, local, and institutional levels which included social distancing, quarantines, and lockdowns. Though these measures proved effective in controlling the spread of the disease, they had negative impacts on daily lives including reducing physical activity (López-Valenciano, 2021), increasing sedentary behaviors (Romero-Blanco, 2020), and disrupting sleep (Marelli, 2021).

Physical activity (PA) is one of the most important health factors for human beings (Sygit et al., 2019). According to Dasso (2019), physical activity is defined as "any bodily movement produced by skeletal muscles that require energy expenditure". Adults are encouraged to participate in at least 150 minutes of moderate PA or 75 minutes of vigorous PA every week to maintain general health (Bull et al., 2020). Despite the positive effects associated with PA, in the last 20 years PA has declined significantly among adults during normal circumstances (Marques et al., 2018; Liangruenrom et al., 2019). Recent results from Thailand's National Health and Welfare Survey indicated that only 42.4% of Thai adults met the World Health Organization's recommended levels of PA (Liangruenrom et al., 2017). However, a public awakening of health consciousness has led to increased interest in ways to improve health. One accessible and easy PA is walking. Studies have shown that walking is a suitable activity for people who do not want to engage in vigorous or costly exercise to improve their health (Ungvari et al., 2023) and reduce all-cause mortality, especially for those who engage for the first time (Kelly et al., 2014; Inoue et al., 2023). Studies in the UK also showed that brisk walking was associated

with reduced risk of respiratory disease (Celis-Morales et al., 2019), including chronic obstructive pulmonary disease and pneumonia-related mortality (Ukawa et al., 2019) among elderly people. Walking, particularly in groups, has also been shown to improve mental and behavioral health (Kritz et al., 2021). Walking in forested areas with natural surroundings was shown to help participants gain confidence in coping and acting on planned activities (Freeman et al., 2017). Walking was one of the activities not restricted in Thailand during the pandemic.

Another area significantly impacted by the pandemic and accompanying restrictions was sleep. A minimum of 7 hours of sleep per day is recommended for an adult between the ages of 18-60 (Watson et al., 2015). Canadian guidelines provide evidence-based recommendations in which a healthy 24-hour day includes 7-9 hours of sleep, reallocating more time for moderate-to-vigorous-intensity PA, and also allocating time to light-intensity PA (Ross et al., 2020). Numerous studies have analyzed the impact of COVID-19 on levels of PA and sleep of adults. Maugeri et al. (2020) studied the changes in PA levels during quarantine and how exercise impacted psychological health in Italy; Castañeda-Babarro et al. (2020) studied how self-reported PA and sedentary time changed during lockdown in Spain. Stanton et al. (2020) studied the association between psychological distress and specific health behaviours, including PA and sleep in Australia, during the pandemic-induced restrictions. Didriksen et al. (2021) studied a large national cohort in Denmark looking at sleep among other factors; Stockwell et al. (2021) summarized reported studies on the differences in PA and sedentary behaviour before and during lockdowns. The studies generally found that PA levels decreased, and sleep patterns changed. These results seem to have been widespread, with an international survey from the Americas, Asia, Europe, and North Africa comparing “before” and “after” confinement conditions, revealing that all forms of PA had declined, while the daily sitting time had increased from five to eight hours per day (Ammar et al., 2020).

A cross-sectional study conducted in Russia by Konstevaya et al. (2021) aimed to evaluate the changes in sleep and PA that resulted from pandemic restrictions imposed on adults over the age of 18. Between April 26 and June 6, 2020, the period of tightest restrictions, data were gathered online: participants described their sleep habits, frequency and length of walking, moderate and vigorous-intensity PA, and muscle strengthening exercises before the pandemic and for the previous seven days. Access to outdoor green space and exercise centers, Internet resources, self-isolation advice, and other preventive measures were also self-reported. The findings revealed that the number of individuals getting enough sleep decreased significantly, and policies, such as not being permitted to leave the house for PA and the closing of fitness centers, were linked to lower PA levels. Thus, in comparison to the pre-COVID era, the PA and sleep hygiene were adversely affected during the pandemic restrictions.

Martínez-de-Quel et al. (2020) conducted a longitudinal study in a Spanish sample to find out how obligatory confinement affected PA, the risk of eating disorder, sleep quality, and well-being of the target population. They found confinement significantly decreased the PA levels ( $p = .001$ ) and sleep quality ( $p < .001$ ). Physically active participants experienced a greater and significant differential effect with respect to PA, quality of sleep, and wellbeing when compared to the physically inactive participants ( $p = .05$ ). In a cross-sectional investigation by Luciano et al. (2021), Italian medical students described their behaviors during lockdowns, comparing them to pre-lockdown data and current recommendations by completing the International Physical Activity Questionnaire Short Form and items from the Pittsburgh Sleep Quality Index. During lockdowns, their PA levels decreased while the number of hours sitting and sleeping increased; even those who did report an increase in PA also reported increased sitting time. Sitting time also went up for students who slept less than seven hours each night. Sitting up may also have been due to increased time spent doing schoolwork; however, many developed habits of binge-watching television series and movies on streaming networks such as Netflix®, Disney+ Hotstar®, and unregulated sites. This led to significant changes in sleep patterns (Siraj, 2023).

Educational institutions managed the pandemic’s challenges in different ways. Many closed (Donohue & Miller, 2020) or went completely online. Residential institutions, especially those with

international students who could not return home, faced unique challenges. Reflecting on this time can provide management lessons that promote better health outcomes and consequently better educational outcomes for students and work outcomes for faculty and staff.

The purpose of this study was to examine the impact of the COVID-19 pandemic on PA and sleep among university adults. Furthermore, the study aimed to understand what modifiable behaviors could be targeted as points of intervention and management for future crises to improve health, academic, and work outcomes, especially for institutions that have access to natural green spaces. It was hypothesized that the pandemic reduced adults' level of PA and negatively impacted sleep.

## **Methodology**

This study was a cross-sectional study that included adults of Asia-Pacific International University (a Seventh-day Adventist institution in Muak Lek, Thailand) selected through convenience sampling method who lived on campus, either in the dormitories or faculty housing. The participants were invited to answer a 35-item questionnaire after a consent form had been completed.

Individuals were eligible to participate if they were above 18 years of age and residing on campus during the first semester of the 2021-2022 academic school. While a sample size of 197 participants was recommended (with a confidence level of 95%), 50 participants responded to the questionnaire, of whom 48 provided sufficient answers for use in the data analysis.

The questionnaire used was adapted from the study by Kontsevaya et al. (2021). The first seven items related to demographics; respondents also indicated the extent to which they followed self-isolation recommendations and their access to outdoor space. The next 20 items evaluated the PA of adults before the pandemic and during the seven days immediately preceding the time the survey was completed.

## **Statistical Analysis**

Demographic characteristics were categorized by sex, participant status, and residential type, and summarized using descriptive statistics. To analyze PA and sleeping behaviors, associated with the impact of the pandemic, paired *t*-tests were used. All statistical analyses were computed using a statistical software package, with significance set at the  $p < .05$  level.

## **Results and Discussion**

### **Participants**

A total of 48 participants completed the questionnaires; the response rate was low as many people struggled with online learning and the lethargy associated with many assignments. Of the respondents, 26 (54.1%) were female, 38 (79.2%) were students, and 34 (70.8%) lived in a dormitory.

During the lockdown in Thailand, this university had many restrictions in place following the DMHTT acronym—distancing, masking wearing, hand hygiene, and testing for COVID-19. On-campus restrictions rigidly enforced social distancing (especially in closed spaces like classrooms, the cafeteria, and assembly places), wearing masks, hand hygiene and COVID-19 testing; the university tested 15% of students every other week. Community members were encouraged to walk to stay active and healthy, but it was unclear if masks had to be worn while walking. Many people disliked wearing masks because they made breathing difficult, especially for strenuous activities. However, walking at a moderate pace was not so difficult, so people could walk together in groups with masks on, or they could walk alone without masks.

The study revealed the amount of time participants spent walking before and during the pandemic; please see Table 1 below for details.

**Table 1** *Comparison of Time Per Day Spent Walking Before and During COVID-19*

Minutes Spent Walking On a Normal Day Before COVID-19	Respondents		
	Pre-COVID-19	Last 7 Days (During COVID-19)	Change
None	5	7	+42%
≤ 30	12	-	-100%
31–60	23	21	-8.7%
61–120	4	17	+325%
≥ 120	2	3	+50%
No response	2	-	-100

The results showed that pre-COVID, more than 60% of respondents spent at least 30 minutes a day walking, and 85% spent some time walking per day. The UK National Health Service recommends walking as a useful form of exercise where pace can replace duration, suggesting that a short (10 minute) brisk walk can count towards the recommended 150 minutes of exercise per week, and provides numerous health benefits (NHS, 2022). A reduction in walking time would be particularly detrimental to general health, and this would be exacerbated by morose attitudes resulting from restrictions and lockdown stress (Sundarassen et al., 2020; Odriozola-González et al., 2020) and online learning (Raj & Fatima, 2020).

The average time the respondents spent walking in the seven days prior to completing the survey was 1.30 hours, or 1 hour and 18 minutes. Respondents who did not walk at all increased from 5 to 7 people (10.4% to 14.6%). However, a general increase in the time spent walking during the lockdown was observed, with 41 people walking more than 30 minutes during the pandemic compared to 29 before it. Walking may have taken the place of meeting up with friends, going to the gym, or playing team sports. There was no difference in the time spent walking when males and females were compared up to one hour; however, more males walked 60–120 minutes (3 versus 1) and more than 120 minutes (2 versus 0) than females. Restrictions on leaving campus and using the gym applied to both students and faculty/staff. Approximately 60% of both groups walked at least 30 minutes per day, but only students walked for more than 120 minutes, suggesting students were more likely to achieve the recommended daily PA goal.

Overall, the restrictions had a significant impact on respondents' PA as shown in Table 2, which summarizes paired a two-tailed *t*-test analysis of questions focusing on the amount of time spent walking before and during COVID-19.

**Table 2** *The Impact of COVID-19 on Respondents' Physical Activity and Sleep*

Change from pre-COVID-19 compared to the last seven days prior to taking the survey...	<i>p</i> value		
	Combined	Male	Female
Days not getting enough sleep	.020	.059	.358
Days having trouble falling asleep	.067	.090	.576
Days per week engaged in high-intensity physical activity	.015	.664	.016
Time spent per day doing high-intensity physical activity	.169	.025	.929
Days per week engaged in moderate-intensity physical activity	.030	.417	.055
Time spent per day on moderate-intensity physical activity	.001	.073	.013
Days per week spent strength training	.244	.439	.329
Days per week performing exercises	.330	.328	.330
Days per week spent walking more than 10 minutes	.002	.161	.005
Time spent walking on a normal day	< .001	.067	.017

Note: the *p* value is significant at < .05

Results showed a significant difference between respondents' ability to get enough sleep before and during COVID-19 restrictions (*p* = .020), days per week spent in high-intensity or moderate



intensity PA ( $p = .015$  and  $p = .030$ , respectively), time spent daily on moderate-intensity PA ( $p = .001$ ), days per week spent walking 10+ minutes ( $p = .002$ ), and time spent walking on a normal day ( $p < .001$ ).

A closer analysis showed that when divided by gender, a significant difference for males was noted in time spent per day doing high-intensity PA ( $p = .025$ ) before and during COVID-19, though the difference was not significant for the whole group. For females, a significant difference in the time per day doing moderate-intensity PA ( $p = .013$ ) was noted, along with a significant difference in the days per week spent walking more than 10 minutes ( $p = .005$ ). These results suggest that the restrictions had a greater impact on the PA of females, while males experienced a greater, though not significant, impact on falling asleep and getting enough sleep. Overall, the number of days that respondents were not getting enough sleep or had trouble falling asleep increased. Decreases were seen in the number of days they engaged in high- or low-intensity PA, the time spent doing moderate PA, and days on which the respondent walked more than 10 minutes. Surprisingly, the number of days per week spent on strength training also increased.

A study by Bisson et al. (2019) reported that sleep quality was positively related to number of steps taken, and that women who took more steps reported higher quality sleep than those who were less active. Our study showed no significant difference between males and females with regards to walking before the pandemic restrictions, but significant results when the time spent walking before and after the restrictions were compared ( $p < .001$ ). Although an increase in the number of days with inadequate sleep was reported, the increase was not significant ( $p = .067$ ).

In a study of 54 young adults over a 12-week period, Wang and Boros (2021) reported that daily walking had a significant impact on sleep quality and sleep components. Physical activity generally improved sleep quality (Lang et al., 2015). Thus, changes in sleeping patterns and quality may have directly resulted from reduction of PA levels during lockdown restrictions. Recent studies showed that problems falling asleep were more prevalent during, than before the pandemic (Marelli et al., 2021); this may be attributed to less PA. In a report by Watson et al. (2015), The American Academy of Sleep Medicine and Sleep Research Society recommended that adults should sleep seven or more hours per night on a regular basis to help prevent “impaired immune function, increased pain, impaired performance, increased errors, and greater risk of accidents.” In encouraging more sleep, it is important to note that studies have shown a U-shaped relationship between all-cause mortality and number of hours of sleep. Following a meta-analysis of sleep studies, Shen et al. (2016) reported that 7 hours/day of sleep were recommended to prevent death among adults. This sleep duration was supported by a large study in the US. Yang et al. (2020) used available data from the National Health Interview Survey (2004-2014), including over 280,000 participants, with a median follow-up period of 5.25 years. They found that sleeping less than 6 hours per day or more than 8 hours per day increased the risk of mortality compared with sleeping 7 hours per day. Alternatively, a study from East Asia with over 300,000 adult participants found sleep duration either longer or shorter than 7 hours was associated with all-cause mortality; the greatest association for all-cause mortality was sleep durations of longer than 10 hours for both women and men (Svensson et al., 2021).

Alternatively, the surge in online gaming (DiFrancisco-Donoghue et al., 2023) and watching online content (Siraj, 2023) may have been an important factor in sleep disruption. Resident hall deans and resident assistants have previously reported widespread use of online gaming sites by male students during the semester even prior to the pandemic lockdown. With the lockdown, it is likely that students spent more time on online games and other forms of entertainment.

When restrictions on other forms of exercise and entertainment are considered, it makes sense that respondents, especially students, would spend more time outside walking rather than cooped up in their rooms for a change of scenery. Pre-pandemic, the university sports grounds were used most evenings for football, volleyball, racket games, and basketball. Many more campus residents used the gym for exercise and the track for aerobic exercises, including running and jogging. Interestingly, this study's data (Table 1) showed an increase in the number of people walking 60–120 minutes. Further study is needed to understand why short walks were replaced by longer walks. This could be because

short walks were in addition to other forms of exercise or entertainment. Since other forms of exercise and entertainment were curtailed, respondents switched to having longer walks. Contrary to a study by Bisson et al. (2019), this study's respondents still reported an increase in days with inadequate sleep ( $p = .020$ ). However, this result must be viewed cautiously since the sample size was quite small.

Most respondents (75%) used digital or online sources to provide instruction and guidance on physical activities, with females using this resource slightly more (77.3%) than males (73.1%). A study by Pramono et al. (2024) compared fitness and exercise levels of university student users and non-users of fitness apps. They reported a significant difference between the exercise intensity of the two groups, as well as differences by gender. Non-users of the fitness app had significantly higher intensity exercise than users in the Pramono et al. (2024) study, but not in this one; this may have been due to the small sample size.

When asked how the pandemic had affected their PA, common responses were that it had no effect (12 respondents), they could not leave their house for sports, and the gym was closed. These results were interesting because the two highest responses were contradictory. Furthermore, the university did not restrict campus dwellers from leaving their residences to carry out general exercise, and even organized some "new normal" small group activities in harmony with closed spaces regulations, limited time for activities, and the requirement that participants wear an approved face mask.

A greater proportion of females than males indicated that restrictions had no effect on their PA; this supported data which showed that males were generally more active prior to the restrictions. The campus has easy access from housing areas to green spaces; many walking trails and paved roads pass through wooded and landscaped areas. Walking through natural zones has been reported to help improve coping mechanisms and prompt action from those who walk (Freeman et al., 2017).

Exercise improves general health and protects against hospitalization with COVID-19 (Cho et al., 2021; Rahmati et al., 2022). Health outcomes for residents may have been improved by encouraging walking as a form of exercise, even if masks needed to be worn in line with the strict campus regulations. Wearing a mask during moderate to high intensity exercise is suitable for healthy young adults without underlying health conditions (Jones et al., 2023; Shaw et al., 2021). Systemic reviews by Asin-Izquierdo et al. (2022) and Zheng et al. (2023) reported exercising while wearing face masks did not cause significant negative physiological or cardiorespiratory effects. This included wearing cloth face masks, where negative effects were experienced at higher exercise intensities (Driver et al., 2022). Changes in physiological measures (heart rate, respiratory rate, blood pressure, oxygen saturation, and time to exhaustion) were dependent on the intensity of exercise (Epstein et al., 2020). Furthermore, training outside and in less crowded places reduced the perceived negative effects of training while wearing face masks (Das et al., 2023).

Finally, the study revealed that most respondents adhered relatively well to protective measures; common responses to "wash hands more often" and "keep social distance" were 22 (46%) and 19 (40%), respectively. This suggests that signage campaign and regular online reminders helped change residents' behavior. Perhaps the university should have done more to encourage people to walk outdoors, whether leisurely, moderately, or fast-paced. During the lockdown, wearing facemasks was strictly enforced, and many people also wore them outdoors while in small groups. Wearing masks was an important tool in preventing transmission of the virus; however, the masks discouraged physical activity due to their discomfort and awkward breathing, especially while exerting oneself. Walking with a mask may be inconvenient, but walking leisurely or even moderately is possible with a mask and does not cause undue hardship. Therefore, walking should have been more strongly encouraged by the university.

Walking in the sunlight fosters synthesis of Vitamin D; Angelidi et al. (2021) reported that Vitamin D helped reduce COVID-19 mortality and invasive mechanical intervention through its immunomodulatory function. This is another reason for walking, especially during the daylight hours.

Study results indicated that restrictions imposed during the pandemic significantly affected campus residents' sleep and PA. However, data also showed that many respondents maintained their

levels of PA. Recent studies have revealed a strong inverse correlation between exercise and hospitalization with COVID-19 (Ezzatvar et al., 2022; Sallis et al., 2021; Sittichai et al., 2022; Castoldi et al., 2023; Young et al., 2023). Simple changes to campus restrictions may have helped improve PA levels, which in turn could have helped to reduce the impact of the restrictions on residents' sleep habits. In hindsight, the university could have done more to encourage physical activity to boost general health and complement the preventative measures designed to keep the virus from entering the campus community.

Several limitations existed in this study. First, a small sample size (48) compromised statistical power. Second, only a few questions addressed sleep. More questions would have provided greater insight on how inactivity, diet, sleep cycles, bedtime and wake times, and screen time affected sleep. Third, the sample was limited to international students, so findings were not representative of the whole university, nor could they be generalized to general populations. Future studies should be conducted with larger and more representative sample sizes, and includes more questions about sleep to achieve better results.

## Conclusion

This study revealed that pandemic restrictions and lockdowns had a significant impact on the PA and sleep habits of campus residents. Since the restrictions faced by respondents were similar to those in many locations, unsurprisingly, negative impacts mirrored findings of other researchers such as Chouchou et al. (2021), Diniz et al. (2022), and Konstevaya et al. (2021). Consequently, some campus residents reduced their physical activities even though walking or jogging were not restricted. The university administration could have encouraged residents to maintain or increase their physical activity through education and announcements about how walking or jogging improves general health and sleep quality.

These findings highlight directions for future interventions. These include reminding the community to remain active, especially by walking along the wooded natural areas where getting Vitamin D improves immune function and protects against infection and disease. Current recommendations by sleep experts of the need for at least seven to nine hours per night should also be pointed out and emphasized.

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# From “Suem Sao” to “Rok Suem Sao” and After: An Ethnography of the Diagnosis and Treatment of University Students Diagnosed with Major Depressive Disorder

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## Abstract

This ethnographic study explored the subjectification and psychiatrization journeys of Bangkok youths who went from realizing they were suffering from *Suem Sao* (Depression) to being diagnosed with *Rok Suem Sao* (Major Depressive Disorder). Through ethnographic interviews, the research examined how cultural perceptions and societal stigma influenced the acceptance and internalization of their depression diagnosis and its social and personal consequences. Focusing on seven young adults, a complex interplay between culture and medical diagnosis was revealed. Firstly, pre-psychiatrization, participants generally accepted their psychiatric labels, often due to the perceived authority and credibility of professionals. Secondly, during psychiatrization, some participants felt dissatisfied with the treatment as doctors strongly relied on prescriptions and lacked communication skills, particularly incorporating inappropriate scenarios of Dhamma into the treatment or unintentionally gaslighting conversation. Thirdly, post-psychiatrization, this study documented the pervasive stigma associated with depression, which significantly impacts an individual's willingness to seek help, tell others, and their subsequent treatment experiences, such as discrimination, feelings of hiding, and burden from having depression, particularly in academic environments. Participants reported a range of responses to their diagnoses, from relief at having their feelings validated by doctors to continued struggles with accepting their condition amidst ongoing stigmatizations.

**Keywords:** *Thai mental health, depression, psychiatrization, subjectification, psychiatry*

## Introduction

*Suem Sao* is a common term for sadness or depression in Thailand. This condition is becoming more recognizable as it becomes more visible on social media and talked about in public. Interestingly, many who experience depression in Thailand are young people. Despite its growing recognition, a significant gap remains in understanding how many young people seek therapy for depression or accept that they have depression. When symptoms persist and worsen, individuals may consult psychologists or psychiatrists for further investigation. If such symptoms continue for more than two weeks, medical standards classify this condition as a Major Depression Disorder (MDD).

*Rok Suem Sao*, is one of the most common psychiatric illnesses, with at least 1.5 million people aged 15 and above having been diagnosed with it in Thailand. This condition a significant cause of death among youths, and according to Mental Health Department data (Hfocus, 2023), the number of patients is increasing. For this reason, depression has become more talked about in Thai society than ever before. However, despite the increased discussion, depression is still not as accepted in society to a large extent. The media and society still frequently present or perceive a misrepresentation of depression as a disease experienced by people who are weak, seeking attention, or of bad character, leading to widespread stigmatization in the community. The problem with stigmatization is that many people who feel depressed do not want to see a doctor because they do not want society to judge them.

For these reasons, the researcher investigated the experience of how young MDD patients in Bangkok experienced a process of subjectification, and the ways in which they come to recognize and internalize their identity as someone who was clinically depressed. The underlying social implications in terms of accepting the given diagnosis, as well as the process of psychiatrization and its aftermath, were explored by employing a psychological/anthropological way of thinking along with ethnography, to capture the nuanced experiences of young individuals with depression in Bangkok.

The researcher believes that this qualitative approach was ideal for this topic since it allowed for an in-depth exploration of participants' personal and cultural narratives for both the subjectification and psychiatrization processes. Ethnographic interviews facilitated direct engagement in the participants' environments, providing insights into how cultural beliefs, stigma, and healthcare practices intersected with their lives. This method is particularly effective in understanding the subjective and complex nature of depression within a specific cultural context, making it an essential tool for this type of research.

The researcher aimed to identify a common pattern with the psychiatrization process in Thailand, and to answer some questions such as: Was it easy for respondents to accept that they were officially clinically depressed? What were their reactions? For the psychiatrization and its aftermath, what was their journey after receiving the MDD label? Did anything change in their lives? Their overall experiences after receiving such a diagnosis were voiced through ethnographic interviews.

## Literature Review

This section begins with definitions of subjectification and psychiatrization.

For *Subjectification*, Foucault viewed it as the procedures by which subjects are led to become who they are. For him, subjects emerge in two interconnected ways: they are subject to, and subject themselves to rules; and determine who they are through their own free acts. He discusses these two senses of subject as "subject to someone else by control and dependence; and tied to his own identity by a conscience of self-knowledge" (Foucault, 1982, p. 331). His thinking about this evolved through a process of self-observation, self-analysis, self-interpretation, self-knowledge, and even self-empowerment. Subjectification "refers to the procedures by which the subject is led to observe himself, analyze himself, and recognize himself as a domain of possible knowledge...the way the subject experiences himself in a game of truth where he relates to himself" (Foucault, 1982). Thus, subjectification refers to how participants recognize, internalize, and adopt certain identities. In this paper, they took on and identified with the feelings and diagnosis of someone with Major Depression.

For *Psychiatrization*, Beeker and her colleagues (2021, p. 3) sought to understand the growing use of mental health services in societies around the world, calling this "a psychiatrization of society". They viewed psychiatrization as "a complex process of interaction between individuals, society and psychiatry through which psychiatric institutions, knowledge, and practices affect an increasing number of people, shape more and more areas of life, and further psychiatry's importance in society as a whole" (2021, p. 3). Psychiatrization can include the medicalization of behaviors and emotions in everyday life, as well as seeing a psychiatrist, (over)use of psychiatric treatments, and so on.

Previous research on depression in Thailand and Southeast Asia should also be noted. Kaewpila et al. (2020) studied the factors contributing to depression among Thai medical students, examining how institutional, cultural, and individual factors interacted to influence their mental health. In-depth interviews with medical students who had been identified through screening as experiencing moderate to severe depression gathered detailed insights into their personal and environmental challenges. These researchers found that a combination of high institutional demands, personal vulnerabilities, and inadequate support systems led to significant levels of stress and depression among these medical students. Their findings are useful for this study since they reveal that depression in Thailand, especially for young medical students, is still visible and complex.

Another larger scale study by Dessauvagie et al. (2021) involved a systematic review of six ASEAN countries—Cambodia, Laos, Malaysia, Myanmar, Thailand, and Vietnam—concerning depression. The results suggested a prevalence of mental health problems among university students as well as a lack of willingness to seek professional help. These findings are beneficial to this study since they provide a cultural background indicating low mental health literacy in ASEAN countries and potential stigmatization, which are significant barriers. This inspired the researcher to look at the problem of seeking professional help in Thailand, the pathway to psychiatrization among young individuals.

In the context of psychiatrization, Rose (2006) studied global trends of psychiatric diagnoses and treatments, as well as the social and ethical implications of such trends. He argued that psychiatric



practice has widened, leading to the medicalization of many behaviors that might previously have been considered within the range of normal human experience. He argued that there has been an expansion in viewing personal and social problems through a medical lens, and increasing acceptance of psychiatric drugs as solutions for a wide array of issues. Thus, the researcher incorporated this notion into patient interviews to establish whether or not this is true for Thai society.

Whooley (2017) also discussed that the Diagnostic and Statistical Manual of Mental Disorders (DSM) has gone through many revisions yet failed to advance its scientific understanding of mental health conditions, often reflecting changes in social attitudes and politics rather than scientific discoveries. Whooley suggests that use of the DSM as a diagnostic tool perpetuates the professional power of psychiatrists by enabling them to define and control the mental health discourse. This power is not necessarily derived from a deep understanding of the disorders but rather from the ability to set the terms and standards by which mental health is understood and treated. Thus, diagnosis can also be used as a political tool to limit people. However, since Whooley's work was based in an American context, this study explored whether such labels can also be oppressive in the Thai context.

According to Horwitz and Wakefield (2023), the medical model treats depression as a disease with specific symptoms and biological causes that often require pharmaceutical interventions. Social model thinkers, on the other hand, posit that depression originates from external stressors, events, and experiences; hence depression should be treated by considering social and environmental factors as well. These authors also suggest that treatments should be tailored and might often include social interventions rather than only medical ones. Since depression can be viewed not only from the medical side, but also from the social side, the main focus of this current research project was to investigate the experience and consequences of depression from a social perspective.

The book entitled *Culture and Depression: Studies in the Anthropology and Cross-Cultural Psychiatry of Affect and Disorder* (1985), combines depression with anthropological fieldwork. It argued that depression is not universal but differs according to culture. This variation extends to symptoms, diagnosis, and treatment practices. The book also advocated the integration of anthropology, psychology, and psychiatry to develop a more nuanced understanding of depression that respects cultural differences and incorporates them into practice and research. Many contributors to this book had investigated depression in various cultures, thus inspiring the researcher to investigate the processes of subjectification and psychiatrization in Thailand.

## **Methodology**

The researcher conducted semi-structured interviews with seven individuals currently diagnosed with MDD. The recruitment process initially identified 11 potential participants; however, the inclusion criteria necessitated a diagnosis of MDD, leading to the disqualification of two participants. Furthermore, one participant voluntarily withdrew from the study, citing concerns that the interview process might evoke traumatic memories. Another participant was excluded due to a personal situation that led to emotional instability; this decision was taken as a precautionary measure to allow the participant time for self-healing and to prevent potential mental health damage. Consequently, the final participant cohort comprised seven individuals, six of whom were female, and one was male.

Prior to the interviews, all participants were required to submit documentation or verification of their current symptoms to ascertain their mental health status. This preliminary step ensured that participants were in a suitable condition to engage in the interview process, safeguarding their well-being throughout the study.

The study participants mostly consisted of individuals with whom the author had been acquainted during a period of admission to a psychiatric ward. Some were selected using a snowball technique, with one participant guiding the researcher to meet friends who suffered from the same condition. Interview duration varied, ranging from approximately 45 to 80 minutes. Most participants were higher education students, mostly undergraduates, with some recent graduates. Interviews were conducted both in-person and online via Zoom, according to participant availability.

Questions were asked in two major stages: 1: Examining the Process of Subjectification, consisting of four sub-thematic questions, and 2: Examining the Consequences of Receiving a Diagnosis/Label, also consisting of four sub-thematic questions. In the first stage of the interview, the researcher asked the participants about the starting point at which they recognized their depressed emotions (*Suem Sao*). They were also asked how they handled their feelings at that time, leading them to see a psychiatrist for official support, as well as their reaction when diagnosed with MDD. The participants' responses allowed the researcher to learn about their subjectification process. For the second stage of the interview, the researcher asked the participants about their psychiatrization experience and the consequences of receiving a diagnosis that might impact both personal and social aspects.

At the outset of the interview, the researcher commenced the session by engaging in a discussion centered around the participant's daily life, serving as a preliminary exercise to create a conducive atmosphere for dialogue. This approach subsequently facilitated a seamless transition to the first thematic question. Depending on the appropriateness of the context, additional sub-questions were posed to elucidate further insights. Considering the privacy of the participants, no audio or visual recordings were made during the interview sessions. However, the researcher carefully documented significant details in Thai. These notes were subsequently translated and summarized into English to enable a comprehensive analysis of the data. The analytical process focused on distilling key ideas expressed by participants in relation to the thematic questions and theoretical framework.

For the framework of this project, the researcher primarily used the Top-Down and Bottom-Up concepts proposed by Beeker et al. (2021) in their work entitled *Psychiatrization of Society: A Conceptual Framework and Call for Transdisciplinary Research*. These authors suggested that psychiatrization is a complex process that involves the interaction between individuals, society, and psychiatry itself. In order to understand this phenomenon, the traditional top-down approach might be outdated. Instead, a combination of both top-down—an institute that seeks to diagnose patients—and bottom-up—patients who want their condition to be confirmed by doctors—should be considered for a more comprehensive interactive process. This framework can be used to better understand why patients have such reactions when realizing their depression, allowing for a clearer understanding of how young people in Bangkok experience subjectification and psychiatrization in a more interdisciplinary way.

## Results

Information about the seven participants is shown below in Table 1.

**Table 1** Participant Demographic Profiles

Case	Sex	Age	Birthplace	Occupation	Current Diagnosis	Current Condition
Case #1	Female	26	Nakhon Pathom	Employee	MDD, PTSD	Worse
Case #2	Female	23	Nakhon Nayok	Student	MDD, PTSD, Panic Attack, ADHD	Getting Better
Case #3	Female	26	Lopburi	Legal Officer	MDD	Getting Better
Case #4	Female	25	Samut Sakorn	Student	MDD	Getting Better
Case #5	Male	32	Nonthaburi	Lecturer	MDD, ADHD	Getting Better
Case #6	Female	23	Buriram	Student	MDD	Worse
Case #7	Female	21	Bangkok	Student	MDD, Anxiety	Getting Better

### ***Pre-Psychiatrization: Process of Receiving a Diagnosis and Subjectification***

In all seven cases, the research participants developed depressive symptoms during childhood or in adolescence. In some cases, there might also be an underlying genetic relationship. The depressive symptoms (*Suem Sao*) among research participants varied, but overall, the issues can be broadly summarized into the following major themes: academics, being bullied, family and relationships, and possibly genetics. Despite the variety of causes, the factors that led research participants to decide to see a psychiatrist may be divided into two categories: 1) deciding to go by themselves; and 2) being observed by others, leading them to seek medical help.

Firstly, only one participant decided to go to a psychiatrist on her own. Participant #6 told her mother that she felt like she was experiencing stress, but her mother dismissed it as normal teenage behavior. She then researched depression on the Internet, including hospital websites and patient experience videos. Feeling that the symptoms fitted hers, she asked her mother to take her to the doctor and eventually learned that her condition was not just stress but clinical depression.

Secondly, the other participants reported that they did not initially decide to see a psychiatrist, but others who had observed them suggested they seek professional help. For example, Participant #1 was approached by a teacher about self-inflicted injuries, which made her consider seeing a psychiatrist. Participant #2 was approached by a primary school teacher to whom she was close, who noticed her deteriorating condition and suggested she see a doctor. Participants #3 and #7 had similar situations, being approached by friends who already suffered from depression and saw their similar symptoms. Participant #4 was influenced by her mother, who had previously suffered from depression, and noticing her symptoms, urged her to go to the hospital. Participant #5 decided to seek help after consulting with a psychologist and realizing his condition was more than just normal stress.

It is particularly interesting that the nature of depression is often initially misunderstood as being merely stress, leading many people to delay seeking medical help unless someone observes and recognizes their abnormal symptoms. This is troubling, since it may delay a diagnosis of depression until it may be too late for effective treatment.

In terms of subjectification, after participants realized their abnormal emotions, many still doubted their condition. It should be noted that despite consulting those around them, some participants did not embrace their diagnosis. As a result, they considered their abnormality to be stress or sometimes craziness instead, as reported by one of the participants (Participant #6), who said, "Am I going to be insane?" This reflects that becoming "depressed" is identified as being undesirable.

When asked about their feelings upon being diagnosed with depression, Participants #1 and #2 did not initially believe the diagnosis until seeing the official medical certificate, only then accepting that they were truly suffering from depression. Participant #3 mentioned that she was not particularly concerned or shocked by the diagnosis; she simply wanted to recover and sought help from her doctor. Participant #4 expressed a desire to understand exactly what was wrong with her and emphasized the importance of a correct diagnosis by the doctor. She finally accepted her condition of depression, comparing it to a mountain being lifted off her chest because she finally knew what was wrong with her. This case reflects the significant power of medical confirmation for patients who feel hopeless and lost regarding their condition. Participant #5 reported feeling unsurprised by his diagnosis because he had been through considerable difficulties, so he accepted the doctor's diagnosis readily. Participant #6 was shocked to learn of her condition and did not want to acknowledge it. She clearly expressed her concerns about being diagnosed with depression due to its social stigma, being perceived as a condition of those with "bad character/personality." Nevertheless, she did not deny it, even stating, "I unfortunately got Major Depression," and emphasized that knowing helped in getting timely and accurate treatment. Finally, Participant #7 accepted that she had depression even before the doctor confirmed it because she had already started self-harming. She had checked her symptoms online and knew they matched those of depression, so the diagnosis did not surprise her.

It can be concluded that each of the participants had a different subjectification process when diagnosed, but overall, they did not find it difficult to accept that they were clinically depressed. Some immediately accepted their illness when told by a doctor, while others did when they saw concrete

evidence, like a medical certificate. However, due to the participants' backgrounds, many initially doubted their own abnormal emotions. Visiting a doctor served as both social confirmation and solidification of their identity as someone genuinely ill. Interestingly, it was difficult for patients to resist this diagnosis because it came from a medical authority that appeared rational and trustworthy, while the severity of many participants' conditions meant that immediate medical attention was required. Thus, it can also be concluded that most participants did not develop subjectification themselves, but rather by confirmation from a doctor. While not embracing it entirely, they unwillingly accepted it due to their deteriorating health conditions, reflecting their belief that MDD has never been perceived as an ordinary illness, but a peculiar condition.

On the one hand, this aligns with the idea of subjectification from Foucault (1982, p. 778), who proposed that a human becomes a "subject" from institutional practices, particularly the "dividing practice," which separates the healthy from the sick. Thus in this case, many participants—along with society—have internalized the concept of dividing practice, resulting in them partially embracing it while also wanting confirmation from a psychiatric institution with the power to guide their "lost" feelings at the time. On the other hand, there is a normalization of stress rather than recognizing it as a problem. This may be why many participants become so used to being sad that they became numb to their feelings and tend to avoid seeing a doctor; since they had already normalized these feelings, they no longer recognized them as being abnormal unless told by others.

### ***Psychiatrization: Process of Treatment***

After research participants were officially diagnosed with depression (*Rok Suem Sao*), treatment that involved taking medication prescribed by a psychiatrist started. Participants' experience in seeking medical help varied, as highlighted in the following.

After being diagnosed with depression, Participant #1 began to understand her behavior better, realizing it stemmed from an imbalance of chemicals in her brain. After receiving a medical certificate diagnosing her with depression and taking medication for a while, she truly accepted she was suffering from the condition. She described her experience at a particular hospital as somewhat unsatisfactory. After graduating from university, she had to switch hospitals. She recounted an interaction with a doctor at the new hospital, who inappropriately joked, "Don't commit suicide, because if you do, it would be the doctor's fault," which she felt was an entirely unacceptable comment. The doctor suggested she make merit, which made her unsure whether she was dealing with a medical doctor or a fortune teller. The researcher viewed this as a maladaptive attempt to relate to the patient in a way that could negatively affect her due to gaslighting, reflecting the doctor's lack of communication skills. Furthermore, the doctor suggested cultural activities like making merit, which could dangerously stigmatize the patient by suggesting that she was sinful or that her condition was due to sin, worsening her depression and self-image. In the worst-case scenario, if a patient decided to commit suicide to escape these imposed feelings of guilt, it would clearly be seen as inappropriate advice for someone with depression. From the patient's perspective, seeking a doctor's help means that one can't find a solution, yet is judged and advised to make merit instead of receiving proper treatment.

Similarly, Participant #2 shared that after being diagnosed her with depression, she initially refused to accept the diagnosis, feeling 50/50 about it. However, she eventually accepted it when seeing it officially written on her medical certificate. She described her treatment process as strange. Like most patients, initially she was prescribed medication, but struggled with side effects at first. Interestingly, similar to the case of Participant #1, Participant #2 mentioned that her doctor suggested she listen to life coaches, chant prayers, become a monk, and listen to Dharma teachings, with which she disagreed. Participant #2 felt that despite the doctor offering many options, it seemed like a covert way of pressuring her to follow them. This could be seen as a healthcare worker taking a position of authority by dictating the treatment (Beeker et al., 2021; Rose, 2007). She disagreed with the doctor's approach, viewing life coaching as nonsensical and deceitful. At that time, many scandals and news stories on life coaches supported her view. This example reflected how doctors may try to adapt their practice to current situations, although sometimes this be inappropriate. The researcher noted that

doctors need better critical thinking skills, enabling them to discern how best to communicate with patients to avoid misunderstandings. Moreover, Participant #2 shared that once she began going to see the doctor, she felt that the number of diagnoses kept increasing. Initially diagnosed with depression, she was later diagnosed with additional conditions such as PTSD, ADHD, and anxiety disorder, which she found intriguing. The researcher viewed these additional diagnoses as a deeper dimension of psychiatrization, with the participant being viewed as the doctor's customer.

After being diagnosed with depression in England and having taken basic medication for a while, Participant #5 was ready to return to Thailand, and thus permanently discontinued his treatment in England. He began treatment at a university hospital in Thailand, where he started his second degree. He shared that the difference between the treatment experiences in Thailand and England was the amount of time the psychiatrists had to offer. In England, even though he did not see a specialist psychiatrist but a general practitioner, he felt like someone was listening to him. He emphasized that part of his positive response might be due to his good experiences in England, where the university's psychology team would inquire and ask questions that encouraged self-reflection. He felt he gained something from each session, and importantly emphasized that the treatment team's communication style in England seemed more empathetic. Although he did not say it was bad in Thailand, he felt that the doctors did not have sufficient time for patients due to high patient volume, leading to less communication. It seemed that treatment from the Thai doctors focused more on prescribing medications than healing minds. When asked how the psychiatrist could help, sometimes he could not answer because he felt at a loss, too, leading to conversations that ended abruptly. This is another case reflecting communication problems with doctors in Thailand. Focusing solely on medication while ignoring basic human factors like communication, which is also a tool for helping patients, may lead to unresolved issues.

The remaining participants mostly mentioned suffering from side effects of medication when entering the prescribed treatment procedure. One participant (Participant #6) mentioned that she behaved more politely because she did not want others to view her as being troublesome for having clinical depression. This reflected that stigmatization had a considerable impact on her identity, and psychiatrization has somehow shaped how she should behave (as discussed in the next section).

Overall, the main theme arising from the process of treatment and psychiatrization experienced by the seven participants was the heavy dependency on psychotropic prescriptions from psychiatrists and a lack of proper communication from the doctors. Two sub-concerns, therefore, emerged: localization of practice, such as recommending that patients listen to Dhamma, and inappropriate communication, such as (unintentional) gaslighting from the doctor, both of which can cause serious harm to patients. These issues reflect the necessity for additional communication skills training for doctors, both culturally and strategically.

### ***Post-Psychiatrization or Post-Diagnosis: Stigmatization at the Social and Personal Level***

The study participants shared both the positive and negative social and personal impacts that they experienced after being diagnosed with depression (stigmatization). Interestingly, before asking this question, the interviewer enquired whether the participant had told anybody about their sickness or emotions. Many participants reported that they did not tell anybody, choosing to hide their depression from those around them. The interviews revealed that all seven participants opted to conceal their condition in some way. Some chose to inform only their families, while others, due to family issues, confided in a few friends or a partner.

Participant #3 shared that she was afraid to tell her family due to fear of being judged as an adult; she worried they would not understand the gravity of her situation. Instead, she chose to confide in her friends, who became concerned and ultimately helped her to seek medical attention. Alternatively, Participant #6 decided to tell her mother because of their close and trusting relationship, which made her feel comfortable enough to share. These cases reflect how family relationships played a crucial role in the participants' decisions with whom they chose to share their feelings and emotional state

with at the time. In addition, due to the potential stigma of telling others about their depression, many participants foresaw a negative outcome, which prevented them from disclosing such concerns.

Many participants shared their experiences after receiving a diagnosis and the many ways, both socially and personally, that it affected their lives. While a mixture of positive and negative impacts were seen, the negative effects seemed to be more pronounced. The following four cases are of particular interest.

Participant #7 shared that after being diagnosed with depression, she felt it allowed her to see her own worth more clearly and connect with others who also suffered from depression, providing a chance to re-evaluate herself. However, some aspects were not so positive, especially regarding her friends. Her friends noticed a decline in her work performance, began to find her annoying, and saw her as a burden to the team; they did not understand her at all. Initially, her mother did not understand either, even accusing her of wanting to be depressed. However, after realizing the severity of her condition, her mother tried to adjust and learn more about it, while her siblings started to communicate better with her. Her university professors and the department staff also began to provide more support and care. She believes that people became more empathetic toward her after they understood the difficulties she faced due to depression. However, this is merely the positive feedback shared by the participant; she also recounted quite a few negative experiences, particularly with her friends, reflecting a similar pattern also observed in other research participants.

Participant #4 shared that after receiving her diagnosis, she had more direction and knew what to do. She did not feel like a burden, but was concerned because her mother was very worried about her becoming a burden. However, she realized that after being diagnosed with depression, she was treated differently in a way she did not like, and just wanted people to understand what she had been through. Nevertheless, not everyone empathizes with those who are depressed or understands what they are going through. As her condition worsened, she decided to tell a small group of friends. She had to undergo Electroconvulsive Therapy treatment, which caused her to lose some skills when returning to her studies, making it difficult for her to perform as well as before. She had to ask professors for recorded lectures and watch video clips repeatedly because she could not grasp the lessons. However, her peers in the class were displeased, thinking she was receiving preferential treatment. She shared that her friends accused her of exploiting her depression for personal gain, which hurt her deeply, making her regret sharing her condition with them since it led to gossip. Additionally, some professors were completely unaware of the realities of depression; she mentioned that one professor showed no empathy toward her at all. Ultimately, she felt good about having a clear diagnosis of depression, but also despised the other aspects, knowing that the term “depression” could also imply that she was a social outcast, a drag, or a burden to society who needed looking after.

Similarly, Participant #2 shared that at first she had not told anyone outside her family about her depression. However, she needed to inform the head of her department about her illness, which led to her peers becoming aware of her depression even though she did not want anyone to know for fear of being judged. After being diagnosed with depression, she felt worse about herself, as if she was a burden to her family and friends who had to deal with her mood changes. She also mentioned significant side effects from her medication, which caused her to gain weight. However, she jokingly said that at least depression taught her not to trust people easily, which she saw as a double-edged sword. She also shared similar experiences to those of Participant #4 about her education, saying that she was gossiped about because her peers thought that being depressed meant getting special treatment from professors. In reality, she did not want any special privileges; she just wanted to complete her studies like everyone else.

Participant #5 felt bad about himself because he felt like a burden. He also mentioned that when he became depressed, his friends gradually started to disappear. He was the oldest participant in the group being studied, so his experience with depression did not coincide with those of other participants. He had been suffering from depression since 2018, a time when there may have been less awareness about mental health in Thailand. He emphasized that this period was particularly difficult compared to the present, when more empathy exists toward such conditions. The direct social

impact that he experienced after diagnosis was non-acceptance from his family. At that time, having depression was equated to being suicidal—it was not considered normal. Those labeled as depressed were seen as people who could never be happy, leading to suppression because parents would prohibit them from posting about sadness, expressing it, or showing any signs of wanting to end their lives, making it confusing for them to determine whether this was beneficial or detrimental. On the one hand, it could be seen as concern, while on the other, the significant stigma attached to depression by society meant that his parents did not want him to be associated with the disease.

After being diagnosed with depression, patterns observed among the research participants can be divided into personal and social impacts, with the general experience in Thai society being quite negative. On a personal level, some participants felt they had become a burden, while others did not see themselves as such. However, a significant number clearly felt like a burden and internalized the concept of stigma in some way. Historically in Thai society, depression was seen as a disease experienced by people who are unhappy with life and likely to eventually commit suicide, while in contemporary times, it has become viewed as a disease experienced by people who are likely to create a burden for others. However, many participants do not want to burden anyone, demonstrating that individuals with depression tend to be concerned about how others perceive them because they do not want to be seen as burdensome. Furthermore, having depression also changes self-perception, both positively and negatively, such as becoming more cautious in friendships due to experiences of betrayal or becoming more self-reflective.

On a social level, research participants reported that those around them had negative perceptions of depression. A clear stigmatization of depression exists in Thai society, especially in academic institutions like universities or schools, which are not safe spaces for students with depression. There is a perception that those who are depressed receive more privileges, leading to biases that may not reflect reality, but arise from the competitive nature of academic environments. This diminishes empathy toward those with depression and reinforces the stigma that depression in Thai society is not just about weakness, but also about being a burden. This leads people who do not understand depression to believe that those who are weak receive special privileges when—in fact—patients do not desire special treatment, but only fair support to avoid being a burden to anyone. Patients already bear the weight of self-stigmatization. Depression is almost seen as a despicable disease among teenagers in competitive university environments, where peers view those experiencing it as a drag on the group. As such, they need special help. However, people with depression do not want special treatment; they just need understanding. Moreover, interviews revealed that people surrounding the research participants generally lacked understanding or awareness about mental health, which could be why misconceptions and stigmatization still occur. Of particular concern is that university society is highly competitive, and individuals forget to practice empathy toward each other, viewing illness into a matter of attention seeking. Thus, it is important to focus on raising awareness about depression before society misinterprets it further, causing more people to suffer from its social impacts.

### ***Psychiatrization Process in Thailand***

In the end, the complex subjectification and psychiatrization processes of depression among young people in Bangkok can be divided into three phases.

In terms of subjectification and pre-psychiatrization, the study examined how participants initially recognized their depressive symptoms and the pathways to seeking psychiatric help. The findings suggested that many participants would only visit a psychiatrist if encouraged to seek help by someone close to them who noticed their distress. Furthermore, after being labeled clinically depressed, they had mixed feelings about accepting it, implying that the stigma associated with mental illness in Thai culture played a significant role in their hesitation to embrace the diagnosis.

The psychiatrization stage covers the experiences of participants receiving and reacting to medical treatment for depression. During the interviews, participants reported varied experiences with psychiatric treatment and doctor interaction, with some expressing dissatisfaction with a purely medical approach, which often failed to consider a patient's cultural context.

During the post-psychiatrization (post-diagnosis) stage, various social and personal consequences after receiving treatment were discussed. These included the social impact experienced by participants, such as the significant social stigma associated with being labeled as someone suffering from depression, affecting their relationships and social interactions. Many opted to hide their diagnosis from others outside of their immediate families or close friends. As for personal impact, the diagnosis of depression had mixed impacts on participants' self-perception. Some felt more understood and supported, while others felt more isolated and stigmatized.

## Discussion

Studying the experiences of depressed young adults in Bangkok has helped to clarify how young people internalize cultural stigma and acceptance of psychiatric labels. In this section, similarities and differences in this study's results are compared to those of other scholars, and the limitations and potential development of this research are discussed.

Firstly, the phenomenon experienced by the interviewed group was that they did not want to seek help or tell others about their condition in the beginning unless it was necessary. This study suggested that most participants somehow concealed their symptoms from their social circles and did not initially visit the doctor on their own. In other words, most only decided to see a psychiatrist due to the worsening of their condition and the influence of others. Many also ignored the condition, saying that it was just normal stress and they could cope. This situation is similar to a study in Catalonia by Martínez-Hernández et al. (2014), who suggested that many young individuals perceived their mental health issues as manageable without professional intervention, choosing instead to rely on personal coping mechanisms. However, it is important to note that a major difference between the two papers might be due to the cultural context. While Martínez-Hernández et al. (2014) suggested that stigma and accessibility issues were significant barriers, this study implies that collectivist cultural and social pressures from family and society in general perpetuate social stigma.

Secondly, it is worth noting how the participants accepted psychiatric labels and went along with them, without doubting the diagnosis. This contrasted with the research conducted in Sweden by Lindholm and Wickström (2020), who suggested that young people in Sweden did not simply accept psychiatric labels as fixed or unchangeable. Instead, they actively engaged with these labels, often redefining or transforming their meanings. They borrowed the term "Looping Effects" from Hacking (2004, p. 279) that suggests that classifications not only categorize individuals, but also affect them—people change in response to being classified. These changes can then lead to modifications in the classifications themselves, a process referred to as looping effects. However, possibly due to cultural differences, looping effects did not occur in the Thai context, but in fact, participants seemed to internalize and passively accept labels from psychiatrists. This reveals that medical rhetoric is still effective in Thai society, and is aligned with Rose (2007), who argued that biomedical powers, including psychiatry, have extended their reach into almost every aspect of human life. This could explain why patients did not contest psychiatric labels, seeing them through the lens of Foucauldian biopower and the formation of subjectivities.

Thirdly, despite being a small element of the research, it is interesting that psychotropic medicines are still utilized as a primary way to treat depression, rather than considering the social perspective. This was aligned with Rose (2006), who argued against the overuse of psychiatric medicine in mental health. Notably, some participants reported during the interviews that psychiatrists did not have time for them, merely asking about the medication, which made them feel like talking to a robot pharmacist rather than a psychiatrist willing to listen. This potentially suggests that Thai doctors do not really have time for patients due to their workloads and systems.

Lastly, comparing the findings of this study to similar research on the experiences of depressed patients, Martin and Atkinson (2020) revealed that UK students felt disengagement and isolation as depression took hold, describing it as "The weariness of the world was upon me," and "It all fell down to chance." This present study also implied the same, in that many participants also experienced loneliness. Interestingly, they experienced isolation due to ostracism from university friends who



internalized negative concepts of depression and judged them, reinforcing their depressive symptoms. However, unlike participants in Martin and Atkinson's (2020) study, who reported significant barriers to accessing mental health services, the findings of this present study suggested a different dynamic. In Bangkok, the authority of medical professionals often led to a quicker acceptance of psychiatric labels, potentially influencing the speed and manner in which students seek help. This difference might be attributed to cultural variations in the perception of mental health and figures in authority, as well as the availability and societal acceptance of mental health services.

This research study had several limitations. Firstly, the sample was small and not representative of the population of Bangkok. Furthermore, the participants were university students, whose way of life or immediate priorities in life may be different from other groups of people. Another limitation may be that the participants of this study were already acquainted with the researcher, which may be deemed unprofessional; nonetheless, the participants were able to provide a very insightful and deep understanding of their lived experiences since they trusted the researcher. For further studies on this topic, participants may be recruited directly from hospitals to enable a larger sample. Furthermore, research needs to be conducted systematically over a longer period. It is hoped that greater attention will be given to psychiatrization and psychological anthropology to shed more light on the lived experiences of patients suffering from stigmatization.

## **Conclusion**

From its findings, this study revealed that acceptance and internalization of a depression diagnosis are deeply influenced by cultural perceptions, such as that of society toward mental health, which often results in societal stigma. Participants displayed varying degrees of readiness to accept their psychiatric labels. Most participants ultimately accepted them, often influenced by the authoritative status of medical professionals within the Thai culture. The findings also suggest that while psychiatrization helps frame and treat depression, it tends to overlook the patient's voice, experiences, and social situations. This leads them to be placed into fixed cultural and clinical categories that may not align with their cultural and personal narratives. In addition, many participants also reported inappropriate actions from doctors, which the researcher saw as an attempt at medical localization, a practice that is harmful rather than helpful. This misalignment highlights the need for a more culturally sensitive approach to the psychiatric treatment of depression in Thailand.

This research study offers valuable insights for psychiatrists by demonstrating the importance of understanding the cultural dimensions of diagnosing and treating depression among young people. It highlights discrepancies between patients' cultural identities and predominantly Western psychiatric models, along with the need to pay greater attention to the patient's voice and stressing the need for culturally sensitive mental health practices. Psychiatric professionals can utilize these insights to develop more culturally attuned communication strategies and treatment plans. Additionally, these professionals should be urged to consider the broader social and cultural narratives that shape patients' lives and their acceptance of and response to psychiatric diagnoses. Furthermore, this research offers a beneficial insight into the difficulties faced by university students suffering from MDD. This study can be used to adapt a policy for universities or other educational institutions to help students better understand their struggles.

Since this research was conducted in an academic environment, promotion of a more human-centered mental health curriculum in education institutions is suggested. This could prevent unnecessary stress and competition, significantly reducing stigma and promoting more empathy. Furthermore, this study advocates that current psychiatric practices in Thailand be adapted to better integrate with Thai cultural contexts, such as by enhancing doctors' communication and empathetic skills. The society also needs increased mental health awareness to foster more empathetic understanding and decrease discrimination toward illness and disability. Initiatives could include community outreach programs to educate the public about mental health, cultural competence training for healthcare providers, and development of advocacy programs involving patients and

community leaders. Such efforts could help to create a supportive environment that encourages individuals to seek help without fear of judgment or discrimination.

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## What is Intercultural Communicative Competence in English Language Teaching? Examining the Discourse of Thai Pre-Service English Teachers

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### Abstract

Due to globalization, intercultural communicative competence (ICC) has become important. To integrate ICC into the classroom, appropriate perceptions towards this construct are needed. To know and understand what these perceptions might be, this study examined pre-service English teachers' views collected through an online open-ended survey; a total of 53 respondents completed the survey. Analysis of the data was done through a corpus approach; specifically, keywords were derived from comparison with a benchmark corpus. Subsequently, the contexts of occurrence of these keywords were analysed. This study analysed the first five keywords, which were "we," "language," "different," "culture," and "students." Based on the contexts of occurrence, this study found that the pre-service teachers perceived ICC as a notion that can be taught through specific pedagogical practices; that ICC is driven by differences in language and culture; and that students have the role of enhancing their ICC knowledge and skills. The findings present a contextual understanding of ICC, which may not necessarily be aligned with other cultural settings.

**Keywords:** *Intercultural communicative competence, pre-service teachers, English classroom*

### Introduction

With the rise of globalisation and the recent emphasis on equality, ICC has remained an essential notion and skill (Mai, 2021). The fundamental principles of ICC include the promotion of sensitive and respectful communication among interlocutors from different linguistic, cultural, and socioeconomic backgrounds. Many have advocated for ICC to be integrated into the English language classroom, so that it may be taught alongside English—a communicative tool used globally. In the Southeast Asian region, there have been various reports about the integration of ICC. For instance, in Malaysia, the integration of intercultural lessons may be subject to students' English language proficiency and their personal intercultural lived experiences (Dalib et al., 2017). In Thailand, Thongprayoon et al. (2020) has also reported students' lack of willingness to partake in intercultural activities if they perceive their English language ability as being low. Furthermore, in-service teachers reported a lack of pedagogical knowledge and skills for integrating intercultural lessons in their English language classrooms (Oeamoum & Sriwichai, 2020).

While these reports have been helpful in illustrating the position of ICC in the English language classroom, they have focused primarily on the experiences of in-service teachers. Very few studies have actually considered the experiences or perceptions held by teachers who are still undergoing training. As argued by Van Katwijk et al. (2023), doing research on pre-service teachers is pivotal, as it may help practitioners and teacher educators recognise issues that may pose a challenge in the future. This could then spur appropriate responses to ensure that pre-service teachers would be ready when they enter real classrooms and school contexts.

With this as a caveat, this study aimed to analyse the perceptions of Thai pre-service English teachers regarding ICC. It is hoped that the findings from this study would contribute to the improvement of teacher education in ICC, which is a crucial notion in today's globalised world.

### ICC in the English Classroom

The English classroom is considered a suitable location for ICC integration, as the language is important for both global and academic communication. In the English classroom, teachers and students have the space to explore communication in different cultural contexts (Baker & Fang, 2020).

Intercultural communicative competence (ICC) may be defined as having cultural frames of reference to guide and navigate through interaction in a multicultural or global setting. Furthermore, ICC acknowledges that communication across cultures encompasses not only linguistic knowledge and skills, but also other communicative and non-communicative perspectives that may shape how an interaction unfolds (R'boul, 2021). It should be noted that ICC has long been identified as an essential skill for students at different educational levels. In fact, the notion of ICC was first introduced through Communicative Language Teaching, where one of the principles was for students to possess pragmatic awareness to facilitate interaction that is respectful towards other interlocutors and appropriate for the communicative event (Sato & Kleinsasser, 1999).

Teaching ICC is not a linear process, as there are multiple considerations that the teacher needs to make. Among them are the teacher's perception towards him- or herself, the teacher's perceptions towards culture and language, the teacher's perceptions towards students, and also the teacher's perceptions about how culture fits into the larger educational curriculum. The integration of ICC is also dynamic, given the many classroom variables. In other words, the extent of intercultural-ness of a lesson may constantly shift. Furthermore, including ICC in the English language classroom may not be entirely open to other cultures, as teachers may revert to focusing on information presented in the materials used. This may lead to a focus on Western-based cultures as the model for communication, especially if materials originate from English-speaking countries (Vitta, 2023). Variables that shape the integration and teaching of ICC are not isolated; rather, they have the propensity to affect one another.

If English language teachers are not sure of how to integrate ICC, they may always consider starting with the local culture; nevertheless, this must be done sensitively, especially if the English teacher is a foreigner. Furthermore, English teachers have reported that ICC is rather difficult to integrate as they believe that high language and communicative proficiency are necessary; however, other practitioners and scholars believe that there are other ways to attend to this issue, such as allowing translanguaging in the classroom (Tai & Wong, 2023). Besides having the willingness and pedagogical skills to integrate intercultural lessons, English teachers also need to have ample support from their environment. One issue which may pose a challenge is support in the form of teaching and learning materials. This specifically concerns the limited inclusion of local and regional cultures in classroom materials (Saemee & Nomnian, 2021; Labtic & Teo, 2020). In addition, the integration of ICC into the English language classroom may only be viable if there is enough curriculum space afforded by the larger educational context. On the contrary, if school administrators or other stakeholders believe in strict adherence to the curriculum, it will be challenging to integrate ICC or any other related or valuable concepts into the learning setting.

### ***Thai Teachers' Practices and Perceptions towards ICC***

As seen through the discussion above, the integration of intercultural lessons into the English language classroom still meets with challenges. One reason possibly affecting the integration of ICC in Thailand may be a lack of guidance on how it may be included in the English language classes or other subjects. This may be the case, given the report by Loo and Sairattanain (2023), where there was a perceived lack of clarity in efforts for education reform. This may pose a greater challenge to teaching and learning efforts, such as a mismatch between curriculum goals and teaching materials (Oeamoum & Sriwichai, 2020; Ulla et al., 2022). There may also be an overt concern with regards to the teaching of other cultures, given the prevalence of the local culture. For instance, the importance of hierarchy in society is a defining feature of Thai culture. To consider and adopt other cultures that do not necessarily share similar cultural practices may cause tensions within the teacher or with others (Young, 2021). There is the perception that Thai English teachers, whether pre-service or in-service, would not be able to carry out the teaching of culture effectively. Snodin (2016) reported a myriad of reasons, such as a lack of first-hand experience with other cultures, which had an adverse impact on teachers' confidence in integrating culture into the English language classroom. This issue, however, may be addressed if teachers are able to take a more open approach in their pedagogical practice. A

way to do this is to teach English with an emphasis on the significance of the local culture. Doing this will avoid the displacement of cultural beliefs and practices in the immediate context (Boonsuk & Ambele, 2020).

While research on in-service teachers has highlighted challenges faced when integrating ICC, little is known about the experiences or perceptions of pre-service English teachers. One reason may be the lack of studies done with this group of teachers; another reason may be the hesitance of Thais to have negative reports about themselves. This is not due to pre-service teachers thinking highly of themselves; rather, it is a way for them to not offend their teacher educators. Saying that they did not understand how a teaching practice is done, or how a cultural value may be integrated into an English class may be considered disrespectful, as it inadvertently reflects on the teacher educator's inability to get the pre-service teachers to do or understand something well (see Loan, 2019). This conundrum was also reported in Sairattanain and Loo (2021), where Thai pre-service teachers were found to hold a positive view towards teacher education reform; however, this did not mean that they understood what this reform meant.

### **The Study**

This study seeks to analyse the perceptions of Thai pre-service English teachers regarding ICC. To this end, a qualitative approach was deemed appropriate, as this would allow for the researchers to identify varying views that may be held by the pre-service teachers. Conceptually, this study was premised upon notions of intercultural teaching and learning as proposed by R'boul (2021). He proposed nine strategies, all of which were meant to support the dialectal teaching of intercultural communicative competence. The purpose of these teaching strategies is to allow for the examination and reconfiguration of power between teacher and students, as well as to create a space where multiple perspectives may be given equal consideration.

### **Methodology**

This study was carried out at Sisaket Rajabhat University, Thailand, among 53 pre-service English teachers. At the time of this research, the participants were in their third year of studies, and were taking a course about communication across cultures. The study utilised an open-ended online survey to collect the participants' perceptions about intercultural communicative competence in English language teaching. There were nine items in the survey, all of which were statements of teaching strategies proposed by R'boul (2021). For each of the nine items, participants had to respond to this prompt, "What do you think of this strategy in your English language classroom?"

There were 477 responses, and the data analysis was corpus assisted. To start, participants' responses were analysed through AntConc version 3.5.9 (Macintosh OS X) for keywords that were derived from a comparison with the 5,000 top words of the Corpus of Contemporary American English (COCA). After the keywords were generated, the first five nouns and adjectives were selected for further analysis. These five words would have a high frequency count, as well as high keyness. The latter would indicate the aboutness of the corpus being analysed, as well as the main concepts or concerns of the participants (Watson Todd, 2020). To ensure that meaningful words were selected for further analysis, only nouns and adjectives were selected; the former represent concepts, while the latter reflect evaluations or judgements pertinent to the discourse (Durán-Muñoz, 2019). From there, their contexts of occurrence (concordance lines) were read iteratively to draw insights about the participants' perceptions. Analysing the contexts in which keywords occurred is a useful gauge for perceptions, given that they provide insights into how terms are used to express meaning (Anthony, 2022).

### **Findings**

The participants' responses comprised 22,945 words. After a comparison with COCA, five key nouns and adjectives were identified, which were, "we," "language," "different," "culture," and "students." Information about their frequency and keyness are provided in Table 1.

**Table 1** *Keywords and Their Frequency and Keyness*

No	Keyword	Frequency	Keyness
1	We	333	+122.34
2	Language	316	+115.64
3	Different	309	+112.88
4	Culture	244	+87.37
5	Students	212	+84.18

In this section, keywords are discussed by drawing upon meaning from their contexts of occurrence (extracts). The keywords and important elements of the the context are indicated in italics.

### ***“We”***

While “we” might be conventionally viewed as a pronoun, some have reclassified it as belonging to the class of nouns due to its reference to people. The pronoun we may be inclusive or exclusive; the former refers to the collective inclusion of interlocutors and others who might not be immediately present, while the latter refers to interlocutors involved in the interaction. In the case of responses provided by the participants, we may be inclusive–referring to Thai people in general. This may be seen in Extracts 1 and 2.

#### *Extract 1 [emphasis added]*

*We must understand* that communication has many issues, and many factors affect communication.

#### *Extract 2 [emphasis added]*

But when *we communicate* with teachers or adults, *we must have* respect, know how to think, think before speaking.

In both extracts, it may be seen how the participants perceived communication as being shaped by different factors, especially in terms of how Thais value respect in communicating with those who are older. Besides being culturally shaped, communication conventions may also be determined based on interlocutors involved in a communicative event, such as those indicated in Extracts 3 and 4. An awareness was evident among the participants that Thais could find themselves interacting with those of different cultural backgrounds. Knowing how different cultures shapes communication may help with understanding.

#### *Extract 3 [emphasis added]*

*We also have to accept and learn* about the differences of our communication partners. so that we can easily access and understand

#### *Extract 4 [emphasis added]*

*We can develop Thai communication* by teaching a new communication culture by building up cognitive and accurately speaking systems.

While responses were seemingly inclusive, they were also imperative in their intended meaning. This may be observed through the use of verbs such as can, must, and need. What is seen from here is how the participants may perceive the teaching of communication as something that has definitive pedagogical practices. While this may be necessary, especially for pre-service teachers who are yet to tackle teaching and working in the classroom and school settings, they may lead to misaligned professional expectations and inadvertently lead to tensions. This could be beneficial, as pre-service teachers would then need to develop resilience and creativity (Loo et al., 2019).

### ***“Language”***

To the participants, language was viewed in tandem with another concept, such as culture (Extract 5). This notion has been well established in the teaching of English from a communicative perspective, where the language user needs to have an understanding of the culture of interlocutors involved, as well as the culture of the communicative context.

*Extract 5 [emphasis added]*

In communication, *language and culture are completely intertwined* because *language and culture can tell the identity* of a particular race. Instructors must take into account their understanding of *language and culture in order to lead to acceptance* of cross-cultural communication.

Language is also not just confined to verbal or written exchange, as there are other complimentary communicative strategies such as body language (Extract 6). These need to be used appropriately to enhance the intended meaning of a communicative event. Similar to how language and culture are related, the use of gestures and body movements to support language use is also culture sensitive. This would require language users to be aware of body language that is acceptable.

*Extract 6 [emphasis added]*

Because *body language* is added to the *supplement*. This reason allows us to choose what to talk about and what facial look to show.

Another aspect that shapes the use of language, especially in spoken discourse, is accent (Extract 7). In the context of Thailand, studies have reported a preference of English teachers for certain accents, such as the elusive native English accent that is considered standard or in some cases, the correct one. In this response offered by the participant, however, there was a recognition that there are varied accents of the English language, which include those that are typically not associated with native English speakers. These accents were evaluated as being easy or difficult, rather than right or wrong. Having this perspective may be indicative of an intercultural perspective, as well as an acknowledgement that some accents may be easier as they are more familiar, and some may be more difficult as students or teachers have never encountered them.

*Extract 7 [emphasis added]*

Therefore, understanding a *language* may be *easy or difficult* depending on the speaker's *accent*. Which this accent may be different in the terrain, culture, pronunciation, English has many accents such as Indian accent, Thai accent, etc.

In the participants' responses regarding language, it may be observed that its use is shaped by the recognition and knowledge of other aspects meaningful to communication. Furthermore, according to participants, students in Thailand have been exposed to these meanings from a young age, and that language has to be used carefully, especially when interacting with those who are older (Extract 8).

*Extract 8 [emphasis added]*

The use of *language* depends on *class and social role*, but it is understandable because students are cultivated when they are young. The use of the *language* in Thailand is used *carefully* because it requires respect for the elders.

Even though cultural meanings that shape communication in Thailand are prevalent, participants held to the perspective that these should still be taught. Perhaps this is necessary due to the new linguistic code being used—English. Doing so might require a comparison of cultural values that may be inherent to both the Thai language and English (Extract 9).

*Extract 9*

Because *language* is a *mark or a symbol of understanding* between teachers and students who want to convey culturally accurate meanings and understand each other. The teacher must arrange the speech in a systematic and step-by-step manner so that the students can easily understand.

**“Different”**

It has been established that communication in Thailand is affected by its cultural beliefs and practices. Because of this, it is expected that there will be a different approach when communicating in a foreign language, including English. This perspective is observed in the participants' responses, where there were considerations for the levels of language, depending on the interlocutor and their job, and age, as well as the environment where the communication takes place. This may be observed in Extracts 10 and 11.

*Extract 10 [emphasis added]*

It is necessary because there are *different levels of language usage* in Thailand, so we have to learn to use languages that are used *differently according to our interlocutors*, because when society and environment change, the use of language also changes.

*Extract 11 [emphasis added]*

Communication in societies with *different roles*, whether in *job* function or *age*. There will be *different cultures in communication*. For example, when we communicate with close friends We'll talk about some nonsense, talking about fun does not have to be very formal.

The differentiated approach in communication is also perceived to be applicable when learning about other cultures. This is because there may be differences in terms of 'identity', as mentioned in Extract 12. An intercultural view may also be observed here, especially in its acknowledgement of the 'lifestyle' and 'preferences' that a 'person' may have. This may point towards the awareness that some people may live individualistically, rather than being defined by cultural beliefs or practices.

*Extract 12 [emphasis added]*

Each person has a *different, lifestyle and preferences* will vary. So when we go to learn in other cultures, we will understand the *differences of identity* in other cultures as well.

These differences are not only recognisable, but they are also teachable, as mentioned in Extract 13. The view of this participant is that differences in communication may be taught to students. This does not need to happen in settings outside of the class; rather, it is something that can be integrated into students' formal learning experience.

*Extract 13 [emphasis added]*

So in the teaching methodology it actually has to teach the learners to know that in different settings we use a *different speech*. As a teacher I can show my students that the language that they use with *different people* may *differ* due to *individuals' personality and social position*.

### **"Culture"**

In line with the perspective of differentiation, culture was also viewed as dynamic, as it is constantly changing. This reflects the principles of ICC, where there is an acceptance that culture is bound to change over time. This may be instigated by continuous interaction with others from a different culture, such as that seen in Extract 14. The dynamicity of culture is also fast paced, as seen in Extract 15. And to ensure that students have current insights of these changes, teachers are expected to provide skills to students. This is different from teaching students about culture as a body of knowledge. What is emphasised here is the teaching of skills that would help students to be able to independently learn about these changes in culture.

*Extract 14 [emphasis added]*

Because as said, *culture* is *not static*, it is *constantly changing*. In the future, we must meet and work with foreigners. Therefore, it is good that we are *aware* of the *culture* as it *affects communication, collaboration or understanding* with co-workers.

*Extract 15 [emphasis added]*

Due to the *culture* is *constantly changing*. Teachers need to update the situation all the time. In order to keep up with the world and to keep up with the events and should instill in learners to know how to listen and know how to learn from others. In order to live happily in the future.

When teachers themselves are cognisant of the dynamicity of culture, this may have an influence on their students. This may also lead to an 'understanding' and an 'awareness' of themselves. This may be indicative of reflexivity, which has been discussed by other researchers (Extract 16).

*Extract 16 [emphasis added]*

Then if student do *understand* about *culture*, they will have an *awareness of their identity*. For me I think this point is possible. Teacher can use many methods to make their student understand this point. Teacher can use activity like work in pair, work in group and let student discuss their idea or opinion with their friend then, teacher give summary about the activity.



## “Students”

Based on the keyword ‘students’ and their contexts of occurrence, it may be seen how they are viewed as requiring support to develop language as well as intercultural skills. In particular, students were perceived to be deficient in aspects of communication, which may be seen through nearby words or phrases such as requiring, or how they are unable to. In these situations, teachers would then need to provide appropriate learning materials and experiences in the classroom (Extracts 17 and 18). Doing this might help students to clearly see how culture may be distinct.

### *Extract 17 [emphasis added]*

Communicating with people with higher social status there are many levels of language in Thai society, such as *students requiring* a polite language when speaking to a teacher or someone with a lower social status requiring an official language to communicate.

### *Extract 18*

*Students are unable* to see truly diverse cultural perspectives. Teachers should bring an example of both the advantages and disadvantages of foreign cultures. And the advantages and disadvantages of the traditional Thai culture and show students perspectives on differences in cultures and personalities.

While the teaching process of culture seems to be confined to teachers and students, there are also other elements, such as materials. Nonetheless, how these materials are utilised to facilitate intercultural development is still dependent on the teachers (Extract 19).

### *Extract 19 [emphasis added]*

Teachers choose learning materials that will allow *students to clearly see* the differences in culture.

As seen in the keyword ‘student’ and some of their contexts of occurrence, participants perceive the teacher as being responsible to get students to see what they know or do not know; and what they did wrong. However, there were responses that showed otherwise. This may lead to negative thinking or feelings among students—an inferiority complex. This is interesting to note, especially in the context of Thailand, where there have been reports of high tension in the teaching of the English language. However, it appears to be ironic how there is still pressure to perform well in the English language, despite the possibility of adverse effects on the students (Extract 20).

### *Extract 20 [emphasis added]*

For example, in Thai society, teachers who teach English or foreign languages must mention what *students have*, not just about accuracy alone. The *student's writing or pronunciation is wrong*. Then the teacher blamed or reprimanded the *students directly*. [This] Will cause *students to have inferiority complexes* in learning that language

## Discussion

From the keywords identified, this study was able to draw several meanings that were reflective of pre-service English teachers’ perceptions. Broadly speaking, the pre-service teachers were of the view that there are pedagogical practices that they—as English teachers—should carry out to integrate intercultural lessons. They saw themselves as being responsible to educate their students. The participants were also of the belief that language plays a pivotal role in intercultural interaction and development. Furthermore, the teaching of ICC is driven by the acceptance of difference, such as that seen in the distinct characteristics of culture. In order to facilitate efficient communication, the participants underlined the connection between language and culture. Language includes non-verbal indicators like body language, in addition to spoken and written communication. However, the lack of clarity and direction in educational reforms, as highlighted by Sairattanain and Loo (2021), makes it difficult to integrate such international viewpoints into teaching practices, making it challenging for teachers to successfully incorporate cultural elements into their courses.

The results of this study are aligned with other research studies such as those by Imsa-ard (2023) and Lee et al. (2023). In particular, this study illustrated similar challenges in integrating intercultural communication into English language teaching in Thailand. Just as Loan (2019) highlighted the hesitation of pre-service teachers to admit difficulty in understanding teaching practices or cultural

integration, these findings reflected this concern. Similarly, the lack of adequate teaching materials supporting intercultural lessons, as noted by Labtic and Teo (2020) and Saemee and Nomnian (2021), was evident in this study. These parallels emphasise the need for tailored approaches, considering factors like the interlocutor's characteristics and communication context, as advocated in the literature, and echoed in the results. Perhaps a bigger challenge would be the effective teaching of the notion of difference. This may be subject to several factors, such as having the linguistic tools to consider intercultural concepts; having a suitable environment that permits and advocates for an intercultural stance; and having the willingness to partake of intercultural interaction. Teachers would need to be willing to take the risk of diving into intercultural aspects that may be unfamiliar or dynamic. Students, on the other hand, would need to take on a more critical stance in learning about cultures, which would also require overt instructions and guidance from their English teachers (Rajprasit, 2020).

## Conclusion

The findings of this study shed light on pre-service English teachers' perceptions regarding the integration of intercultural lessons into their teaching practices. The study participants emphasised the importance of supporting students in developing both language and intercultural skills. They recognized that students may have difficulties in communication and understanding diverse cultural perspectives. Teachers are seen as being responsible to provide appropriate learning materials and experiences to help students clearly see the differences in culture. Overall, teachers are viewed as having a significant role in guiding students' learning and fostering intercultural understanding. Moreover, it also illustrates how ICC is possibly localised to the participants' settings. To examine these challenges further, as well as to gain a better understanding of pre-service teachers' experiences in integrating ICC, future studies should consider examining and observing their teaching practicum. Doing so may allow practitioners and teacher educators to offer immediate and contextual help, which may be more impactful to ensure that pre-service teachers are receiving ample and appropriate support during their formative period of learning to teach.

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## Impact of Remote Work on Work-Life Balance in the Southeastern Asia Union Mission of Seventh-day Adventists

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### Abstract

The COVID-19 pandemic led to an increase in remote work arrangements. While remote work has been praised for its flexibility, it is unclear how remote work affects work-life balance. This study examined the remote work practices and work-life balance of Southeastern Asia Union Mission (SEUM) Seventh-day Adventist employees, as well as those working in its subsidiary missions in Cambodia, Laos, Thailand, and Vietnam before and during the pandemic. A quantitative survey was administered to all 121 and mission office employees of SEUM. The online survey questionnaire explored demographics, pre-pandemic work experiences, during pandemic work-life balance experiences, and remote work satisfaction.

The findings revealed a significant negative correlation ( $-0.392, p < .01$ ) between remote work and work-life balance for SEUM employees. Employees generally reported a decrease in work-life balance when working remotely as compared to their pre-pandemic work experiences. Interestingly, strong organizational communication regarding remote work policies was associated with higher remote work satisfaction. This study offers valuable insights about the need to create a supportive work environment for remote employees. Recommendations include prioritizing clear communication, investing in employee well-being initiatives, and conducting further research to inform long-term remote work strategies.

**Keywords:** *Work-life balance, remote work, working from home*

### Introduction

The nature of work and working patterns are changing in this modern era (Thilagavathy & Geetha, 2020). In recent years, shared office work space standards have changed. Many businesses implemented work from home (WFH) practices in response to the COVID-19 pandemic in an effort to promote social isolation and stop the disease from spreading.

The way people work has changed rapidly; instead of spending nine to five at an office workstation, people may now work remotely from the comfort of their homes (Globalization Partners, 2022). The competitive, aggressive, and demanding nature of business necessitates active involvement and total devotion from employees, which compromises their ability to maintain a healthy work-life balance (Turanligil & Farooq, 2019).

Work-life balance is a key factor in employee engagement, productivity, and retention (Qualtrics, 2024). Employees who work remotely can maintain a healthy lifestyle, which helps keep them cheerful, focused, and productive throughout the workday (Nison, 2021). However, some researchers and articles have claimed that remote work may actually damage the work-life balance of employees. Being unable to identify a clear line between home and office or switch off when working remotely has caused remote employees to experience increased stress and other health problems (Done, 2022).

This research study examined the relationship between remote work and work-life balance during the pandemic. What were the impacts of remote work, positive or negative, on employees' work-life balance? Since this research study was conducted with organizations in Southeast Asia, the culture of this region was also examined to see the role that it may play in impacting the work-life balance of employees while working from home.

This study investigated how working from home during the pandemic affected the work-life balance and quality of life of office employees who worked at the SEUM and its subsidiary missions'

in Cambodia, Laos, Thailand, and Vietnam. Two research questions that guided this study are shown below as follows:

1. What was the relationship between remote work and the work-life balance of SEUM employees in Thailand, Vietnam, Cambodia, and Laos during the COVID-19 pandemic?
  - How did the pandemic and the shift to remote work impact the work-life balance and personal and professional roles and responsibilities of employees of SEUM?
  - How important is work-life balance to employees of SEUM?
2. What helpful suggestions might SEUM stakeholders make about how remote work may be managed in order to improve work-life balance?

### **Literature Review**

According to a publication by the Organization for Economic Co-operation and Development (OECD, 2016), employees and employers praised remote work for offering a better work-life balance. Remote work allows employees to carry out their responsibilities and activities outside of the office, providing them with full independence and choice over where they work and how they balance work with their personal lives. As a result, this helps improve their work-life balance and workforce inclusion. However, the blurring of lines between work and personal life may create a threat in terms of work-life balance. Overworking is one example that may result from remote work and harm employees' work-life balance. Additionally, distractions in the home environment may lead to decreased productivity. Research has suggested that some remote workers engage in non-work activities during work hours, such as social media use, online shopping, or household chores (Brower, 2023).

### ***Working from Home***

Working from home (WFH) has allowed employees to work remotely using tools and resources approved by their organizations (MBA Skool Team, 2022). WFH originated in the 1970s due to rising gas prices, offering flexibility and time savings for employees (Choudhury, 2020).

The pandemic significantly accelerated the WFH trend (Béland et al., 2020). The pandemic also impacted employee well-being, with numerous changes in work schedules and locations. Women were more likely than men to work from home during the pandemic (Hill, 2020). Many employees reported increased productivity and prefer continued remote work (Baudot & Kelly, 2020).

While WFH offers flexibility and avoids commutes, it is not suitable for all jobs, particularly those requiring physical presence. However, many jobs can be done remotely, including administrative, customer service, technical support, web development, writing/editing, and virtual assistant roles (Indeed Editorial Team, 2023).

### ***Benefits and Challenges of Remote Working***

Remote work during the pandemic increased significantly. Studies have shown that it brought many benefits to organizations, including improved productivity, performance, and retention (Farrer, 2020). Remote workers also benefit from time savings, schedule flexibility, and a better work-life balance (George, 2021). However, remote work can also have negative effects. It can blur the boundaries between work and personal life, leading to isolation and loneliness (Dimitropoulou, 2023). Studies have also shown that remote work can increase stress and negatively impact sleep (Messenger et al., 2019). Some challenges of remote work include technology issues, working environments, communication, and management (Green et al., 2020).

### ***Work-Life Balance***

Work-life balance refers to dividing one's time between work and personal life for good health and well-being (JOIN, 2022). This concept has roots in the idea of rest, as seen in the Bible (Genesis 2:2). The traditional six-day workweek, with one day of rest, evolved to a two-day weekend (Skills You

Need, 2024). Modern technology, however, makes it harder to disconnect from work, making work-life balance a significant challenge (Links International, 2024).

Employee well-being is directly linked to achieving a healthy work-life balance, and employees have rights in relation to managing their work schedules to accommodate their family responsibilities (Reilly et al., 2012). Work-life imbalance can negatively affect health, relationships, and productivity (Ahmed, 2020). Increased stress can weaken the immune system and worsen health problems (Mayo Clinic Staff, 2021). This is particularly concerning in cultures with strong work ethics, where long hours are common (Links International, 2024). Work-life balance also differs across generations. Boomers prioritize work and are willing to sacrifice their personal lives (Rook, 2019). Gen Xers value balance and seek flexibility to manage both work and personal commitments (Kerian, 2024; Rook, 2019). Millennials and Gen Z prioritize work-life integration, aiming to align personal and professional goals (PWC, 2011; Rook, 2019).

### ***SEUM Background***

The Southeastern Asia Union Mission (SEUM) is part of the Seventh-day Adventist Church and covers the territories of Cambodia, Laos, Thailand, and Vietnam (Adventist Asia, 2023). It was created in December 2021 from the dissolution of the Southeast Asia Union Mission (Southern Asia-Pacific Division, 2023), and consists of four Adventist Missions: Cambodia, Laos, Thailand, and Vietnam (Costello, 2020). The SEUM's headquarters office is in Thailand, and its main goal is to spread the gospel to the residents of these 4 countries (Southern Asia-Pacific Division, 2023). Within its territory, are 88 churches with 37,318 members, and it serves a total population of 190 million (Adventist Yearbook Organization, 2024).

### ***Work and Culture of Southeast Asia***

Southeast Asia is a culturally diverse region with a rich history (Asudkar, 2020). Family and religion are central to Southeast Asian culture (ANU College of Asia & the Pacific, 2017). Buddhism is the dominant religion, but there are also significant Muslim, Christian, and Hindu populations (Andaya, 2021). Traditionally, Southeast Asian societies are collectivist, emphasizing the needs of the group over the individual (Xu, 2021). This is reflected in family structures and gender roles. The burden of housework often falls on women, even when they have full-time jobs (Tsuya et al., 2000).

The region is undergoing rapid development, with growing economies and a rising middle class. This is leading to modernization, but traditional values remain important (OECD, 2023). One aspect of traditional culture that persists is an emphasis on hard work (Jacob, 2022). Long working hours are common, and success is linked to dedication and perseverance (Greenspan, 2017). This work ethic can be seen in countries like Japan and Thailand, which rank poorly for work-life balance (Wong, 2022).

### ***Methodology***

This study investigated the impact of the COVID-19 enforced shift to remote work on the work-life balance of Southeastern Asia Union Mission (SEUM) employees. The researcher used a descriptive quantitative approach to gather data, distributing a self-administered questionnaire to all 121 SEUM employees across the Cambodian, Laotian, Thai, and Vietnamese missions, along with the SEUM headquarters office in Thailand. The questionnaire, offered in English and the local languages for inclusivity, collected information on demographics, remote work experiences, and how those experiences affected work-life balance. To analyze this data, the researchers employed descriptive statistics to understand the overall trends, correlation tests to identify potential relationships between variables, and ANOVA or general linear models to understand the influence of multiple factors on work-life balance. This comprehensive approach using quantitative data analysis may provide valuable insights into how remote work during the pandemic impacted SEUM employees' work-life balance.

### ***Findings***

This study specifically investigated the impact of the sudden change to remote work during the pandemic on the work-life balance of employees at the SEUM headquarters and its subsidiary mission

offices. Online self-administered questionnaires were distributed to all 121 SEUM office employees, to capture a comprehensive picture of experiences across the organization; the response rate was encouraging, with over half (62) of the targeted population participating in the survey.

The study's core finding painted a concerning picture, with a significant decrease in reported work-life balance among SEUM employees working remotely during the pandemic. This suggested that the lines between work and personal life blurred considerably for many employees during this challenging time.

A paired *t*-test was used to compare the mean scores of work-life balance before and during the pandemic to see if there were any significant differences; the results are shown in Table 1.

**Table 1** *Work-Life Balance Before and During the Pandemic*

	Paired Differences					Significance			
	Mean	Std. Deviation	Std. Error	95% Confidence Interval of the Difference		<i>t</i>	df	One-Sided <i>p</i>	Two-Sided <i>p</i>
				Lower	Upper				
Work Detachment and Personal Fulfilment (Pre) - Work Fulfillment and Effective Work-Life Integration (During)	0.281	0.986	0.137	0.006	0.555	2.053	51	.023	.045*

*Note:* \*Significant at the .05 level

The results from Table 1 show significant differences, suggesting that the level of work-life balance of employees significantly decreased during the pandemic; the results were significant at the .05 level,  $t = 2.053$ ,  $p < .05$ . This is also visible through the descriptive statistics, which showed that during the pandemic, work-life balance declined significantly from 3.64 before to 3.36 during the pandemic.

Interestingly, the study found a generational difference in adapting to remote work. Table 2 presents the mean difference in work fulfillment for two age groups working from home during the pandemic. Older employees within SEUM reported a better work-life balance ( $p = .071$ ) while working remotely compared to their younger colleagues (27–42 years old).

**Table 2** *Work-Life Balance Between Different Age Groups*

Age	Age Range	<i>N</i>	Mean	Std. Deviation
Work Fulfillment and Effective	27–42 years	40	3.250	0.733
Work-Life Integration (During)	43–58 years	11	3.740	0.941

Table 3 presents Spearman correlation coefficients to assess associations and direction (positive or negative) between the eight variables. It's important to note that while the initial survey received responses from 62 participants out of a population of 121, only 52 of them experienced remote work during the pandemic. Therefore, the analyses involving remote work experiences are based on data from 52 participants.

**Table 3 Analysis of Pre-Pandemic Work-Life Balance and Work Satisfaction Before/During Pandemic**

		Work Detachment & Personal Fulfilment (Pre)	Work Engagement (Pre)	Commute & Work Completion (Pre)	Work Fulfillment & Effective Work-Life Integration (During)	Work From Home Efficiency (During)	Remote Work Satisfaction (During)	Supportive Remote Work Environment (Policy)	Strong Communication (Policy)
Work Detachment & Personal Fulfilment (Pre)	Correlation Coefficient	1.000	.278*	.253*	.251	.270	-.392**	.250	-.090
	Sig. (2-tailed)		.029	.047	.073	.053	.004	.074	.525
	N	62	62	62	52	52	52	52	52
Work Engagement (Pre)	Correlation Coefficient	.278*	1.000	.085	.345*	-.029	.002	-.046	.344*
	Sig. (2-tailed)	0.029		0.513	0.012	0.839	0.988	0.747	0.013
	N	62	62	62	52	52	52	52	52
Commute & Work Completion (Pre)	Correlation Coefficient	.253*	.085	1.000	.011	.431**	.123	.402**	.147
	Sig. (2-tailed)	.047	.513		.937	.001	.384	.003	.300
	N	62	62	62	52	52	52	52	52
Work Fulfillment & Effective Work- Life Integration (During)	Correlation Coefficient	.251	.345*	.011	1.000	-0.206	.064	.322*	.504**
	Sig. (2-tailed)	.073	.012	.937		.144	.651	.020	.000
	N	52	52	52	52	52	52	52	52
Work From Home Efficiency (During)	Correlation Coefficient	.270	-.029	.431**	-.206	1.000	.131	.183	.069
	Sig. (2-tailed)	.053	.839	.001	.144		.356	.193	.629
	N	52	52	52	52	52	52	52	52
Remote Work Satisfaction (During)	Correlation Coefficient	-.392**	.002	.123	.064	.131	1.000	.027	.582**
	Sig. (2-tailed)	.004	.988	.384	.651	.356		.848	.000
	N	52	52	52	52	52	52	52	52
Supportive Remote Work Environment (Policy)	Correlation Coefficient	.250	-.046	.402**	.322*	.183	.027	1.000	.145
	Sig. (2-tailed)	.074	.747	.003	.020	.193	.848		.304
	N	52	52	52	52	52	52	52	52
Strong Communication (Policy)	Correlation Coefficient	-.090	.344*	.147	.504**	.069	.582**	.145	1.000
	Sig. (2-tailed)	.525	.013	.300	.000	.629	.000	.304	
	N	52	52	52	52	52	52	52	52

Code. \*Correlation significant at the .05 level (2-tailed); \*\*Correlation significant at the .01 level (2-tailed)

The results highlighted that employees' remote work satisfaction during the pandemic was significantly correlated to their level of work-life balance (work detachment and personal fulfilment - Pre) before the pandemic. However, the correlation coefficient of -.392 indicated a negative and moderate correlation, suggesting that employees who perceived a high level of work-life balance pre pandemic had a low level of remote job satisfaction during COVID-19.

It is also important to note that remote work satisfaction during the pandemic was significantly and positively correlated with strong communication of organizational policy regarding remote working,  $r = .582$ ,  $p < .01$ . This relationship was observed to be strong with a high coefficient. Moreover, work-life balance during the pandemic had a significant and positive correlation with the remote work environment policy and strong communication policy (both policies).

The effect of remote work on work-life balance during the pandemic, with the moderating effects of remote work satisfaction and policy factors, were also tested. Tables 4 and 5 show a general linear model that was run because the grouping variable was not numerical.



**Table 4 Tests of Between-Subjects Effects**

Dependent Variable:					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected model	14.497 <sup>a</sup>	7	2.071	5.165	.000
Intercept	10.750	1	10.750	26.809	.000
Hours during COVID	0.069	1	0.069	0.172	.680
Support. Remote work env. policy	0.156	1	0.156	0.389	.536
Strong communication policy	10.300	1	10.300	25.687	.000
Remote work satisfaction during	0.054	1	0.054	0.136	.714
Hours during COVID * SRWE policy	1.703	1	1.703	4.246	.045
Hours during COVID * SC policy	0.623	1	0.623	1.554	.219
Hours during COVID * RWS dur.	1.135	1	1.135	2.832	.100
Error	17.642	44	0.401		
Total	621.082	52			
Corrected Total	32.139	51			

Code. <sup>a</sup> associated with corrected model ( $R^2 = .451$  ;Adjusted  $R^2 = .364$ )

**Table 5 Parameter Estimates**

Dependent Variable:						
Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	2.099	0.575	3.653	.001	0.941	3.257
[Hours during COVID=1]	0.366	0.882	0.415	.680	-1.411	2.142
[Hours during COVID=2]	0 <sup>a</sup>					
Support. Remote work env. policy	0.283	0.141	2.002	.052	-0.002	0.568
Strong communication policy	0.408	0.140	2.907	.006	0.125	0.691
Remote work satisfaction during	-0.315	0.128	-2.461	.018	-0.573	-0.057
[Hours during COVID=1] * SRWE policy	-0.812	0.394	-2.061	.045	-1.606	-0.018
[Hours during COVID=2] * SRWE policy	0 <sup>a</sup>					
[Hours during COVID=1] * SC policy	0.266	0.213	1.247	.219	-0.164	0.696
[Hours during COVID=2] * SC policy	0 <sup>a</sup>					
[Hours during COVID=1] * RWS dur.	0.517	0.307	1.683	.100	-0.102	1.137
[Hours during COVID=2] * RWS dur.	0 <sup>a</sup>					

The results showed that the overall regression model was statistically significant,  $F = 5.165$ ,  $p < .001$  in predicting work-life balance. The effect of remote work hours during the pandemic was insignificant,  $F = 0.172$ ,  $p = .680$ . However, one of the moderating effects, namely Remote Work X Supportive Remote Work Environment (SRWE), or the organizational policy, significantly predicted work-life balance,  $F = 4.246$ ,  $p < .05$ . This implied that the effect of remote work on work-life balance differed based on how supportive was the remote work environment policy. The coefficient was negative, with fewer hours worked as compared to more hours; this suggested that the effect of fewer hours worked had a less significant impact on work-life balance than did the effect of more hours worked. In other words, a better remote work policy significantly improved the link between higher hours worked and work-life balance.

This highlighted the importance of transparent communication during periods of significant change. Even more impactful was that a supportive remote work environment policy—likely

encompassing flexible work hours, clear expectations, and access to necessary resources—positively influenced work-life balance even for employees who reported working longer hours during the pandemic. This suggests that well-designed remote work policies can mitigate some of the challenges associated with remote work and contribute to a healthier work-life balance.

While the shift to remote work during the pandemic presented challenges to work-life balance for SEUM employees, the study also identified key strategies for mitigating those challenges. Clear communication of remote work policies and implementation of supportive remote work environments can significantly improve employee well-being and satisfaction during periods of remote work. The study also suggested that pre-pandemic work-life balance experiences may influence how employees adjust to remote work arrangements.

## **Discussion**

This research on SEUM employees during the COVID-19 pandemic found a decline in reported work-life balance when working remotely. Potential contributing factors included the blurring of boundaries between work and personal life, increased distractions in the home environment, and additional stress brought on by the pandemic. This aligned with findings from a qualitative study on UK remote workers, which identified overwork and its negative impact on well-being as key challenges (Grant et al., 2013).

The reasons behind the reported decline in work-life balance for SEUM's remote workforce during the pandemic were also explored, and several factors were found to have contributed to this problem. Firstly, the physical separation between work and personal life that a traditional office provides was blurred. Working from home can lead to situations where employees answer work emails while having dinner or take work calls during downtime, making it difficult to switch off and relax truly. Secondly, home environments are often filled with distractions compared to a structured office. Chores, family members, pets, or even the television can all compete for attention, hindering focus and creating a feeling of constantly playing catch-up. Thirdly, the pandemic itself was a significant source of stress for many people. Previous researchers have reported links between the pandemic and symptoms of depression, anxiety, and stress (Montano & Acebes, 2020). Concerns about health, job security, and the overall uncertainty of the situation likely bled into work life, making it even harder to achieve a healthy balance. Finally, establishing routines and schedules to maintain work-life separation can be difficult, potentially leading to longer working hours or an inability to disconnect at the end of the workday. These combined factors likely created significant tension in achieving work-life balance for the SEUM remote workforce during an already stressful time.

Interestingly, the study revealed that older employees reported better work-life balance while working remotely compared to younger colleagues. A 2016 study involving 500 workers from Finland, Lithuania, and Sweden produced similar results: workers in older age groups were more likely to report maintaining better work-life balance (Richert-Kaźmierska & Stankiewicz, 2016). This disparity might be due to generational differences in priorities or how work-life balance was defined. Younger employees, perhaps focused on career advancement, might be more inclined to work longer hours or be readily available remotely. Older employees nearing retirement might prioritize personal time and be more comfortable establishing clear boundaries between work and life. Additionally, the very definition of work-life balance could differ. Younger generations might see it as a clear separation of work and personal space, even if it meant longer hours at the office. Older workers might value flexibility and the ability to manage personal tasks throughout the workday, even if these lines were blurred a bit. It's important to remember that these are potential explanations based on the study's findings, and further research would be needed for definitive conclusions. After all, not all younger or older employees perfectly fit these categories; there are variations within each age group. Nevertheless, this finding highlighted the potential impact of generation on how remote work influences work-life balance.

This study shone a light on the importance of clear communication and supportive environments for a successful remote work experience. Employees who felt included with more in-depth

communication were almost five times more likely to report increased productivity, according to a study about the future of remote work (Alexander et al., 2021). Employees who felt that their organization clearly communicated remote work policies and offered a supportive environment reported higher satisfaction with these arrangements. Clear communication translates into well-defined policies and expectations around remote work. These include issues like work hours, communication protocols, performance expectations, and how to access necessary resources. When employees understand these aspects, it helps them to avoid confusion, frustration, and feelings of isolation. Supportive environments can take many forms, from providing ergonomic equipment for home offices to offering training on remote work tools and best practices. It can even involve creating virtual social events to help employees stay connected. Essentially, a supportive environment allowed remote employees to feel equipped, valued, and connected, even when they were physically apart. By prioritizing clear communication and building supportive remote work environments, organizations can significantly improve employee satisfaction with this style of work.

The pandemic itself likely played a role in the reported decrease in work-life balance. Future research is recommended to explore the impact of remote work outside of a pandemic setting.

### **Implications and Limitations**

This study offers valuable insights for understanding work-life balance in the age of remote work. Traditional ideas emphasizing a strict work-life separation need to be adjusted to the blurred boundaries of remote settings. This research showed how remote work can make it difficult to truly disconnect from work. Interestingly, communication was an important factor to be considered. Clear communication from employers regarding remote work policies was found to be positively linked to employee satisfaction with remote work. This suggests that communication itself can be a resource for remote workers, empowering them to manage their work-life balance more effectively.

Finally, the research underscored the importance of context. The pandemic significantly impacted everyone's work-life balance, and it is important to differentiate the long-term effects of remote work from temporary disruptions caused by such global crises. In essence, understanding the unique challenges and opportunities presented by remote work, along with clear communication from employers, is crucial for achieving a healthy work-life balance in this new work environment.

Some constraints that limited this study need to be acknowledged. Firstly, the data was collected near the end of the pandemic, a time of significant challenges that likely influenced employee perceptions of work-life balance. Studying remote work outside of a pandemic could reveal different outcomes. Secondly, the study focused on religious non-profit organizations, whose work culture might differ from for-profit companies. This limits how broadly the findings can be applied to other workplaces. Finally, the relatively small sample size and reliance on self-reported information may have introduced potential bias. Future research with a larger, more diverse group of participants and objective data collection methods could strengthen our understanding of work-life balance in remote work environments.

### **Conclusion**

This study investigated the impact of remote work on work-life balance for SEUM employees during the COVID-19 pandemic. The results showed that employees generally reported a worse work-life balance while working remotely compared to their pre-pandemic office work. This suggests that adjusting to remote work can be challenging, especially for those who already had a good work-life balance before.

An interesting finding was the positive link between clear communication from the organization and employee satisfaction with remote work. Employees who felt well-informed about remote work policies and practices reported being happier with the arrangements.

The study also identified both positive and negative aspects of remote work. While employees appreciated the flexibility, relaxed dress code, and potential cost savings on commuting and childcare, they also faced challenges like communication difficulties, isolation, and decreased productivity due

to distractions. It's important to remember that the pandemic itself likely played a role in the reported decrease in work-life balance. Factors like lockdowns, family stress, and overall pandemic anxiety could have contributed to these findings.

This study recommends that the SEUM improve remote worker support through clear and ongoing communication about policies, expectations, and best practices. A well-designed remote work policy that prioritizes work-life balance may be implemented, with employee-centric practices (flexible scheduling, breaks, dedicated workspaces) and organizational support (clear expectations, communication tools, well-being resources, respecting time off). Regular check-ins and a possible hybrid work model could also be considered. Additionally, training programs on time management, communication tools, and maintaining work-life boundaries could equip employees with skills needed to succeed in a remote work environment. Finally, it is suggested that the SEUM explore initiatives to support employee well-being, such as stress management programs or mental health resources, to create healthier work environments overall.

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# Google Gemini's Influence on Workplace Dynamics in Bangkok: An Empirical Study of AI Integration, Employee Interactions, and Job Satisfaction

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## Abstract

This research study delved into the intricacies surrounding adoption of Google's Gemini and its ramifications on employee interactions, daily operational tasks, and overall job satisfaction within organizational contexts. Employing qualitative methodology, the study utilized in-depth interviews as the primary data collection method. Employing a purposive sampling technique, the participant pool comprised a diverse array of eight individuals from various organizational departments of firms in Bangkok, Thailand to ensure inclusion of different perspectives and roles. Through content analysis, the study scrutinized the multifaceted impact of Gemini on the dynamics of organizational operations. The findings revealed that the introduction of Google's Gemini significantly reverberated across three dimensions of workplace dynamics: employee interactions, execution of daily operational tasks, and the overarching sentiment of job satisfaction among employees. While integration of Gemini promises to substantially augment productivity levels and elevate workforce morale, a nuanced and balanced approach is imperative to optimize its benefits while mitigating potential drawbacks. This necessitates a deliberate focus on preserving the human elements indispensable for fostering a dynamic, innovative, and harmonious team environment amidst the technological advancements facilitated by Gemini.

**Keywords:** *Gemini, employee interactions, operational tasks, job satisfaction*

## Introduction

The integration of artificial intelligence (AI) into the workplace has fundamentally reshaped how businesses operate, influencing everything from operational efficiency to employee engagement. This transformative technology offers numerous potential benefits, such as automating routine tasks, enhancing decision-making processes, and personalizing employee experiences, but it also introduces challenges, including ethical considerations and the potential for workforce displacement (Wamba-Taguimdje et al., 2020; Zirar et al., 2023). AI technologies such as machine learning algorithms, natural language processing, and robotic process automation have become integral in various sectors including finance, healthcare, manufacturing, and customer service. These tools help companies to analyze vast amounts of data quickly, predict trends, and make informed decisions more efficiently than ever before. For instance, AI-driven analytics can identify inefficiencies in supply chains, while chatbots can handle customer inquiries, freeing up human employees for more complex tasks (Jha et al., 2021; Haleem et al., 2022; Aldoseri et al., 2023).

Launched in May 2023, Google's Bard AI represents an advanced AI chatbot engineered to respond to a broad spectrum of user inquiries with a sophistication nearing human understanding. Similar to other AI-powered text generation tools such as ChatGPT, Bard AI differentiates itself by integrating the capabilities of Google Search. This integration facilitates direct access to contemporary information from the Internet, proving particularly advantageous for tasks necessitating up-to-date knowledge or rapid information retrieval. The foundation of Bard AI lies in Google's Pathways Language Model (PaLM 2), which has undergone extensive training on a comprehensive dataset encompassing text from books, articles, websites, and code from GitHub repositories. Such thorough training empowers Bard AI to execute a variety of tasks, including text generation, language translation, creation of diverse creative content, and providing informative responses to user queries (Rudolph et al., 2023; Siad, 2023; Waisberg et al., 2024).

Furthermore, as reported by Pichai and Hassabis (2023), CBS News (2024), and Langley (2024), Google renamed its "Bard" chatbot to reflect the new AI technology powering it, named "Gemini." The launch of Gemini intensifies competition between Google and Microsoft in the realm of emerging AI technologies, which these companies promote as innovative tools for enhancing creativity, facilitating tasks such as code debugging, and even preparing for job interviews. Google has introduced a free version of Gemini, alongside a premium variant available at \$20 per month, offering two months for free to attract trial users. Ahead of the official announcement, Sissie Hsiao, a Google general manager responsible for Gemini, expressed to journalists, "We believe this represents one of the most significant advancements in fulfilling our mission." Gemini's functionalities will be integrated into Google's search application for iPhones, a platform where Apple has traditionally promoted its Siri voice assistant for similar tasks. According to the Mountain View, California based company, Gemini is a highly advanced AI system capable of tutoring students, providing coding assistance to engineers, generating creative project ideas, and producing content based on user preferences. While its longstanding voice assistant will continue to be available, Google expects that Gemini will become the primary method through which users engage with the technology to assist in their thinking, planning, and creative processes. This development signifies Google's continued exploration of new and potentially challenging territories, while still adhering to its foundational mission to "organize the world's information and make it universally accessible and useful."

The critical dependence of many organizations on effective customer service highlights the importance of ensuring customer satisfaction and loyalty, as well as maintaining high performance levels. Within this context, recent advancements in AI offer substantial opportunities for enhancing operational efficiencies and improving employee interactions. Google Gemini, a state-of-the-art AI tool, has demonstrated considerable potential to revolutionize workplace dynamics. Although numerous studies have been conducted on various AI applications, such as ChatGPT—for instance, Limna et al. (2024) investigated the integration of ChatGPT in business environments in Bangkok, Thailand—the specific implications of Google Gemini within Thai organizational settings remain insufficiently explored. This empirical study explores the integration of Google Gemini and its impact on employee interactions, daily operational tasks, and overall job satisfaction. By examining these crucial areas, the research seeks to provide deeper insights into the effects of AI technologies on organizational dynamics and employee well-being. The findings are expected to inform the development of more effective strategies for AI integration in the workplace, focusing on enhancing both employee satisfaction and organizational performance.

### **Research Objective**

The primary objective of this study is to explore the specific impacts of Google's Gemini on workplace dynamics in Bangkok, Thailand, focusing on three key areas: 1) employee interactions, 2) daily operational tasks, and 3) job satisfaction. Workplace dynamics, in this context, refer to the interactions, relationships, and communication patterns among employees within an organization.

1. For employee interactions, the study examines how the automation of routine tasks and enhanced communication through Google's Gemini influence interpersonal relationships and collaboration among employees.
2. Regarding daily operational tasks, it explores how Gemini streamlines operations, reduces the burden of mundane tasks, and allows employees to focus on strategic and creative activities.
3. Finally, for job satisfaction, the study assesses how the integration of Gemini affects employees' overall job satisfaction by reducing workload and stress and providing opportunities for more meaningful work.

By examining these areas, the research aims to provide insights into the broader impact of AI technologies on organizational dynamics and employee well-being.



## Review of Related Literature

In the contemporary dynamic business environment, effective workforce management emerges as a critical challenge for organizations aiming to secure sustainable growth and a competitive edge. Hurry (2024) proposes a transformative approach to workforce management that leverages advanced analytics, AI, and integrated strategies to accurately forecast performance. This method synthesizes data-driven insights with proactive decision-making, enabling businesses to optimize employee performance, enhance productivity, and drive organizational success. The holistic framework encompasses predictive analytics models, AI-driven algorithms, and strategic initiatives, all aimed at facilitating comprehensive workforce optimization. By employing machine learning techniques, organizations can acquire valuable insights into employee behavior, preferences, and performance patterns, which support proactive interventions to address potential issues and seize opportunities. By aligning workforce management strategies with broader organizational goals, companies can cultivate a culture of continuous improvement and innovation. This alignment helps ensure long-term sustainability and resilience in a rapidly changing market environment.

Mossavar-Rahmani and Zohuri (2024) highlighted that global industrial landscapes are undergoing significant transformation due to the integration of AI in workplace settings, ushering in a new era marked by enhanced productivity, creativity, and revolutionary changes. AI technologies are becoming indispensable tools that refine workflows, automate repetitive tasks, and augment human capabilities across various sectors, including finance, human resources, and manufacturing. In manufacturing, AI-driven robotic systems are improving speed and precision, thereby increasing output and achieving economies of scale. In the financial sector, AI algorithms play a crucial role by analyzing extensive datasets to provide insights into market trends, risks, and investment strategies. Furthermore, AI-powered chatbots are transforming customer service by delivering immediate, personalized support, revolutionizing the interaction between consumers and businesses.

Naqbi et al. (2024) illustrated that the integration of generative AI across diverse organizational settings signifies a substantial advancement in digital transformation and creativity enhancement. The deployment of generative AI in sectors such as academia, engineering, and communications is revolutionizing productivity enhancements, ranging from the generation of compelling advertising content to the rapid production of precise technical reports. Nonetheless, the implementation of generative AI presents several ethical challenges, necessitating strict adherence to safety standards and legislative frameworks. It is imperative to acknowledge the social and cultural ramifications associated with its use. Consequently, while generative AI serves as a powerful tool for business innovation, its effective and responsible utilization demands meticulous management.

Fenwick et al. (2024) elucidated a modern and forward-thinking perspective on the strategic and human-centric functions of human resource management (HRM) as AI becomes increasingly integrated within the workplace. Over the past twenty years, HRM has experienced a profound transformation, shaped by market dynamics and technological advances, transitioning into a discipline that is both cross-functional and data-driven. As AI infiltrates various HRM functions, it catalyzes a revolution in traditional practices by increasing system efficiencies, conducting advanced data analysis, and enhancing value creation processes within organizations. Consequently, HRM assumes a vital role in addressing the complexities introduced by AI-driven environments, ensuring that integration of these technologies is aligned with organizational goals and employee welfare.

Bhargava et al. (2021) qualitatively explored working adults' perceptions of the implementation of robotics, AI, and automation [Robotics, Artificial Intelligence, and Automation (RAIA)] on job security, job satisfaction, and employability. The findings suggested that "human touch" and "soft skills" remain irreplaceable by RAIA. Employees need to view RAIA as an opportunity rather than a threat, although they may face a job satisfaction dilemma. Organizations must be well-prepared for industrial changes both before and after implementation of RAIA. These insights are valuable for industrial and organizational psychologists, HRM practitioners, and strategic IT decision-makers in managing RAIA-related technological changes. Considering employees' suggestions and perceptions can help mitigate the consequences of these changes. Both employees and employers should adopt a

flexible and open-minded approach toward RAI technology, embracing its potential impact on job roles and responsibilities, with a commitment to continuous learning and technological adaptation.

According to Braganza et al. (2021), innovative and highly efficient Artificial Intelligence System Automation (AI-SA) is reshaping jobs and the nature of work throughout supply chain and operations management. AI-SA can have one of three effects on existing jobs: no effect, elimination of entire jobs, or elimination of specific tasks within a job. This paper focused on jobs that remained after the effects of AI-SA, albeit with alterations. The term "Gigification" is used to describe these altered jobs, as they share characteristics of gig work. The study examined the relationship between Gigification, job engagement, and job satisfaction. While Gigification tended to increase job satisfaction and engagement, AI-SA weakens this positive impact. The authors suggested that, over time, the effects of AI-SA on workers will lead to a shift from full-time, permanent jobs to gigified jobs.

## **Methodology**

This research adopted a qualitative methodological approach. Central to this approach were in-depth interviews, a hallmark of qualitative research. Qualitative research aims to uncover the underlying reasons and processes that guide individuals' decisions and actions, seeking to understand how these choices ultimately take shape (Kalu & Bwalya, 2017). In-depth interviews are particularly effective in garnering detailed insights on specific topics, yielding precise information aligned with research objectives. They facilitate a deep dive into subject matter, enabling a nuanced understanding that quantitative methods may not capture (Rutledge & Hogg, 2020). Additionally, it integrated a documentary method as a complementary approach to reinforce primary data collection. This involved a meticulous review of secondary data, which played a crucial role in formulating pertinent interview questions. The synthesis of primary data from in-depth interviews and secondary data reviewed provided a robust foundation for achieving comprehensive and accurate research outcomes.

The study employed a purposive sampling methodology to select respondents. Purposive sampling involves the intentional selection of participants deemed to have a deep understanding and knowledge pertinent to the research topic (Tongco, 2007). The sample was comprised of eight participants. They were specifically chosen for their direct experience with AI tools like Google's Gemini within their professional roles, ensuring that their insights were highly pertinent to the study. Individuals who had actively engaged with or managed the implementation of AI technologies in their respective departments were selected.

To capture a wide range of perspectives on the impact of Gemini, the sample included participants from various departments such as operations, human resources, information technology, and research and development. The organizations varied in their nature, encompassing sectors such as business operations and technical support. The participants held positions at different levels within their organizations, including operational, middle management, and strategic levels. This diverse representation made possible a broad understanding of Gemini's impact across various organizational functions and hierarchies. Ensuring an equal gender distribution (four males and four females) provided a balanced view of experiences and perceptions. The age range of participants (29 to 40 years) ensured that they were mature professionals with diverse career experiences, contributing to the depth of the insights gathered. All participants were residents of Bangkok, Thailand, ensuring contextual relevance to regional business practices and cultural dynamics, making the findings more applicable to similar settings. Additionally, the participants were professionals and subject-matter experts in organizational workplace dynamics, particularly with recent experiences or knowledge related to AI tools like Gemini. The extent to which the respondents used generative AI in the workplace varied. Some participants used Gemini extensively for automating routine tasks like data entry, email filtering, and report generation. Others utilized it for more strategic functions, such as data analysis and pattern recognition, which enhanced decision-making and operational efficiency. Overall, the integration of Gemini into their daily work allowed participants to focus more on high-level problem-solving and strategic thinking, significantly influencing their job roles and satisfaction.

Table 1 presents the participants' demographic information, detailing their gender, age, department, as well as the dates and times at which their interviews were conducted.

**Table 1** *Respondents' Demographic Information and Interview Dates and Times*

No.	Gender	Age	Department	Date and Time of Interview
R1	Male	32	Operations	March 26, 2024 at 09:30 am
R2	Male	40	Human Resources	March 26, 2024 at 11:00 am
R3	Male	39	Human Resources	March 26, 2024 at 01:00 pm
R4	Male	31	Research and Development	March 27, 2024 at 09:00 am
R5	Female	29	Operations	March 27, 2024 at 11:00 am
R6	Female	37	Information Technology	March 27, 2024 at 01:00 pm
R7	Female	40	Human Resources	March 28, 2024 at 09:00 am
R8	Female	33	Research and Development	March 28, 2024 at 01:00 pm

From Table 1, the study respondents also represented different organizational levels, with distinct roles and job descriptions. In operations (R1 and R5), responsibilities included overseeing daily business activities, optimizing operational efficiency, and ensuring smooth workflow. Gemini's automation of repetitive tasks such as data entry and report generation allowed these participants to focus more on strategic planning and client interactions. Human resources professionals (R2, R3, and R7) managed employee relations, recruitment, training, and development. The tool streamlined communication tasks like scheduling meetings and summarizing key decisions, enhancing overall efficiency, and enabling deeper engagement in strategic human resources initiatives and employee development programs. In research and development (R4 and R8), responsibilities encompassed conducting research, developing new products, and improving existing ones. Gemini assisted in data analysis and pattern recognition, significantly reducing time spent on routine work and allowing these respondents to concentrate on innovative research and product development. For information technology (R6), tasks involved managing the company's IT infrastructure, ensuring cybersecurity, and supporting technology-driven projects. The automation of routine IT tasks and enhanced data analysis capabilities improved operational efficiency and accuracy, enabling the IT professional to focus on higher-level problem-solving and system improvements.

Content analysis facilitates the systematic and objective delineation and quantification of distinct phenomena. This method allows for the extraction of valid inferences from verbal, visual, or written data (Vespestad & Clancy, 2021). In this study, content analysis served as the primary tool for analyzing qualitative data gathered from in-depth interviews. It was instrumental in interpreting participants' nuanced verbal responses, enabling a comprehensive understanding of the study's subject matter within the context of Gemini's influence on workplace dynamics.

## Results

A systematic analysis of participants' responses yielded several noteworthy themes regarding the implementation of Gemini within organizational workplace dynamics. These themes encompassed employee interactions, the management of daily operational tasks, and the overarching impact on job satisfaction. Gemini's integration in the workplace has positively impacted employee interactions by freeing up time for more meaningful engagement, improving operational efficiency through

automation, and enhancing job satisfaction by reducing stress and enabling focus on more valuable tasks. However, the study also underscored the necessity for organizations to address concerns about job security and provide continuous training to help employees thrive in an AI-enhanced environment. Each theme provides a nuanced understanding of the transformative effects that Google's Gemini exerts on both interpersonal collaborations and procedural efficiencies within workplaces. This exploration offers valuable insights into how such technological integration can enhance or modify traditional work environments, potentially leading to improved productivity and employee morale.

### ***Employee Interactions***

Employee interactions in the workplace were notably influenced by the introduction of Gemini, which serves multiple functions that reshape communication dynamics. By managing routine communication tasks such as scheduling meetings, summarizing key decisions, and providing language translations, Gemini helped streamline interactions and reduce miscommunications, particularly in diverse teams or those spread across various geographical locations. This optimization of communication processes allowed employees to focus more on substantive, in-person engagements and collaborative brainstorming sessions, thereby enhancing interpersonal relationships and fostering a more cooperative work atmosphere. However, a potential downside is an over-reliance on Gemini for communication that could lead to a decrease in face-to-face interactions among team members. This shift might undermine team cohesion and diminish opportunities for spontaneous knowledge exchange, which are often crucial for holistic team development and innovation.

Gemini has been a game changer for us, especially in how we handle our day-to-day communications. This AI tool takes over routine tasks like scheduling meetings and summarizing decisions, which has been incredibly helpful. (R1)

With the routine tasks automated, we now have the capacity to engage more deeply in project work and brainstorming sessions. This additional time has allowed us to improve our focus on creative and strategic areas where human input is crucial. Instead of merely exchanging emails, we are now able to hold meaningful discussions that drive innovation and strategic planning. For example, our team meetings have transformed from procedural updates to sessions where we collaborate on new ideas and solutions, fostering a more dynamic and productive work environment. (R2)

To be honest, while Google's Gemini is great for managing structured tasks, there is a slight concern that we might start relying too much on digital communication. This can reduce our face-to-face interactions, which are critical for building relationships and informal knowledge sharing. (R3)

Initially, there was a bit of a learning curve, and some team members felt a bit isolated. But as we have adjusted, we have found ways to use Gemini to actually enhance our team dynamics. For instance, its translation features help us communicate more effectively with our international colleagues, which has been fantastic for inclusivity. (R4)

As teams become more global and diverse, Gemini is essential for managing communication barriers and administrative overhead. But it is important to keep the human element in mind and use these tools to support, not replace, the personal interactions that foster team spirit and innovation. (R7)

### ***Daily Operational Tasks***

The integration of Gemini significantly enhanced daily operational tasks within organizations. By automating repetitive tasks such as data entry, report generation, and email filtering, Gemini increased operational efficiency and liberated employees' time. This allowed them to focus more on strategic thinking, problem-solving, and client interactions, thus adding greater value to their roles. While Gemini does not replace traditional data analysis tools, its capabilities in text generation, summarization, completion, and editing help process and interpret large volumes of textual data. This enhances the accuracy of routine tasks by identifying patterns and insights that may elude human observation, supporting more informed decision-making processes. These features, combined with descriptive statistics, ensure that Gemini aids in data interpretation and complements, rather than replaces, specialized data analysis tools. Additionally, this process improves workflow precision and

reliability. The introduction of Gemini prompts a redefinition of required skill sets within workforces. As certain tasks are managed by Gemini, previously valuable skills may decrease in relevance, necessitating a shift in employee competencies. Consequently, organizations are offering training and development opportunities to equip employees with new skills tailored to effectively collaborate with AI assistants like Gemini, ensuring workforce relevance and maximizing AI efficiencies.

Gemini allows employees to focus on more value-added activities. With repetitive tasks being managed by Gemini, we find ourselves spending more time on strategic thinking and direct client interactions. It has really shifted our focus towards higher-level problem-solving and innovation. (R5)

Gemini has been pivotal. By handling mundane tasks like data entry, report generation, and email filtering, this AI tool has drastically improved our operational efficiency. Moreover, Gemini's ability to analyze text-based datasets and identify patterns is exceptional. This not only cuts down the time we spend on analyzing data, but also significantly reduces the margin for human error. The accuracy it brings to our workflows is quite remarkable. (R6)

As Gemini takes over certain tasks, the skill sets required for many roles are changing. Our organization is actively investing in training programs to help employees acquire new skills that complement Gemini's capabilities. It is about working alongside AI, not being overshadowed by it. By equipping employees with these new skills, we aim to enhance their workforce's ability to collaborate with AI tools effectively and maintain a competitive edge in the evolving job market. (R7)

In a competitive business environment, efficiency and precision are key. Technologies like Gemini not only enhance these aspects, but also allow businesses to remain agile and responsive to market changes. Adopting such technologies isn't just beneficial; it is necessary for survival and growth. (R8)

### ***Overall Job Satisfaction***

The deployment of Gemini within organizations has a profound impact on overall job satisfaction through several distinct pathways. First, by automating mundane and repetitive tasks, Gemini has significantly reduced employee stress and workload. This reduction in daily task pressure can lead to a more positive and less burdensome work experience, enhancing employees' overall job satisfaction. Moreover, relief from these routine duties has allowed employees to engage more deeply with work that is both challenging and fulfilling. This shift enables them to utilize their creativity and expertise more effectively, which can substantially increase job engagement and satisfaction. Employees often find greater value in their roles when they can focus on complex, meaningful tasks that require higher cognitive skills and provide a sense of accomplishment.

However, the introduction of such AI technology also brings about concerns regarding job displacement. With Gemini taking over tasks traditionally performed by humans, fears of redundancy may arise among workforces. It is imperative for organizations to mitigate these fears through clear and transparent communication about AI's role in workplaces. Additionally, offering reskilling and upskilling programs can reassure employees about their career prospects, helping them adapt to the evolving job landscape where AI complements human capabilities rather than replacing them outright. This strategic approach is crucial in maintaining morale and job satisfaction as AI becomes more prevalent in organizational settings.

Gemini has greatly impacted our job satisfaction by taking over the more mundane and repetitive tasks. This shift has noticeably reduced stress levels and allowed us to engage in more meaningful and intellectually stimulating work, which has been fantastic for morale. (R1)

The employees have positive feelings about using their creativity and expertise more effectively. By automating the routine tasks, employees now have the opportunity to tackle more complex challenges, which plays to their strengths and fosters a deeper sense of achievement and satisfaction in their roles. It is empowering for them to apply their skills in ways that add significant value. (R3)

With AI taking over certain tasks, there are concerns about job security among your staff, which, to me, is a natural concern. There is an initial fear that AI might replace jobs. However, our organization is

committed to transparency about the role of AI. We emphasize that AI tools, like Google's Gemini, are here to augment our capabilities, not replace us. (R4)

We offer reskilling and upskilling programs to ensure that our employees are equipped to work alongside AI. These programs are designed to help employees develop new skills that are in demand in an AI-enhanced workplace. For example, we focus on data analysis, project management, and even AI oversight. The aim is to prepare our workforce not just to coexist with AI, but to thrive with it. (R5)

In my opinion, the key is to balance the use of AI with the human aspect of work. This is very important. We need to use AI tools like Gemini to handle tasks that can be automated, but also ensure that we maintain and enhance the elements of work that require human touch—creativity, empathy, and strategic thinking. Providing opportunities for growth and emphasizing the value of human contributions in the AI landscape are essential. (R8)

## Discussion

Integration of Google's Gemini into organizational settings has had a profound impact on employee interactions, daily operational tasks, and overall job satisfaction. Gemini has significantly influenced in-person interactions among employees by automating routine tasks and enhancing communication efficiency. This AI tool frees up time, allowing employees to engage more in meaningful face-to-face discussions during meetings and collaborative sessions. In addition, participants highlighted that Gemini facilitates better team dynamics by ensuring alignment through automated summaries and translations, bridging language barriers in diverse teams. This reduction in routine task stress enables employees to focus on strategic activities and innovation during in-person meetings, enhancing overall productivity. However, concerns about over-reliance on digital communication potentially reducing spontaneous interactions were noted. To address this, organizations are encouraged to balance AI use with initiatives promoting in-person engagements and provide training programs to help employees integrate digital tools while maintaining effective face-to-face communication.

Gemini enhances both digital and in-person interactions, creating a more cohesive and productive work environment. This integration profoundly impacts employee interactions, daily operational tasks, and overall job satisfaction. While handling routine communication tasks increases efficiency and fosters improved interpersonal relationships, it also presents challenges such as reduced face-to-face interactions. Organizations must reevaluate necessary skills and develop training programs to adapt to an AI-enhanced work environment. Despite reducing stress and workloads, Gemini raises concerns about job security, necessitating transparent communication and supportive measures like reskilling and upskilling programs.

The findings of this study are aligned with previous research, illustrating the complex role of AI in modern workplace environments. Notably, Mossavar-Rahmani and Zohuri (2024) observed that adoption of AI in workplace settings is precipitating a profound transformation across the global industrial landscape, heralding a new era characterized by heightened productivity, increased creativity, and revolutionary shifts. AI technologies are emerging as vital tools that streamline workflows, automate repetitive tasks, and enhance human capabilities in diverse sectors such as finance, human resources, and manufacturing. This integration of AI is reshaping how businesses operate, driving efficiency and innovation across multiple industries. In addition, Tiwari et al. (2024) explored the multifaceted impacts of AI on productivity, job roles, decision-making processes, and wider socioeconomic contexts. Technologies such as machine learning and natural language processing have been instrumental in facilitating routine tasks, thereby enabling employees to allocate more time to creative and strategic initiatives. This shift is likely to significantly enhance productivity, contributing to improvements in operational efficiency across various industries. Nevertheless, the transformative nature of AI also introduces concerns regarding job displacement and necessitates the upskilling of employees to accommodate evolving job roles.

Furthermore, Morandini et al. (2023) also noted that introduction of AI within organizations involves the simultaneous implementation of various organizational strategies. Initially, it is essential

to identify the cross-functional skills required to bridge existing skills gaps in workplaces. Moreover, organizations play a crucial role in assisting employees to recognize the skills necessary for adopting AI, enhancing their existing skills, and developing new capabilities. Additionally, companies must establish processes to support their workforces by offering targeted training and development opportunities. This ensures that employees maintain open attitudes and adaptable mental models in preparation for evolving labor markets and the accompanying challenges. Moreover, Asfahani (2022) confirmed a positive association between AI and various aspects of industrial-organizational psychology. The study's results indicated that AI-enabled systems and robotics are poised to play a significant role in the future, highlighting their potential to positively impact workplace dynamics and employee well-being. This association underscores the importance of integrating AI technologies thoughtfully within organizational frameworks to enhance operational efficiency and job satisfaction. Ahumada-Tello et al. (2023) found that AI is a valuable tool that facilitates more effective decision-making, and holds promise for enhancing employee well-being. AI can play an important role in shaping the future of work and improving employee satisfaction.

Overall, while the introduction of Gemini can significantly enhance productivity and employee morale, a balanced approach is required to fully leverage its benefits while mitigating the potential downside. This involves maintaining a focus on human elements crucial for fostering a dynamic, innovative, and cohesive team environment.

## **Conclusions**

This study provides detailed insights into how respondents' organizations have adopted Google's Gemini and integrated its use within their business processes. Specifically, the use of Gemini has been applied to data entry, email filtering, and other routine tasks. Gemini automates these mundane tasks, significantly reducing the level of effort required from employees. This shift allows employees to focus on more strategic and value-added activities, which enhances operational efficiency and precision. To establish the relationship between using Gemini and job satisfaction in the workplace, in-depth interviews with participants who had direct experience with Gemini were conducted. The interviews focused on understanding how the automation of routine tasks by Gemini impacted participants' workload, stress levels, and overall job satisfaction. Content analysis of these interviews revealed that the reduction in mundane tasks led to a more positive work experience, allowing employees to engage in more fulfilling and intellectually stimulating activities. This shift in job responsibilities contributed to an increase in job satisfaction among employees. Through these methods, the study provides clear evidence of the impact of Google's Gemini on both business processes and employee satisfaction, demonstrating the tool's effectiveness in enhancing workplace dynamics.

The implementation of Gemini in organizations significantly affected workplace dynamics across three main areas: employee interactions, daily operational tasks, and overall job satisfaction. Gemini streamlines communication by automating routine tasks, allowing employees to focus on more substantive and collaborative work. However, this reliance on digital communication might reduce personal interactions, potentially affecting team cohesion. In operational tasks, Gemini's automation improves efficiency and accuracy but necessitates shifts in employee skill sets, prompting organizations to invest in training programs. For job satisfaction, while Gemini reduces workloads and stress by handling mundane tasks, concerns about job displacement and the need for new competencies arise. Overall, the integration of Gemini offers considerable benefits in productivity and morale, but requires careful management to balance technology's advantages with maintaining essential human elements of the workplace.

Integration of Gemini into organizational processes presents significant academic and practical implications, enriching both theoretical understanding and operational workplace strategies. Academically, Gemini provides a fresh perspective on communication dynamics, offering a platform to test and expand communication theories across diverse and geographically dispersed teams. It also serves as a pivotal case study for operations management, exploring the interplay between automation and human activity, and shedding light on AI's psychological impacts on job satisfaction

and organizational behavior. Practically, adoption of Gemini necessitates development of innovative human resource strategies focused on continuous learning and adaptability, highlighting the importance of strategic change management so that technological integration is aligned with both business and employee needs. Furthermore, Gemini transforms leadership and team management practices by promoting inclusivity and redefining collaboration in a technologically advanced setting. These contributions underscore Gemini's role in enhancing operational productivity, fostering workplace inclusivity, and stimulating innovative work practices, ultimately steering organizations towards a more flexible and adaptive approach to work in an AI-enhanced environment.

### Limitations and Recommendations for Future Studies

The study has several limitations that suggest areas for improvement in future research. Firstly, the small sample size of eight participants limits the generalizability of findings. Future studies should include a larger and more diverse group of participants to enhance data robustness. Secondly, the reliance on qualitative methods and a focus solely on Bangkok did not capture the full spectrum of potential impacts across different cultural and organizational contexts. Incorporating quantitative methods and expanding the geographic scope could provide a more comprehensive understanding of Gemini's effects. Additionally, the subjective nature of qualitative analysis might introduce biases, which could be mitigated by using a mixed-methods approach to balance qualitative insights with quantitative data. Furthermore, while the study provides empirical insights, some findings may be seen as generally known facts. Future research should aim to delve deeper into the specific and nuanced impacts of AI technologies like Gemini. This includes investigating less obvious effects and providing more granular insights that contribute significantly to the body of knowledge on AI in the workplace.

Another limitation of this study is the lack of a clearly specified method for assessing job satisfaction. While the study evaluated job satisfaction based on factors such as the reduction in workloads and stress due to automation of routine tasks, opportunities for engaging in more meaningful activities, and overall improvements in workplace morale and engagement, these criteria were not explicitly detailed in the original discussion. Future studies should clearly define and standardize the criteria for assessing job satisfaction to ensure consistency and comparability of results. Additionally, future research should include a broader range of job roles and industries to obtain a more comprehensive understanding of how AI tools like Gemini impact job satisfaction across different contexts. Furthermore, longitudinal studies could provide deeper insights into the long-term effects of AI integration on job satisfaction and workplace dynamics.

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- 1.5. Manuscripts should contain minimal formatting (bold and italics commands are acceptable).
- 1.6. Manuscripts should not contain editorial controls of any kind.
- 1.7. Manuscripts should also contain a 150-200 word abstract of the article. Provide at least three keywords, but do not exceed seven.

### **2. Suggested Referencing Format**

- 2.1. In order to maintain a consistent look for *Human Behavior, Development and Society*, use of the American Psychological Association (APA) publication guidelines is mandatory. For details, please see the APA Publication Manual (7<sup>th</sup> edition).
- 2.2. *HBDS* follows the APA guidelines for endnotes (preferred), in-text citations and references.
- 2.3. Referencing Samples: Please refer to <http://www.apastyle.org/> for questions about referencing, and serialization in the APA format.

### **3. Submissions Procedure**

- 3.1. Manuscripts submitted to *HBDS* must not have been previously published elsewhere or under review for publication in other journals.
- 3.2. Manuscripts must adhere to the journal guidelines; failure to comply with these may result in the rejection of a submission.
- 3.3. Manuscripts must be submitted through the ThaiJo online submission system at <https://so01.tci-thaijo.org/index.php/hbds>; look for the *HBDS* web page.
- 3.4. Manuscripts should be submitted by no later than December 31 for the April issue, April 30 the August issue, and August 31 for the December issue. Nonetheless, even if a submission is received before the stated dates, and is accepted, the journal's Administrative Board reserves the right to decide on the publication date.

### **4. Review Process**

- 4.1. Manuscripts will be checked for originality and prescreened by the editorial staff to see if their structure, content, and formatting complies with journal standards.
- 4.2. Manuscripts will undergo a double-blind review process conducted by at least 2 qualified independent peer reviewers who are external to authors' institutions, and knowledgeable in a relevant academic field. This process typically takes from 4–6 weeks, depending on peer reviewer response times.
- 4.3. Authors will be informed of reviewers' comments as soon as they are available.
- 4.4. Authors will be given up to 1 month to revise their papers (should that be necessary) and should return the revised version by the 1<sup>st</sup> of February/June/October (or earlier).

### **5. Numbers in APA Style**

- 5.1 In general, round decimals to two places with the exception of *p*-values (three decimal places is the limit— $p < .01$  or  $.001$ ). Percentages are expressed as whole numbers or to one decimal place.
- 5.2 Rounding rules: If the final number is 5 or more, add one to the last decimal place to be kept (1.565 becomes 1.57). If the number is less than 5, write the number with the required decimal places (2.344 becomes 2.34).
- 5.3 When a statistical expression cannot exceed the value of 1, then the number reported is NOT preceded by a zero (e.g., with *p*-values— $p < .01$ , also applies to correlations, Cronbach's alpha).
- 5.4 Large numbers—use commas between groups of three digits in most figures of 1,000 or more.

5.5 Further information can be gained by consulting. James Cook University, Singapore. (n.d.). Numbers in APA. See [https://www.jcu.edu.sg/\\_\\_data/assets/pdf\\_file/0009/680085/Numbers-in-APA.pdf](https://www.jcu.edu.sg/__data/assets/pdf_file/0009/680085/Numbers-in-APA.pdf); Guadagno, R. (2010). Writing up your results – Guidelines based on APA style. Retrieved from [https://ich.vscht.cz/~svozil/lectures/vscht/2015\\_2016/sad/APA\\_style2.pdf](https://ich.vscht.cz/~svozil/lectures/vscht/2015_2016/sad/APA_style2.pdf)

#### 6. Recommended Verb Tenses for APA Style Articles (p. 118)

Paper Section	Recommended Tense	Example
Literature review (or whenever discussing other researchers' work)	Past Present perfect	Quinn (2020) presented Since then, many investigators have used
Method	Past	Participants completed a survey
Description of procedure	Present perfect	Others have used similar methods
Reporting results	Past	Results were nonsignificant Scores increased Hypotheses were supported
Discuss implications of results	Present	The results indicate
Presentation of conclusions, limitations, future directions, etc.	Present	We conclude Limitations of the study are

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