



Received: 29 January 2025

Revised: 24 February 2025

Accepted: 25 February 2025

DIGITAL INTEGRATED MARKETING AND CONSUMER CHOICE FOR SAUSAGES IN BANGKOK, THAILAND

Parisa PEROTTI¹ and Sasiprapa PHANTHANASAEWEE¹

¹ School of Business Administration, Bangkok University, Thailand;
parisa.per@gmail.com (P. P.); sasiprapa.c@bu.ac.th (S. P.)

Handling Editor:

Professor Dr. Wing-Keung WONG

Asia University, Taiwan

(This article belongs to the Theme 1: Business & Economic in Industry 5.0)

Reviewers:

1) Associate Professor Dr. Warat KARUCHIT

NIDA, Thailand

2) Assistant Professor Dr. Adipon EUJARUSPHAN

Thammasat University, Thailand

3) Dr. Sandusit BROREWONGTRAKHUL

RBRU, Thailand

Abstract

This study aimed to examine the digitally integrated marketing communication that affects consumers' purchasing decisions for ABC Sausage Brand products in Bangkok, Thailand. The questionnaires were used to collect data from a population of 400 people who had previously consumed ABC brand sausage products and lived in Bangkok. The data were analyzed using descriptive statistics, including percentage, mean, standard deviation, and multiple regression analysis. The study results revealed that most ABC Sausage Brand customers were female, aged between 26-33 years, single, had a bachelor's degree, had an income of 25,001-35,000 baht, were private employees, and had 3-4 family members. In terms of behavior in buying sausage products, it was found that most consumers had a frequency of purchase of 3-4 times per month. The primary reason for purchasing sausages was the product quality/delicious taste. Most consumers buy sausages through convenience stores. The average cost per time is 101-300 baht. The consumption pattern is mainly with family. Most of them buy AFM-brand sausages. The people who influence the decision are friends/acquaintances and family. The primary information channel is TikTok. The hypothesis testing found that Digital Integrated Marketing Communication, including digital advertising, digital personal selling, digital sales promotion, digital public relations, and digital direct marketing, significantly affects the purchasing decision of ABC brand sausage products consumers in Bangkok.

Keywords: Digital Integrated Marketing Communication, Purchase Decision, Sausage

Citation Information: Perotti, P., & Phanthanasaewee, S. (2025). Digital Integrated Marketing and Consumer Choice for Sausages in Bangkok, Thailand. *Asian Administration and Management Review*, 8(1), Article 18. <https://doi.org/10.14456/aamr.2025.18>

Introduction

Sausages are a popular meat product in both domestic and international markets, particularly among consumers seeking convenience and time-saving meal preparation. Sausages offer high nutritional value as they are a rich source of protein from meat and can be preserved for extended periods through processing methods that prolong shelf life without compromising nutritional quality. Their ease of consumption and convenient transportation make sausages ideal for modern consumers (Bangkokbiznews, 2020). In Thailand, the sausage market has seen a continuous increase in demand, corresponding with population growth and rising income levels. Sausages are consumed as snacks and can serve as a main meal component. They have a distinctive taste and a smooth texture, with fat comprising approximately 30-40% of the content, enhancing the flavor satisfaction for consumers. Moreover, sausages are considered a processed meat product that meets the need for convenient and quick consumption, maintaining widespread popularity in Thai society (Katchwattana, 2019). The eating habits of Thai consumers have shifted significantly, particularly among younger generations and working-age individuals who tend to consume more than three meals a day. Interestingly, some groups consume an average of 5-6 meals daily. Beyond the standard three main meals, there is also a growing trend of consuming additional snacks or light meals 2-3 times a day. This rise in snack consumption reflects more flexible eating behaviors, influencing changes in the food market, especially in business and industrial sectors that can develop products to meet these evolving demands (Marketeer, 2016).

In the digital era, organizations across all sectors, including government agencies, state enterprises, and private businesses, are inevitably affected by the rapid advancement of digital technology. Adapting to these changes has become essential. Organizations must adjust their operational models and communication processes to maximize efficiency, ensuring they remain competitive in an increasingly dynamic and fast-paced market (Ministry of Digital Economy and Society, 2024). The e-commerce sector is experiencing rapid growth and heightened competition, compelling companies to adopt digital marketing strategies to achieve their business objectives. Digital marketing plays a pivotal role in this era, as technology significantly influences consumer behavior and opens new opportunities for entrepreneurs. Selecting appropriate digital marketing tools has become a critical factor in attracting consumers in a rapidly evolving landscape (Vicheanpant, 2014; Wertime & Fenwick, 2008). Digital Integrated Marketing Communication (DIMC) means executing marketing strategies through online channels, leveraging internet technology, and integrating social media platforms to facilitate effective communication with consumers. This approach requires creativity in designing messages and content that are clear, engaging, and tailored to meet the needs and behaviors of consumers in the digital age. This strategy has gained widespread popularity among marketers due to its ability to reach target audiences quickly and effectively (Wuttisakdusakun, 2017).

The Digital Integrated Marketing Communication (DIMC) strategy is increasingly becoming a significant revenue-generating channel. It serves as a hub for knowledge exchange and a pathway for creating a unified brand experience, fostering consumer confidence in purchasing products or services. This strategy uses various social media platforms to build brand awareness through the internet by applying principles of advertising, public relations, sales promotion, and more. Integrated marketing is viewed as a way to deliver a seamless and cohesive experience for consumers when interacting with a brand. Businesses strive to combine all aspects of marketing communication, such as advertising, sales promotion, public relations, direct marketing, and social media, by blending tactics, methods, channels, media, and activities to work harmoniously together. Treating marketing functions as isolated units limits communication and reduces operational effectiveness. An integrated marketing communication approach ensures that all channels are aligned and follow the same strategy,

reflecting the company's business objectives and values. Businesses that have adapted significantly to the current wave of digital communication transformation, particularly in the food industry, have seen notable changes. Nowadays, restaurants and various food products are present across nearly all types of digital platforms to maximize consumer reach. This not only enhances competitiveness but also highlights the importance and necessity of embracing digital marketing trends. Many entrepreneurs in the food industry recognize that joining the digital marketing wave is essential to keeping their businesses and products relevant and competitive (Kasikorn Research, 2022).

The objectives of this study are 1) to examine consumer opinions towards the Digital Integrated Marketing Communication strategies of ABC Sausage Brand's consumers in Bangkok, 2) to investigate the purchasing decision patterns of ABC Sausage Brand's consumers in Bangkok, 3) to explore the influence of Digital Integrated Marketing Communication on the purchasing decisions of ABC Sausage Brand's consumers in Bangkok. These objectives highlight the importance of Digital Integrated Marketing Communication (DIMC) in enhancing the competitive capability of the ABC Sausage Brand in Bangkok, a highly competitive market. The research findings can help entrepreneurs apply the results to effectively develop marketing strategies that align with consumer behavior in the digital era.

Literature Review

Consumer purchasing decisions are psychological processes influenced by both internal and external factors. According to Kotler & Keller (2016) and Mothersbaugh et al. (2024), this process consists of five stages; 1) Problem Recognition, 2) Information Search, 3) Evaluation of Alternatives, 4) Purchase Decision, and 5) Post Purchase Behavior. Internal factors, such as motivation, perception, and attitude, and external factors, such as culture, social influences, and marketing, play significant roles in shaping consumer behaviors.

Digital Integrated Marketing Communication (DIMC) uses technology and social media for marketing communication. It does not follow a fixed pattern but adapts according to consumer behaviors (Kotler & Keller, 2016; Whitburn et al., 2020). DIMC consists of five key components; (1) Digital Advertising - Using online media to communicate and encourage purchasing behavior, (2) Digital Personal Selling - Leveraging technology for personalized, one-on-one communication to build customer relationships; (3) Digital Sales Promotion - Stimulating purchases through short-term promotions and incentives, (4) Digital Public Relations - Focusing on enhancing brand image and credibility through online platforms, and (5) Digital Direct Marketing - Engaging in direct communication with customers to prompt responses and drive purchases.

Research Hypothesis

Hypothesis 1: Digital advertising influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok.

Hypothesis 2: Digital personal selling influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok.

Hypothesis 3: Digital sales promotion influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok.

Hypothesis 4: Digital public relations influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok.

Hypothesis 5: Digital direct marketing influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok.

Research Conceptual Framework

Independent Variables

Digital Integrated Marketing Communication

- Digital Advertising
- Digital Personal Selling
- Digital Sales Promotion
- Digital Public Relations
- Digital Direct Marketing



Dependent Variables

Purchasing decision of
ABC Sausage Brand's
consumers in Bangkok

From the conceptual framework, the relationship between integrated marketing communication factors, which are defined as independent variables, is established. These factors include (1) digital advertising, (2) digital personal selling, (3) digital sales promotion, (4) digital public relations, and (5) digital direct marketing. These independent variables are linked to the purchasing decision process, defined as the dependent variable. The purchasing decision process consists of five stages: (1) problem recognition, (2) information search, (3) evaluation of alternatives, (4) purchase decision, and (5) post-purchase behavior.

Research Methodology

This study employs a quantitative research approach to survey and analyze data from a sample of ABC Sausage Brand consumers in Bangkok. The methodology outlines various aspects of the research process, including the population and sample, research tools, data collection, data interpretation, and statistical methods for analysis and hypothesis testing, all of which align with the study's objectives.

Population and Sample

The population for this study comprises consumers who have previously consumed ABC Sausage Brand and reside in Bangkok. According to market data, the primary target group for sausage consumption in Thailand consists of individuals aged 18 years and above living in urban areas. These consumers typically consume sausages as meals or snacks and exhibit a tendency toward convenient and easy eating habits (Somboon, 2024). The researcher, therefore, selected a sample that includes both male and female working-age individuals who are considered to have purchasing power. According to the National Statistical Office (2024), the total population of individuals aged 18 and above living in Bangkok is 5,494,932 people. The sample size was determined using Yamane's formula (1973) with a 95% confidence level and a margin of error of $\pm 5\%$. Based on this calculation, this study's sample size was 400 respondents.

The sampling method employed in this study is purposive sampling, selecting participants who have previously consumed ABC Sausage Brand and reside in Bangkok, including male and female respondents. The data was collected by distributing a Google Form link to relevant Facebook groups where the target audience was likely to be found. These groups included the AFM sausage sales group, the sausage lovers group, and the nationwide food buying and selling group. The focus was on reaching a target population with prior purchasing experience of sausage products. To ensure the relevance of the sample, the researcher included a screening question to filter for participants who had consumed sausage products at least once in the past six months. This criterion ensured that only suitable respondents were included for further analysis in the study.

Data Collection

The data collection was conducted using a questionnaire divided into five sections; general information of the respondents, purchasing decision behavior related to sausage products, Digital Integrated Marketing Communication (DIMC) factors influencing the purchasing decision of ABC Sausage Brand's consumers, and additional opinions and recommendations.

These include the test of validity and reliability to ensure the quality of the questionnaire. In the pilot test with 40 participants, the overall Cronbach's Alpha Coefficient was 0.946, indicating excellent internal consistency. The overall reliability score for Digital Integrated Marketing Communication factors was 0.936. The sub-factors ranged from 0.731 to 0.888. The overall reliability for the purchasing decision factors of sausage products was 0.902. For the actual study with 400 participants, the overall Cronbach's Alpha Coefficient remained high at 0.905, confirming the consistency of the questionnaire. The reliability score for DIMC factors was 0.852. The sub-factors ranged from 0.719 to 0.861. The purchasing decision factors had a reliability score of 0.847. All values exceeded the acceptable threshold of 0.7, indicating a high level of reliability, allowing for confident data analysis.

The researcher collected data using questionnaires from consumers residing in Bangkok. The survey was shared through online channels by sharing a Google Form link across various platforms. Additionally, secondary sources, including research papers, academic journals, and relevant books, were cited as supporting references for theoretical concepts and framework development.

Research Result

General Information of Respondents

The majority of respondents were female, aged between 26 and 33. Most were single and held a bachelor's degree. Their average monthly income ranged from 25,001 to 35,000 Baht. Most worked as private company employees and lived in households with 3 to 4 family members.

Purchasing Decision Behavior of Sausage Products

Most consumers purchase sausage products 3-4 times per month. Their purchasing decisions are mainly influenced by product quality and delicious taste. The majority buy products from convenience stores, such as 7-Eleven. The average spending per purchase ranges from 101 to 300 Baht, primarily for family consumption.

Digital Integrated Marketing Communication Factors

Digital advertising: Consumers strongly agreed that embedded advertising on digital platforms, especially through non-primary brand social networks, effectively introduced them to new products from ABC Sausage Brand and provided them with quick access to information.

Digital personal selling: The consumers strongly agreed that having a page administrator who is ready to answer questions and provide necessary product information enhances purchase motivation.

Digital sales promotion: The consumers strongly agreed that regular promotions for ABC Sausage Brand on social networks effectively stimulated interest in sausage products.

Digital public relations: The consumers strongly agreed that using famous personalities in digital PR campaigns on social media platforms made recognizing the ABC Sausage Brand easier.

Digital direct marketing: The consumers strongly agreed that receiving information or promotions through Line Official accounts or Facebook Messenger increased information access and communication convenience.

Purchasing Decision of ABC Sausage Brand

Problem recognition: The consumers strongly agreed that their desire to purchase sausages arises from visually appealing products, with attractive product images encouraging the buying impulse.

Information search: Consumers strongly agreed that they should consider information from online reviews or shared experiences with real customers before making purchasing decisions.

Evaluation of alternatives: The consumers strongly agreed that they prefer to purchase sausage brands that are trustworthy and reputable, often recognized through various advertising channels.

Purchasing decision: The consumers strongly agreed that they typically purchase sausages from convenient locations, such as convenience stores or through online ordering platforms.

Post-purchase behavior: The consumers strongly agreed that they are likely to repurchase if ABC Sausage Brand continues improving its products' quality or taste.

Hypothesis Testing Results

The results of the multiple regression analysis between Digital Integrated Marketing Communication (DIMC) and the purchasing decision of ABC Sausage Brand among consumers in Bangkok were analyzed to test the influence of independent variables on purchasing decisions. The findings from the multiple regression analysis can be summarized as follows:

Table 1 Results of the Multiple Regression Analysis between the entire Digital Integrated Marketing Communication and the purchasing decision of ABC Sausage Brand among consumers in Bangkok

Variables	B	Std. Error	Beta	t	Sig.
Constant	0.951	0.188	-	5.049	0.000*
Digital Integrated Marketing Communication	0.745	0.046	0.630	16.190	0.000*

R = 0.630, R² = 0.540, Adjusted R² = 0.514, F = 262.102, p < 0.05

From Table 1, the results of the multiple regression analysis between Digital Integrated Marketing Communication (DIMC) and the purchasing decision of ABC Sausage Brand among consumers in Bangkok reveal a Sig. value of 0.00, which is less than 0.05. This indicates that the hypothesis is accepted, meaning that digital integrated marketing communication significantly influences ABC Sausage Brand's purchasing decision among consumers in Bangkok.

Table 2 Results of the Multiple Regression Analysis between specific elements of Digital Integrated Marketing Communication and the purchasing decision of ABC Sausage Brand among consumers in Bangkok

Independent Variables	B	Std. Error	Beta	t	Sig.
Constant	0.931	0.189	-	4.922	0.000*
Digital Advertising	0.218	0.041	0.247	5.331	0.000*
Digital personal selling	0.134	0.041	0.152	3.294	0.001*
Digital sales promotion	0.110	0.043	0.125	2.570	0.011*
Digital public relations	0.159	0.038	0.192	4.220	0.000*
Digital direct marketing	0.128	0.040	0.154	3.236	0.001*

R = 0.735, R² = 0.664, Adjusted R² = 0.610, F = 53.151, p < 0.05

Table 2 shows the hypothesis testing results. The Adjusted R² value is 0.610, indicating that Digital Integrated Marketing Communication (DIMC) can explain 61% of the variance in the purchasing decision of ABC Sausage Brand among consumers in Bangkok. The remaining 39% is influenced by other factors not included in this analysis.

Hypothesis 1: Digital advertising influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok. The test result shows a Sig. value of 0.000, which is less than 0.05, indicating that digital advertising has a significant influence on this decision.

Hypothesis 2: Digital personal selling influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok. The test result shows a Sig. value of 0.001, which is less than

0.05, indicating that digital personal selling significantly influences the purchasing decisions of ABC Sausage Brand's consumers in Bangkok.

Hypothesis 3: Digital sales promotion influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok. The test result shows a Sig. value of 0.011, which is less than 0.05, indicating that digital sales promotion has a significant influence on this decision.

Hypothesis 4: Digital public relations influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok. The test result shows a Sig. value of 0.000, which is less than 0.05, indicating that digital public relations has a significant influence on this decision.

Hypothesis 5: Digital direct marketing influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok. The test result shows a Sig. value of 0.001 is less than 0.05, indicating that digital direct marketing significantly influences the purchasing decision of ABC Sausage Brand's consumers in Bangkok.

Table 3 Summary of Hypothesis Test Results

Hypothesis	Hypothesis Test Result
Overall	Hypothesis Accepted
Digital Advertising	Hypothesis Accepted
Digital Personal Selling	Hypothesis Accepted
Digital Sales Promotion	Hypothesis Accepted
Digital Public Relations	Hypothesis Accepted
Digital Direct Marketing	Hypothesis Accepted

Conclusion and Discussion

Digital advertising: The research findings indicate that digital advertising significantly influences the purchasing decisions of ABC Sausage Brand's consumers in Bangkok. This result is consistent with the study by Chodchung (2022), which found that digital advertising on platforms such as Facebook, Instagram, and YouTube influences the purchasing decisions of oyster chili paste products by raising awareness and stimulating consumer decision-making. In addition, the findings align with the research by Meksuwan et al. (2023), which revealed that advertising on Facebook and Instagram effectively stimulates purchases and builds brand awareness, allowing brands to effectively reach their target audiences.

Digital personal selling: The research findings reveal that digital personal selling significantly influences the purchasing decisions of ABC Sausage Brand's consumers in Bangkok. This aligns with the study by Srikhunarak (2022), which found that personal selling affects the purchasing decisions of fresh seafood consumers in the Bangkok area. This is also consistent with research by Rodthabthan and Punluekdej (2023), which demonstrated that sales staff influence purchasing decisions for snack products.

Digital sales promotion: The results indicate that digital sales promotion significantly impacts the purchasing decisions of ABC Sausage Brand's consumers in Bangkok. This finding is in line with the research by Thawong (2020), which revealed that digital sales promotion had the greatest influence on purchasing decisions for ready-to-drink fruit juice products in Bangkok. Similarly, Sopa (2020) found a positive relationship between sales promotion and purchasing decisions for consumer goods.

Digital public relations: The research shows that digital public relations significantly influence the purchasing decisions of ABC Sausage Brand's consumers in Bangkok. This result is consistent with the study by Rodthabthan and Punluekdej (2023), which found that news dissemination and public relations affected purchasing decisions for snack products. It also aligns with the research by Rivandi (2021), which identified public relations as the most

influential dimension of integrated marketing communication in shaping consumer purchasing decisions.

Digital direct marketing: The study found that digital direct marketing significantly influences the purchasing decisions of ABC Sausage Brand's consumers in Bangkok. This is supported by the research by Luo and Parncharoen (2020), which discovered that digital direct marketing impacts consumer decisions to use the WeChat application in Sichuan Province. In addition, Thongkhao (2021) found that direct marketing through social media platforms, such as Line, fosters a sense of closeness and satisfaction among consumers.

Recommendations for Practical Application

- 1) The study found that the primary information channels for consumers of sausage products are TikTok and Facebook. Therefore, future research should explore other platforms such as Instagram, YouTube, or the brand's official website to adjust marketing strategies in line with the evolving digital consumer behavior.
- 2) The use of Digital Integrated Marketing Communication (DIMC) can explain the purchasing decision ABC Sausage Brand variable accounting for 61% of the variance in the purchasing decision for ABC Sausage Brand. The remaining 39% is influenced by other factors, which should be investigated further in future studies.

References

- Bangkokbiznews. (2020). *Meat, processed food, safe and beneficial when consumed appropriately*. Retrieved from www.bangkokbiznews.com/pr-news/biz2u/271536.
- Chodchung, S. (2022). Integrated Marketing Communication Affecting Consumers' Decisions in Purchasing Community Enterprise Product: A Case Study of Oyster Chili Paste. *Journal of International Studies, Prince of Songkla University*, 12(2), 1-27.
- Kasikorn Research. (2022). *Processed Food Market Research Report*. Retrieved from www.kasikornresearch.com/TH/analysis/k-econ/business/Pages/index.aspx?c=360.
- Katchwattana, P. (2019). *What Do Thai People Eat? Survey Results Clearly Indicating It's Time to Take Care of Health with 'Personalized Medicine, the Future of Healthcare'*. Retrieved from www.salika.co/2019/10/28/what-thai-people-eat-2019/.
- Kotler, P., & Keller, K. (2016). *Marketing Management*. 15th ed. London: Pearson Education.
- Luo, M., & Parncharoen, C. (2020). The Effect of Digital Integrated Marketing Communication on Sichuan Consumers' Decision to Use WeChat Application. *Suthiparithat Journal*, 34(109), 122-133.
- Marketeer. (2016). *Sausage Market*. Retrieved from <https://marketeeronline.co/archives/24063>.
- Meksuwan, A., Sirikarnkul, P., & Tunwan, J. (2023). The Impact of Digital Integrated Marketing Communication on Online Cosmetic Purchase Decisions in Thailand. *Journal of Innovation in Business, Management and Social Sciences*, 4(2), 13-26.
- Ministry of Digital Economy and Society. (2024). *Annual Report 2024*. Bangkok: Ministry of Digital Economy and Society.
- Mothersbaugh, D., Kleiser, S., & Hawkins, D. (2024). *Consumer Behavior: Building Marketing Strategy*. 15th ed. New York: McGraw-Hill.
- National Statistical Office. (2024). *Registered Population Classified by Age, Sex, Region, and Province*. Retrieved from www.nso.go.th/nsoweb/nso/statistics_and_indicators?impt_branch=300.
- Rivandi, R. (2021). Integrated Marketing Communication and Coffee Shop Consumer Purchase Decision in Surakara City. *International Journal of Economics, Business and Accounting Research*, 5(2), 214-221.
- Rodthabthan, T., & Punluekdej, T. (2023). Integrated Marketing Communication Effect on the Purchase Intention of a Snack Product in Samut Sakhon Province. *Journal of Legal Entity Management and Local Innovation*, 9(8), 214-227.

- Somboon, R. (2024). *Case Study of the Sausage Market and the Marketing Strategy of 'CPF' in Creating Sausage Consumption Behavior as a 'Snack Meal'*. Retrieved from www.brandage.com/article/38698.
- Sopa, N. (2020). *Integrated Marketing Communication Influencing Purchase Decision towards HAPPY SUNDAY Brand*. Master of Communications Arts Thesis, Bangkok University.
- Srikhunarak, N. (2022). *Marketing Communication Affecting Bangkok Consumer's Decision on Seafood*. Master of Business Administration Thesis, Prince of Songkla University.
- Thawong, T. (2020). *Effects of Digital Integrated Marketing Communication and Buying Behavior on Purchasing Decisions to Buy Ready to Drink Fruit Juice in Bangkok*. Master of Business Administration Thesis, Rajamangala University of Technology Thanyaburi.
- Thongkhao, T. (2021). *Digital Integrated Marketing Communication Affecting to the Buying Decision Making of Rag Craft Group Ban Baukpao Chiang Mai Province*. Master of Business Administration Thesis, Maejo University.
- Vicheanpant, T. (2014). *Digital Marketing: Concepts and Applications*. Bangkok: Chulalongkorn University Press.
- Wertime, K., & Fenwick, I. (2008). *DigiMarketing: The Essential Guide to New Media and Digital*. New Jersey: John Wiley & Sons.
- Whitburn, D., Karg, A., & Turner, P. (2020). The Effect of Digital Integrated Marketing Communications on Not-for-Profit Sport Consumption Behaviors. *Journal of Sport Management*, 34(5), 417-434.
- Wuttisakdusakun, A. (2017). *Digital Marketing Communication and Customers Decision Making on Online Messenger in Bangkok District*. Master of Communication Arts Thesis, Bangkok University.
- Yamane, T. (1973). *Statistics: An Introductory Analysis*. 3rd ed. New York: Harper & Row Publisher.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Conflicts of Interest: The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.



Copyright: © 2025 by the authors. This is a fully open-access article distributed under the terms of the Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).