Bulletin of Electrical Engineering and Informatics
Vol. 14, No. 3, June 2025, pp. 2347~2360
ISSN: 2302-9285, DOI: 10.11591/eei.v14i3.8712

The adoption of online food delivery in facing COVID-19 among the Indonesian food MSMEs

Rahmat Yasirandi[1,2], Bundit Thanasopon[1]
[1]School of Information Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand
[2]Center of Excellence-Technological Society (CAATIS), Telkom University, Bandung, Indonesia

Article Info

Article history:

Received May 19, 2024
Revised Dec 5, 2024
Accepted Dec 25, 2024

Keywords:

COVID-19
Indonesian food micro, small, and medium enterprises
Innovation adoption
Online food delivery
Technology-organization-environment framework

ABSTRACT

This study investigates the factors influencing the Indonesian food micro, small, and medium enterprises (MSMEs) in adopting online food delivery (OFD) during the corona virus disease-2019 (COVID-19) pandemic, by employing the technology-organization-environment (TOE) framework. Through a quantitative approach involving 378 respondents, this research explores the multi-dimensional factors affecting OFD service adoption, there are innovation compatibility, innovation complexity (IC), innovation cost, owner's self-efficacy, owner's commitment, customer pressure (CSP), competitive pressure (CMP), government support (GS), and health protocol guarantee. Employing covariance-based structural equation modeling (CB-SEM), the study reveals interesting relationships among the proposed factors. The findings underscore the role of GS and health protocol guarantees in enhancing owner's self-efficacy and commitment towards OFD adoption. Moreover, it challenges the presumed barriers of IC, suggesting a nuanced understanding of adoption process amid a crisis. This study not only enriches the theoretical discourse on technology adoption in the context of a pandemic but also provides practical implications for stakeholders in navigating the post-pandemic business landscape. Future research directions are proposed to explore the continuous intention of food MSMEs towards OFD services post-pandemic, highlighting the evolving nature of the global business environment and the enduring impact of the COVID-19 pandemic on food industries.

Corresponding Author:

Bundit Thanasopon
School of Information Technology, King Mongkut's Institute of Technology Ladkrabang
1 Chalong Krung 1 Alley, Lat Krabang, Bangkok 10520, Thailand
Email: bundit@it.kmitl.ac.th

1. INTRODUCTION

The emergence of corona virus disease-2019 (COVID-19) in late 2019 marked a significant turning point in global health and had far-reaching implications for various sectors, including the food industry. COVID-19 encapsulates the origin and timeline of this novel infectious disease [1]. Since its identification in Wuhan, China, COVID-19 rapidly spread worldwide, leading to a global pandemic that has affected numerous countries and people. The outbreak of a widespread disease triggers not only health crises but also social, political, and economic disruptions. The COVID-19 pandemic has emerged as the largest in human history in terms of the number of infections and deaths, challenging healthcare systems and governments worldwide [2]. To prioritize health concerns, most nations' health ministries have allocated substantial funds from their state budgets. The Indonesian government, in particular, has taken pandemic health management seriously due to the country's high case fatality rate (CFR) of 5% [3]. While multinational corporations have been able to

navigate the challenges posed by the pandemic through digital transformation and the effective utilization of technology, micro, small, and medium-sized enterprises (MSMEs) face more significant obstacles. Many MSMEs were unprepared for the rapid shifts in consumer behavior and the need to adopt digital solutions to sustain their businesses. Table 1 shows the distribution of negative impacts reported by MSME merchants to the Indonesian government. Before the pandemic, the interest in transforming using online food delivery (OFD) did not seem urgent. Nonetheless, given that the predominant segment of consumers for food merchants engages primarily through in-restaurant dining, this modality becomes impracticable in the context of pandemic-induced restrictions. According to the Indonesian government's annual report in 2020, the food and beverage sector was the most affected by the pandemic, accounting for 27.85% of the total micro enterprises in Indonesia [4]. The situation worsened during the initial month of the COVID-19 outbreak, when the government implemented a national-scale lockdown, leading to the closure of over 37,000 businesses, as reported by the Indonesian Ministry of Cooperatives and MSMEs [5]. The food MSMEs play a crucial role in the development strategy of a country as they contribute significantly to poverty reduction and economic growth [6]. The introduction of OFD as e-commerce took place between 2017 and 2018, with GOJEK emerging as one of the pioneering companies in this business in Indonesia [7]. The public's initial response to this innovation was varied. In the early years, this business concept encountered numerous challenges. However, in the context of COVID-19, OFD application offers solutions to problems experienced by food merchants.

Table 1. Impact type on Indonesian food MSMEs in facing COVID-19 era [4]

Impact type	Percentage (%)
Sales decrease	55
Marketing hardship	21
Lack of finance	15
Raw material supply	4

Previous studies have focused on studying consumers or food buyers as adopters of OFD application. However, in OFD business model, the user of OFD application is not only the end consumers side but also with the food merchant side. This prevailing focus has left a notable gap in understanding how merchants, as crucial stakeholders in the food delivery chain, have responded to the rapidly changing market conditions brought about by the pandemic. Thus, this study's research objectives are centered on understanding merchants' experiences and behaviors in using OFD applications during COVID-19. The main objectives of this study are twofold. The first objective is to identify and verify the key factors that influenced the adoption of OFD by merchants during the pandemic era. The second objective is to design and evaluate the proposed conceptual model.

2. LITERATURE REVIEW AND THE ORITICAL FRAMEWORK

2.1. Underpinning theory

Alok K. Chakrabarti, Louis G. Tornatzky, and Mitchell Fleischer introduced the technology-organization-environment (TOE) model in 1990, which has become a foundational framework for understanding the adoption of technological innovations at the organizational level [8]. The TOE model provides a comprehensive explanation of how organizations assess and accept new technologies, considering the alignment between these innovations and the specific needs and preferences of the organization and its users. The model is structured around three key contexts: TOE [9]. In the technological context, the focus is on the tools and resources necessary for adopting an innovation. For instance, when educational institutions, such as schools, implement online learning platforms, they must evaluate and invest in appropriate technology, including computers and internet infrastructure [10]. The organizational context addresses the internal dynamics of the firm, emphasizing the challenges that innovation poses to human resources and internal processes. Finally, the environmental context examines the external factors that influence the adoption process, such as government regulations and market conditions, which can significantly impact an organization's decision to adopt. These contexts collectively provide a robust framework for analyzing the multifaceted nature of technology adoption within organizations.

2.2. The proposed factors

2.2.1. Adoption of online food delivery

Adoption theory explains that adoption is a condition where the users have the opportunity to accept and reject an innovation [11]. The adoption factor is complex and multi-dimensional, influenced by the design and usability of the technology, the attitudes and values of potential adopters, and the fit with daily

practices [12]. This factor is further shaped by stages and repeating patterns in the adoption process. Figure 1 shows the proposed OFD adoption model, which outlines eleven hypotheses connecting various factors, including eight positively influencing and three negatively influencing hypotheses. The details of each proposed hypothesis are as follows.

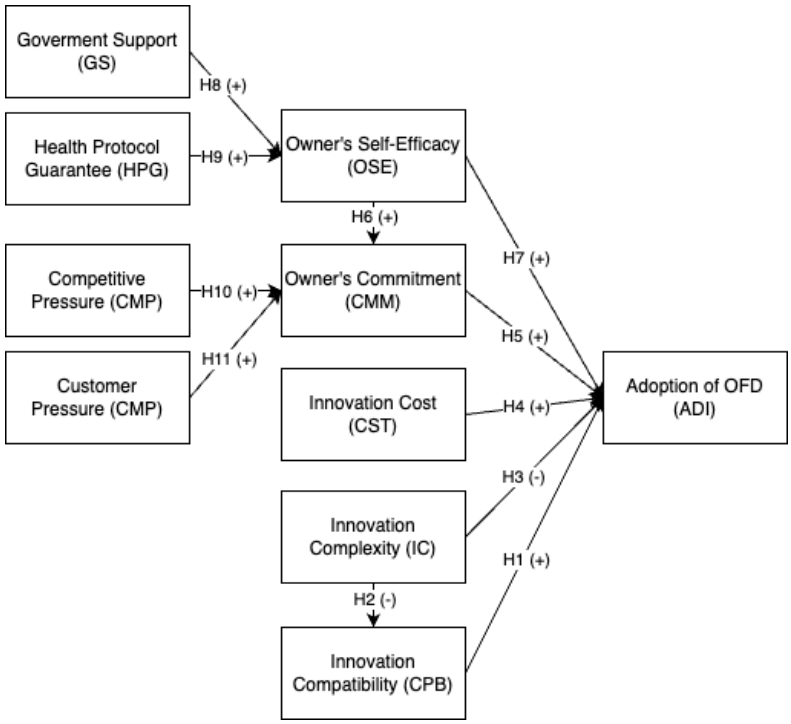

Figure 1. The proposed OFD adoption model

2.2.2. Factors related to technological context

Innovation compatibility is defined as the degree to which OFD services align with a restaurant's existing culture and technology infrastructure [13]. Research consistently shows that compatibility is a significant factor positively impacting the adoption of applications. In the case of OFD services, when the service is compatible with the existing conditions of the merchant, the need for extensive environmental adaptation and support decreases [14]. This compatibility can be a significant factor in adoption, particularly for merchants aiming to minimize effort. Similarly, another study identified operating system (OS) compatibility as a crucial factor in adopting mobile applications. The expectation of an effortless adoption process increases the desire for adoption [15]. If a merchant's business model is already aligned with online delivery concepts, such as merchants offering takeout, transitioning to OFD services becomes more natural. Merchants who already incorporate technology into their operations (like cashless transactions or orders through WhatsApp) may find adopting OFD services more compatible. Thus, familiarity with technology can smooth the transition and encourage more enthusiastic adoption. Therefore, the following hypothesis is proposed: "H_1: innovation compatibility has a positive impact on the adoption of OFD".

Innovation complexity (IC) is defined as the degree to which OFD services are perceived as being relatively difficult to understand and operate [16]. Within the framework of the technology adoption model, this complexity is seen as a deterrent, making new technologies seem less user-friendly and harder to integrate into existing systems. Other researchers suggest that IC can indeed have a negative impact on compatibility for an organization's adoption [17]. This is particularly true in the case of product-oriented web-based interactive innovation (PWII), where product complexity is found to hinder adoption. This is because the intricate features of a product can deter its adoption by making it seem less compatible with existing practices or technologies. Despite the intricate relationship between compatibility and innovation, especially in markets influenced by network effects where compatibility could foster innovation [18], the complexity of innovations like OFD services can make them appear less compatible with the operational capacities of merchants. This is particularly true for small businesses or those less versed in technology, for whom the advanced demands of OFD systems

represent a significant challenge. Therefore, the following hypothesis is proposed: "H_2: innovation complexity has a negative impact on innovation compatibility".

The complexity of innovation not only affects its compatibility with existing systems but also has a profound negative impact on the overall adoption of OFD services. The mechanism of this impact is multifaceted, involving the structure of the technology itself and the attitudes of its potential users [19]. When merchants perceive the technology required for OFD as overly complex, it introduces a barrier to its adoption. The intricacies involved in managing online ordering systems, integrating payment methods, and navigating online interfaces can be particularly overwhelming for smaller or traditional merchants unfamiliar with digital platforms. Consequently, the higher the perceived complexity of an innovation, the greater the resistance to its adoption. This highlights the critical role that simplicity and user-friendliness play in the successful implementation of new technologies, such as those involved in providing OFD services. Therefore, the following hypothesis is proposed: "H_3: innovation complexity has a negative impact on the adoption of OFD".

Innovation cost is defined as the investment cost in the development and operation of adopting OFD services [20]. One of the costs is associated with online delivery services processing fees that may include a percentage of the transaction value or fixed costs per transaction. There is a study that has shown how high delivery charges can deter consumers from using OFD services [21]. Similarly, with the OFD's customers, merchants also face fees, typically ranging from 20 to 30% per transaction. Another challenge for merchants arises when employing digital marketing and promotional activities within OFD applications, which includes achieving priority in search order and offering discounts or loyalty programs to attract customers. Therefore, the extra cost of offering additional services in OFD can be a potential barrier for merchants, as it directly impacts their ability to use the service [22]. Therefore, the following hypothesis is proposed: "H_4: innovation cost has a negative impact on the adoption of OFD".

2.2.3. Factors related to organizational context

Owner's commitment is defined as owner's involvement, direction, and support given to the adoption of OFD services [23]. The commitment of the merchant owner has been shown to positively impact the implementation of new products, influencing the adoption process [24]. In the context of this research, such commitment from the owner is likely to enhance the overall experience and trust in the service, potentially leading to increased adoption. A committed merchant owner tends to strategically integrate OFD services, going beyond merely adding the service as an option to actively embedding it into the business model and aligning it with the restaurant's goals and objectives. Top-level commitment is key to the successful implementation and integration of OFD services into the business. Demonstrating commitment to employees often involves the owner's willingness to invest in necessary resources for the successful implementation of OFD services, and to communicate the importance of OFD services to all employees. Therefore, the following hypothesis is proposed: "H_5: owner's commitment has a positive impact on the adoption of OFD".

Owner's self-efficacy is defined as owner's beliefs regarding their merchant's ability to use OFD applications in their restaurant [25]. Self-efficacy refers to an individual's conviction in their capacity to accomplish specific tasks or attain goals. In the context of this study, owner's self-efficacy implies their confidence in successfully integrating and managing OFD services within their restaurant operations [26]. Owner's confidence in mastering the technology required for OFD motivated them to overcome obstacles and fully engage with the adoption process. Owner's self-efficacy not only mitigated uncertainty and hesitancy but also led to a greater commitment to adopting OFD services. Their belief in their capabilities also commits them to providing the strategies to support the continuity of OFD services. Ultimately, the confidence of these owners in their ability to efficiently manage and deliver OFD services underscores their commitment to these services by demonstrating the pivotal role of owner's self-efficacy in bolstering the resilience and adaptability of their merchant's operations. Therefore, the following hypothesis is proposed: "H_6: owner's self-efficacy has a positive impact on owner's commitment".

The positive correlation between owner's self-efficacy and the successful provision of OFD services transcends mere commitment, significantly impacting the practical aspects of adoption. Research indicates that owners with high self-efficacy navigate the adoption process more effectively, armed with the conviction in their abilities to surmount challenges [27]. This confidence is particularly crucial during the implementation phase, where unforeseen obstacles-ranging from technological disruptions to shifts in consumer demand-may arise. Owners endowed with high self-efficacy demonstrate resilience and strategic foresight, enabling them to adapt their business models to incorporate OFD services effectively [28]. This adaptability, underpinned by the owner's belief in their capabilities, not only reinforces their commitment but also enhances their proficiency in adopting OFD services. Consequently, such owners are better positioned to leverage the benefits OFD services offer, from expanding customer reach to increasing sales [29]. In conclusion, the robust sense of self-efficacy acts as a pivotal catalyst for the successful adoption of OFD services, highlighting its indispensable

role in empowering merchants to navigate and thrive within the pandemic's dynamic. Therefore, the following hypothesis is proposed: "H_7: owner's self-efficacy has a positive impact on the adoption of OFD".

2.2.4. Factors related to environmental context

Government support (GS) is defined as the government's actions to facilitate merchants' conditions to adopt OFD services [30]. OFD services are one of the business activities that do not escape scrutiny. Every decision can simultaneously support and challenge every stakeholder, including the governments. In several countries, regulations and policies in the strategic sector can positively influence firms' innovativeness [31], [32]. For merchant owners, transitioning to online delivery could be a new and challenging task. Self-efficacy mentioned earlier refers to an owner's belief in their merchant ability to succeed in OFD adoption during pandemic. GS in this transition may enhance their confidence in managing their businesses under these new and challenging circumstances. The government's support, therefore, not only bolstered the economic resilience of these businesses but also contributed significantly to boosting the psychological resilience of the owners, reinforcing their belief in their ability to adapt and succeed amid challenging circumstances. During the COVID-19 pandemic, GS for OFD services encompassed financial aid (grants, loans, and tax relief), technical support (access to digital platforms, e-commerce tools, and training), regulatory adjustments (simplified permits and health standards), marketing assistance, and fostering partnerships with OFD providers. By providing these supports, governments can help merchant owners build their confidence and skills in managing online business operations, thereby enhancing their self-efficacy. Therefore, the following hypothesis is proposed: "H_8: government support has a positive impact on owner's self-efficacy".

Previous study has demonstrated that external support alone does not directly lead to the adoption of new technologies or practices; rather, its impact is often mediated by individual factors such as self-efficacy, which directly influences the decision to adopt [33]. In this study, the relationship between GS and the adoption of OFD services is mediated by the owner's self-efficacy, where GS indirectly influences OFD adoption by enhancing the owner's confidence and belief in their ability to successfully manage online business operations.

Guarantee is defined as the degree to which there is a warranty offered regarding the service to be used [34]. For this paper, health protocol guarantee is defined as the merchant believes in guarantees from OFD providers to help provide delivery orders according to the COVID-19 health protocol [35]. When OFD providers guarantee strict health protocols, they reassure merchant owners that the OFD process is safe for both their staff and customers. This safety assurance can significantly increase the confidence of business owners in utilizing these services, mitigating fears associated with COVID-19 health risks. Aligning their services with established health safety standards significantly boosts owners' confidence in the viability and acceptability of their business operations [36]. This support empowers business owners with the knowledge and skills necessary to effectively manage OFD services, thereby enhancing their self-efficacy. Support measures include providing safe packaging assistance, supplying body temperature check tools, and requiring merchants to provide information on the body temperature of delivery personnel. All these guarantees, in turn, markedly enhance the owner's belief in their restaurant ability to meet customer needs and adapt to evolving market demands, especially since the pandemic has forced businesses to adapt quickly to changing conditions. The health protocol guarantees from OFD providers are likely to impact merchant owners' self-efficacy positively by ensuring safety, increasing consumer trust, providing operational support, maintaining competitiveness, mitigating risks, and building trust in their delivery process. Therefore, the following hypothesis is proposed: "H_9: health protocol guarantee has apositive impact on owner's self-efficacy".

Previous studies have shown that self-efficacy plays a critical role in shaping individual attitudes toward the adoption of innovative technologies, suggesting that the influence of external factors is mediated by self-efficacy [37]. Similarly, in this study, health protocol guarantees are a form of external factor. Therefore, the relationship between health protocol guarantees and the adoption of OFD services is mediated by the owner's self-efficacy.

Competitive pressure (CMP) is defined as the degree of pressure from competitors who have adopted OFD services [38]. It is a common phenomenon to have a competitive atmosphere between firms in the same business industry because firms with the same target market will perceive each other as business competitors [39]. The pressure from competitors directly impacts the owner and encourages them to make more informed decisions about committing to OFD services. In a competitive landscape, being visible to competitors can be crucial. This aspect can drive merchant owners to commit to OFD services to ensure they are not outshined by their competitors. As more competitors start offering OFD services, there is a growing industry trend that cannot be ignored. In the pandemic situation, owners may feel compelled to provide OFD to remain relevant and competitive in their market. This pressure acts as a motivating factor, driving the owner's commitment to integrate and optimize OFD services in their business model [40], [41]. Therefore, the following hypothesis is proposed: "H_{10}: competitive pressure has a positive impact on commitment."

Previous study has shown that while CMP can influence the decision-making process, the actual adoption of new technologies often depends on the owner's commitment and other internal factors within the

firm [42]. Research highlights that CMP alone is not a sufficient driver for technology adoption; rather, it acts as a stimulus that must be coupled with a committed decision-making process by the owner to lead to successful adoption [43]. Therefore, CMP alone does not automatically lead to the adoption of OFD services. Instead, it triggers a process of evaluation and decision-making by the business owner as the owner's commitment becomes a crucial mediator in this study.

Customer pressure (CSP) is defined as the demands customers place on merchants to meet their needs to provide OFD services [44]. Many studies have shown how consumers can push companies to take specific actions [45]. This was particularly evident during the COVID-19 pandemic when Indonesian consumers increasingly preferred ordering food online. The pressure from customers who are likely to return and recommend the service can strongly motivate business owners to commit to OFD. Customers' desires for convenience, variety, and fast delivery can significantly impact a merchant owner's commitment [46]. As a result, meeting customer demands plays a key role in how a business owner approaches the adoption of OFD services. This shows the CSP impacts the owner's commitment to enhancing the overall reputation of their restaurant. Therefore, the following hypothesis is proposed: "H_{11}: customer pressure has a positive impact on commitment".

CSP by itself does not directly result in the adoption of OFD services. Rather, it sets off a process in which the business owner's commitment plays a pivotal role as the key mediator. Research has shown that while customer expectations and demands can drive the consideration of innovation, the impact remains indirect; the actual adoption depends heavily on the commitment of the business owner to implement these changes effectively [47].

In the context of food MSMEs in Indonesia, which are predominantly micro-sized, environmental factors influence OFD adoption indirectly through the organizational context due to the owner's central role in decision-making. Given the resource constraints of micro enterprises, the owner's self-efficacy and commitment are the primary drivers of OFD adoption. Factors such as GS and health protocol guarantees must first enhance the owner's self-efficacy to influence adoption effectively. Similarly, competitive and CSP must first drive the owner's commitment to meeting market demands. Therefore, environmental factors more effectively influence adoption through the organizational context, as innovation adoption requires strong an owner's self-efficacy and commitment in addressing external challenges.

3. METHOD

3.1. Participant and procedure

The population in question, characterized by its vast size and lack of precise definition, necessitated a non-probability sampling strategy [48]. This approach is preferred when individual members of the population do not have equal probabilities of being selected. The target participants for this research are food merchants in Indonesia. In terms of selection criteria, the information and communication technology (ICT) development index (released by the Indonesian Central Bureau of Statistics for 2022) serves as a key baseline. We also sample respondents from provinces located in all three time zones, namely, Greenwich mean time+7 (GMT+7), GMT+8, and GMT+9. The main reason for using the ICT development index is that the presence of OFD providers is closely related to the community's level of awareness and the implementation of technology in that area. Given the vast area of the nation and the potential elongation of the data collection phase, the study was limited to a selection of provinces. This subset was identified based on ICT development index scores within each time zone, including Jakarta (index 7.66), Yogyakarta (index 7.14), and West Java (index 6.16) for GMT+7, Bali (index 6.49) and North Sulawesi (index 5.93) for GMT+8, West Nusa Tenggara (index 5.59), and Maluku (index 5.77) for GMT+9. The choice of provinces was influenced by considerations of travel duration and ease of access, particularly for regions within the GMT+9 time zone, which are significantly distant from Jakarta, the capital city of Indonesia. Purposive sampling, also known as authoritative sampling, involves handpicking individuals from a population based on an authority's knowledge and judgment, resulting in more accurate results [49]. Additionally, considerations such as population density, societal progression, and geographical factors influenced the selection process. The chosen provinces are noted for their roles as administrative centers and pivotal regions in specific sectors such as tourism, trade, and education which provide a conducive environment for the proliferation and evolution of ICT. To this end, Cochran's equation was employed to calculate an adequate sample size. This method is crucial for studies involving hard-to-reach populations, which is typical of expansive demographic research. Cochran's equation then quantifies the sample size needed to reflect the population proportionally, given a predetermined margin of error and confidence level. Drawing on established literature to define the variables within Cochran's equation, the study established a 95% confidence level, a 5% margin of error, and an estimated population proportion of 0.5 [50]. These parameters led to a calculated minimum sample size of 385 respondents. However, to mitigate the effects of possible non-responses, the sample target was increased to at least 400 respondents, including for potential

rejections during data cleansing. This adjusted figure ensures that the collected data will be sufficiently representative of the diverse Indonesian provinces, reinforcing the reliability of the study's conclusions. Before conducting data collection for all participants, a pilot study was first carried out and a total of 38 respondents were collected. Statistical testing of the questions as the measurement tool, namely validity testing, provided preliminary answers regarding the validity of each questionnaire item.

3.2. Measures

This study employs a questionnaire to elucidate factors within a complex model. The development of this study's questionnaire items involved a deductive approach, starting with a thorough review of technology adoption literature, focusing on organizational adopters. The deductive approach starts with identifying and reconciling constructs with varying terminologies across studies, such as equating 'Cost' with 'Perceived Fee'. The next step was to extract measurement items from previous literature. Subsequently, relevant items were extracted from thirty-five key papers, forming the question pool that we drew from. The selected questionnaire items were rephrased to match the context of Indonesian food merchants and OFD adoption. The next step was mapping the questions to each construct in the proposed model. The final stage involved evaluating and balancing the number of questions for each factor. This multistage development process ensures the validity and reliability of the questionnaire, facilitating objective insights into the adoption behaviors of Indonesian food merchants towards OFD services.

For the data collection, our data collection tool was a paper-based questionnaire. It was carried out over three months. The relatively long data collection period considered several parameters such as manpower limitations, distance, and research costs. Initially, 15 surveyors were recruited. The surveyors were paid 1-3 USD per response collected. However, within a month, each surveyor was only able to average 5 participants from 20 merchants visited. Thus, this data collection strategy was deemed inefficient and ineffective to continue. In the first month, only about 70 responses were successfully collected, which was far from the target of 400 participants. Subsequently, a different data collection scheme was designed to improve the response rate. The number of surveyors was increased to 31. We also increased the compensation fee from 1-2 USD to 3-5 USD. Not only the surveyors, but also the food merchants who agreed to participate in the survey were also offered a compensation of 3-5 USD. As a result, at the end of the third month, the number of respondents obtained was more than 400. Next, prior to the data analysis, data cleansing was conducted by examining the characteristics of the responses obtained. In this study, a strategy involving the inclusion of several opposite questions for each construct was employed, thereby assisting in validating whether the participants were paying attention when filling out the questionnaire form. This ensures that participants do not arbitrarily assign values, such as giving the same score to all questions. Consequently, if such pattern occurred, those responses were deemed invalid and were disregarded. As a result, approximately 378 participant responses remained viable for analysis. In evaluating a proposed conceptual model statistically, covariance-based structural equation modeling (CB-SEM) is optimal for theory confirmation, given its focus on reducing discrepancies between the model's implied and the sample's covariance matrices, suitable for hypothesis testing with normally distributed data and substantial sample sizes. Given the confirmatory nature and adequate sample size of this study, CB-SEM was deemed appropriate. Empirical studies underscore CB-SEM's parameter consistency and accuracy benefits for larger samples [51]. Utilizing analysis of moment structures (AMOS) software for SEM, this research follows a two-step approach for model evaluation: assessing the measurement model prior to the structural model, as inaccuracies in the former can impact the latter's interpretation. Preliminary pilot testing on the measurement model with a smaller sample ensures the validity and reliability of the data collection instruments. From the results of the pilot data (38 respondents), several instruments have values that do not meet the criteria. Out of 48 instruments, 8 have values outside the ideal criteria (outer loading <0.7). These are GS1, GS2, CSP5, CMP4, HPG2, IC3, ADI3, and ADI5. Thus, this leaves only 38 questions to be tested against the entire survey data set.

4. RESULTS AND DISCUSSION

4.1. Evaluation of measurement model

In the assessment of the measurement model, attention must also be given to indicators exhibiting factor loadings below the recommended threshold of 0.7. These indicators raise concerns regarding their ability to adequately represent their respective latent constructs and thus, their appropriateness within the measurement model. Specific indicators such as ADI1 (0.472) and ADI6 (0.338) associated with the ADI construct, and CMP3 (0.367) related to the CMP construct, exhibited loadings significantly lower than the acceptable level. This suggests that these items may not be contributing to the constructs in a meaningful way. The negative loadings observed for CST2 (-0.158), CPB1 (-0.089), and CSP1 (-0.071) are also problematic as they may indicate a conceptual misalignment with the construct or poor item formulation. These sub-threshold indicators necessitate a critical decision. According to best practices in scale development and validation, such indicators should be

considered for removal from the model. Eliminating these items can potentially improve the construct reliability and validity by focusing on items that have a stronger relationship with the latent variable. It is crucial to ensure that each retained indicator reflects the essence of the construct it intends to measure. Upon the exclusion of these problematic indicators, the measurement model should undergo re-evaluation. This iterative process involves recalculating the average variance extracted (AVE) and composite reliability (CR) for each construct. The goal is to achieve an AVE above 0.5 and a CR above 0.7, ensuring that the remaining indicators provide a valid and reliable measurement of the constructs.

Table 2 describes the outcomes of the second iteration in the evaluation of the measurement model. After the first attempt at calculation, some indicators exhibiting suboptimal factor loadings were eliminated. Following this elimination, the recalculated model demonstrates a fortified construct-indicator relationship across all variables. All factor loadings now surpass the threshold of 0.7, signifying that each indicator robustly and significantly predicts its corresponding construct. Notably, the adjustment in loadings has led to an enhancement in the AVE scores, with all constructs now displaying AVE scores exceeding the 0.5 benchmark. Furthermore, the recalibrated CR scores substantiate the internal consistency of the constructs, with all CR values exceeding the 0.7 benchmark. These augmented scores signify more than just numerical enhancements; they reflect a measurement model that has been subjected to rigorous validation processes, ensuring that each construct is measured in a manner that is both reliable and valid.

Table 2. The second calculation result of measurement model

Construct	Indicator	Outer loading	AVE	CR
Adoption of OFD (ADI)	ADI2	0.820	0.696	0.873
	ADI4	0.900		
	ADI7	0.780		
Owner's commitment (CMM)	CMM1	0.820	0.623	0.768
	CMM4	0.783		
CMP	CMP1	0.755	0.546	0.706
	CMP2	0.792		
Innovation compatibility (CPB)	CPB3	0.838	0.703	0.825
	CPB4	0.852		
CSP	CSP2	0.709	0.501	0.738
	CSP3	0.748		
	CSP4	0.734		
Innovation cost (CST)	CST1	0.789	0.644	0.844
	CST3	0.799		
	CST4	0.801		
GS	GS2	0.774	0.533	0.773
	GS3	0.825		
	GS4	0.734		
HPG	HPG3	0.826	0.612	0.759
	HPG4	0.820		
IC	IC1	0.820	0.698	0.822
	IC4	0.856		
Owner's self-efficacy (OSE)	OSE1	0.836	0.678	0.894
	OSE2	0.888		
	OSE3	0.830		
	OSE4	0.814		

4.2. Evaluation of structural model

4.2.1. Path analysis (hypotheses testing)

Modification indices are recognized for their utility in identifying potential improvements in model specification. They suggest the removal of indicators with numerous relationships, which tends to weaken the independence of the construct represented [52]. Utilizing modification indices, one can observe a list of relationships among indicators, whether from another construct or in the same construct. Our responsibility is to examine the frequency of indicator's influence on other indicators. This indicates that the indicator exerts a disproportionately high influence on other indicators rather than on itself. Upon reviewing the modification indices of this research, it becomes apparent that the indicator OSE2 is implicated in several correlations with other constructs and indicators. This suggests that OSE2 may be causing issues such as multicollinearity or may not be contributing uniquely to the construct it is intended to measure. Consequently, the decision to remove OSE2 from the OSE construct is made. As a result, some p-values associated with OSE as an exogenous variable change. This refinement is expected to not only improve the model fit but also to clarify the structure and interpretation of the relationships between the constructs, leading to a more accurate and reliable measurement model. In assessing the model's validity through p-values, two hypotheses face rejection due to statistical

insignificance: the relationship between owner self-efficacy (OSE) and CMM with a p-value of 0.199, and the impact of IC on adoption (ADI) with a p-value of 0.157. The absence of significant correlation between OSE and CMM suggests a nuanced interaction that may vary under specific conditions, challenging previous assumptions. Similarly, the supposed negative influence of IC on the adoption of OFD services is not supported, highlighting a more intricate relationship. While complexity matters, its effect on technology adoption, such as OFD services, may not be as significant as previously thought.

Table 3 shows the significant paths; a p-value marked with *** indicates a highly significant relationship. Two paths exhibit negative coefficients, while nine paths manifest positive coefficients. The path from IC to CPB, which is strongly negative (β=-0.848, p<0.001), supports H_2. This finding suggests that increased complexity of innovation may inadvertently lead to a decrease in adopter compatibility, potentially attributable to increased confusion among them concerning the adoption [53]. Another path showing a significant negative relationship is from CST to adoption (ADI), where H_4 is significantly negative (β=-0.331, p<0.001), aligning with previous studies that suggest an inverse relationship wherein an elevation in financial costs potentially diminishes the level of technology adoption [54]. In contrast, positive and significant relationships were observed for the paths from commitment (CMM) to ADI (β=0.269, p<0.001), CPB to ADI (β=0.412, p<0.001), and OSE to ADI (β=0.108, p=0.039). These associations endorse the acceptance of H_1, H_5, and H_7. This result aligns with previous research indicating significant positive impacts of commitment, compatibility, and self-efficacy on adoption [24], [28], [55]. Regarding OSE, the model posits significant positive effects from GS and HPG (β=0.248, p=0.012; β=0.569, p<0.001, respectively), accepting H8 and H_9. This aligns with previous studies indicating that satisfaction with the current support provided by the government, along with the health protocol guarantees, plays a crucial role in enhancing the adopters' self-efficacy perspective [32], [36]. Further analysis reveals that H10 and H11 are accepted, with CSP and CMP significantly influencing CMM (β=0.285, p=0.036; β=0.769, p<0.001, respectively). The significant positive coefficients from both CSP and CMP to CMM corroborate the findings of previous research [40], [41], [56].

Table 3. The result of path analysis

Relationship	p-value	Beta (β)	Conclusion	
ADI←IC	0.157	-0.159	Not significant	*Negatively*
ADI←CST	***	-0.331	Significant	*Negatively*
ADI←CMM	***	0.269	Significant	Positively
ADI←CPB	***	0.412	Significant	Positively
ADI←OSE	0,039	0,108	Significant	Positively
CMM←OSE	0.199	0.085	Not significant	Positively
CMM←CSP	0.036	0.285	Significant	Positively
CMM←CMP	***	0.769	Significant	Positively
CPB←IC	***	-0.848	Significant	*Negatively*
OSE←GS	0.012	0.248	Significant	Positively
OSE←HPG	***	0.569	Significant	Positively

***Correlation is significant at the 0.001 level (2-tailed).

Table 4 shows the coefficient of determination, R^2, provides insight into the variance explained by the model for each endogenous variable: ADI (0.81), CMM (0.65), CPB (0.9), and OSE (0.71). The R^2 value for CPB is particularly noteworthy, with the model explaining 90% of its variance, denoting a potent explanatory capacity. Although the R^2 value for CMM is the smallest in the evaluation results, a value of 0.65 is still considered high. It's important to note that in the evaluation of structural model, an R^2 value above 0.50 is generally regarded as an acceptable threshold for demonstrating substantial explanatory power [57]. The beta coefficients elucidate both the magnitude and direction of these relationships, with the significant coefficients validating the posited theoretical constructs. The R^2 values further affirm the model's robustness, demonstrating its substantial explanatory prowess and reinforcing the validity of the theoretical framework encapsulated by the structural model. This study has unexpectedly found no relationship between OSE and commitment (CMM) (H_6). However, not all individuals demonstrate a clear relationship between self-efficacy and commitment, it appears that the influence of self-efficacy on commitment is significantly noticeable only within certain samples of the population [58]. Thus, food merchant owners, regardless of whether their self-efficacy is low or high, may not necessarily impact commitment levels. It could be that, during the initial stages of the pandemic, the urgency driven by competitive and CSP pushed owners to adopt OFD services more rapidly, regardless of their own self-efficacy levels. Additionally, our analysis presents a negative result for H_3, showing that the negative correlation between IC and adoption (ADI) is not significant. A study argues that IC may not be the pivotal barrier to the adoption of new technologies that it was once thought to be [59], [60]. Instead, this study suggests that the impact of complexity on the adoption of OFD services by food merchants, especially in the context of a pandemic, is neither direct nor particularly significant. This critical insight refutes the traditional narrative that complexity is a primary obstacle to technological adoption, proposing that other factors may exert a more substantial influence on the

decision-making process of food merchants in the face of economic challenges posed by a global pandemic. Nevertheless, our other proposed hypotheses were accepted, two hypotheses had a significantly negative impact, and nine hypotheses had a significantly positive impact. Regarding the R^2 values, Tables 3 and 4 display a high level of variance explanation for the endogenous variables, underscoring the model's robustness and validity. Additionally, the Goodness-of-Fit Indices further affirm the adequacy of the proposed conceptual model, reflecting a well-fitting and theoretically consistent structure within the observed data.

Table 4. The result of the coefficient of determination

Endogenous	R^2 value
ADI	0.81
CMM	0.65
CPB	0.9
OSE	0.71

4.2.2. Goodness-of-fit indices

Based on Table 5, the Chi-Square statistic, with a value of 332.908, falls below the threshold of ≤341.395 (with degrees of freedom, d.f., of 300 and a probability, prob., of 0.05), indicating a good fit and suggesting that the model's deviation from the observed data is not statistically significant. However, the Probability (Prob.) value of 0.000, which is below the ≥0.05 criterion, indicates a lack of fit, highlighting the complexity of model evaluation and the necessity of considering other indices. The comparative fit index divided by degrees of freedom (CMIN/DF) value of 1.326, significantly below the ≤2.00 threshold, and the root mean square error of approximation (RMSEA) of 0.032, which is well within the ≤0.08 criterion, both affirm the model's good fit. These indices suggest that the model represents the data with minimal error and is adequately specified [61]. Additionally, the Goodness-of-Fit index (GFI) and adjusted Goodness-of-Fit index (AGFI), with values of 0.927 and 0.905 respectively, exceed the ≥0.90 benchmark, further supporting the model's adequacy in capturing the observed data patterns [62]. Moreover, the Tucker-Lewis index (TLI) and comparative fit index (CFI), with values of 0.980 and 0.983 respectively, surpass the ≥0.95 standard. These indices indicate that the model is highly predictive of the observed data and represents a significant improvement over the baseline model, highlighting its predictive accuracy and the improvement in fit provided by the specified model structure [63]. Incorporating the guideline, if the result of the calculation shows at least 4 "good fit" indices, the proposed conceptual model is approved and accepted. Given that the Chi-Square, CMIN/DF, RMSEA, GFI, AGFI, TLI, and CFI indices all indicate a good fit, the model surpasses this criterion, with 7 out of the 8 indices evaluated showing a good fit. This comprehensive assessment, considering a wide range of fit indices, underscores the model's adequacy and supports its acceptance. This analysis confirms the model's adequacy and justifies its acceptance.

Table 5. The calculation result of Goodness-of-Fit

Index	Cut of value/criteria	Calculation	Result
Chi-Square	≤341.395 (with d.f. 300 and prob 0.05)	332.908	Good fit
Prob.	≥0.05	0	Unfit/not fit
CMIN/DF	≤2.00	1.326	Good fit
RMSEA	≤0.08	0.032	Good fit
GFI	≥0.90	0.927	Good fit

4.3. Theoretical implication

This research provides some theoretical insights into technology adoption by MSMEs during crises like the COVID-19 pandemic. Based on the gap identified in the previous chapter, it was noted that compared to consumers, merchants as users of OFD services have been less studied. A previous study also suggests that a fundamental driver behind the shift of food delivery transformations into OFD is the enhancement of merchant service levels [64]. Consequently, this study underscores that the engagement and experiences of merchants are crucial in the successful adoption of OFD. Commencing with the identification of a key factor emanating from the selected case study, the exigencies brought forth by the pandemic have amplified the need for health and safety assurances for the merchants to provide OFD services. Health protocol guarantee provision by OFD providers has been pinpointed as a fundamental catalyst driving merchants towards an accelerated adoption of OFD services. Other studies may indicate that consumers perceive complex innovations differently, as the IC significantly influences their adoption decisions [65]. While the IC in OFD services may deter food consumers, this perspective can differ significantly from that of food merchants. This

result challenges the prevailing notion that IC inherently hinders adoption, demonstrating that there is no significant negative impact on the adoption of OFD services by food merchants. Another pivotal aspect explored in this study is highlighting a nuanced interplay between owner's self-efficacy and commitment in the adoption of OFD services. These factors may not commonly be mentioned in studies focused on individual perspectives, such as the consumer's adoption models. Despite this, the result reveals that the relationship between owner's self-efficacy and commitment is complex, context-dependent, and not as straightforward as previously assumed.

4.4. Practical implication

Beginning with MSMEs, the study suggests that owners should embrace technological adaptation that aligns with their business models while fostering digital competencies within their staff, thereby enhancing their compatibility underpinned by a belief in their self-efficacy and a commitment to utilizing OFD services effectively. Governments also need to support programs that enhance MSMEs owners' self-efficacy for digital transformation. This involves not only financial incentives and tax relief but also regulations that support digital adoption while ensuring merchant interests. Promoting the public to use OFD also becomes the government's responsibility, with the objective of acclimating potential consumers to, and encouraging their transition towards, online-based services. OFD providers, acknowledging their critical role, are tasked with strengthening health protocol guarantees and extending comprehensive technological support to ensure merchant partners adhere to health guidelines, thereby cultivating trust and safety within the ecosystem. Integrating these practical implications ensures a collaborative effort among MSMEs, governments, and OFD providers, directly addressing the multifaceted factors identified in the study. By focusing on these key areas, each stakeholder can contribute to creating a more robust and resilient digital ecosystem for food MSMEs, facilitating their successful adoption of OFD services amid the challenges posed by the pandemic.

5. CONCLUSION

This study investigated the adoption of OFD services among Indonesian food MSMEs during the COVID-19 pandemic. A quantitative approach was employed, involving 378 respondents to explore the multifaceted factors affecting the adoption of OFD services. By integrating the TOE framework, our research offers nuanced insights into the multi-dimensional factors that influence technology adoption in crisis situations. The findings from CB-SEM elucidated the complex interplay between TOE factors, revealing both facilitators and barriers to OFD service adoption. Significantly, the path analysis results underscore the importance of technological compatibility, organizational commitment, and environmental support in shaping the adoption behaviors of food MSMEs. Notably, the study found that while IC has no significant impact on adoption intentions, factors such as owner's self-efficacy, GS, and health protocol guarantees play pivotal roles in enhancing adoption. These findings challenge conventional wisdom regarding the barriers to technology adoption and highlight the critical role of supportive measures in facilitating the successful integration of new technologies. The outcomes of this research not only enrich the theoretical discourse on technology adoption in the context of a global crisis but also offer pragmatic guidelines for enhancing the digital transformation of Indonesian food MSMEs. As the study navigates the post-pandemic business landscape, the insights derived from this research will be instrumental in supporting the continued growth and adaptation of the food sector in Indonesia and beyond. Moreover, by delineating the adoption patterns of OFD services by Indonesian food MSMEs throughout the COVID-19 pandemic, this study furnishes a solid groundwork for future research. Future research aims to understand the continuance intentions of food MSMEs regarding the adoption of OFD services in a post-pandemic era. The necessity for such research is underscored by the evolving nature of the global business landscape, which necessitates a deeper understanding of the factors influencing long-term adaptation strategies among OFD services. Expanding the scope of this research to include case studies from other countries or comparisons between populations could broaden perspectives, offering valuable insights for stakeholders worldwide in an era where OFD services are globally implemented. Such insights are crucial, as businesses capable of more efficient digital transformation stand to gain significant advantages, not only in Indonesia but in other countries as well.

FUNDING INFORMATION

This research was supported by the School of Information Technology, King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand. The support was provided in the form of laboratory facilities and access to journal portals. The authors gratefully acknowledge this assistance.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Rahmat Yasirandi	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	
Bundit Thanasopon	✓	✓		✓	✓					✓		✓		✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study are available upon request from the authors, subject to the necessity of data usage. While all participants voluntarily provided their information, it was strictly for the purpose of this study and in accordance with the data collection agreement established at the time of the research.

REFERENCES

[1] I. Chakraborty and P. Maity, "COVID-19 outbreak: Migration, effects on society, global environment and prevention," *Sci. Total Environ.*, vol. 728, p. 138882, Aug. 2020, doi: 10.1016/j.scitotenv.2020.138882.
[2] Y. Fan, K. Zhao, Z.-L. Shi, and P. Zhou, "Bat Coronaviruses in China," *Virus.*, vol. 11, no. 3, Mar. 2019, doi: 10.3390/v11030210.
[3] F. Kahar, G. D. Dirawan, S. Samad, N. Qomariyah, and D. E. Purlinda, "The Epidemiology of COVID-19, Attitudes and Behaviors of the Community During the Covid Pandemic in Indonesia," *Struct.*, vol. 10, p. 8, 2020.
[4] N. Shimomura, *Impact of COVID-19 Pandemic on MSMEs in Indonesia*. Jakarta: LPEM FEB UI, 2020.
[5] L. Adam and E. Lestari, "Shielding MSMEs from the Adverse Effects of COVID-19," *J. of Southeast Asian Econ.*, vol. 40, no. 3, pp. 365–386, 2023.
[6] S. Gade, "MSMEs' role in economic growth--a study on India's perspective," *Int. J. Pure Appl. Math.*, vol. 118, no. 18, pp. 1727–1741, 2018.
[7] D. Lee, "How Ojek became Go-Jek: Disruptive technologies and the infrastructure of urban citizenship in Indonesia - spotlight on disruptive urban technologies," *Int. J. of Urban and Regional Resear.*, Dec. 2018.
[8] J. Melitski, D. Gavin, and J. Gavin, "Technology adoption and organizational culture in public organizations," *Int. J. of Organization Theory & Behavior*, vol. 13, no. 4, pp. 546–568, Jan. 2010, doi: 10.1108/IJOTB-13-04-2010-B005.
[9] H. O. Awa, O. O. Ukoha, and L. E. Orokor, "Integrated technology-organization-environment (T-O-E) taxonomies for technology adoption," *J. of Enterprise Information Manage.*, vol. 30, no. 6, pp. 893–921, Jan. 2017, doi: 10.1108/JEIM-03-2016-0079.
[10] M. A. Hameed, S. Counsell, and S. Swift, "A conceptual model for the process of IT innovation adoption in organizations," *J. Eng. Tech. Manage.*, vol. 29, no. 3, pp. 358–390, Jul. 2012, doi: 10.1016/j.jengtecman.2012.03.007.
[11] E. T. Straub, "Understanding Technology Adoption: Theory and Future Directions for Informal Learning," *Rev. Educ. Res.*, vol. 79, no. 2, pp. 625–649, Jun. 2009, doi: 10.3102/0034654308325896.
[12] L. E. Trachtman, M. M. Spirek, G. G. Sparks, and C. Stohl, "Factors affecting the adoption of a new technology," *Bull. Sci. Technol. Soc.*, vol. 11, no. 6, pp. 338–345, Dec. 1991, doi: 10.1177/027046769101100605.
[12] A. N. Tashkandi and I. M. Al-Jabri, "Cloud computing adoption by higher education institutions in Saudi Arabia: an exploratory study," *Cluster Comput.*, vol. 18, no. 4, pp. 1527–1537, Dec. 2015, doi: 10.1007/s10586-015-0490-4.
[14] W.-Y. Kim and H.-S. Yang, "Importance Analysis of SCM Adoption Factors," *J. Korea Acad.-Ind. Coop. Soc.*, vol. 10, no. 9, pp. 2290–2299, Sep. 2009, doi: 10.5762/kais.2009.10.9.2290.
[15] K. H. Shih, H. F. Hung, and B. Lin, "Assessing user experiences and usage intentions of m-banking service," *Int. J. Mob. Commun.*, vol. 8, no. 3, pp. 257-277, 2010, doi: 10.1504/ijmc.2010.032974.
[16] P. Limthongchai and M. Speece, "The effect of perceived characteristics of innovation on E-commerce adoption by SMEs in Thailand," *SSRN Electron. J.*, 2003, doi: 10.2139/ssrn.2565392.
[17] W. Wei, "The impact of product complexity on adoption of web-based interactive innovation practices," *Innovation (North Syd.)*, vol. 14, no. 3, pp. 431–445, Sep. 2012, doi: 10.5172/impp.2012.14.3.431.
[18] S. Bond-Smith, "The impact of compatibility on innovation in markets with network effects," *Econ. Innov. New Technol.*, vol. 28, no. 8, pp. 816–840, Nov. 2019, doi: 10.1080/10438599.2018.1563936.
[19] J. L. Pierce and A. L. Delbecq, "Organization Structure, Individual Attitudes and Innovation," *Acad. Manage. Rev.*, vol. 2, no. 1, pp. 27-37, Jan. 1977, doi: 10.2307/257602.
[20] S. Y. Sohn, J. Jeon, and E. J. Han, "A new cost of ownership model for the acquisition of technology complying with environmental regulations," *J. Clean. Prod.*, vol. 100, pp. 269–277, Aug. 2015, doi: 10.1016/j.jclepro.2015.03.057.
[21] Y. Wu, Y. Lu, and S. Huang, "Impacts of delivery charge on the possibility of consumers using online food delivery," *Sustain.*, vol. 14, no. 3, pp. 1-21, Feb. 2022, doi: 10.3390/su14031795.

[22] C. Chatterjee, K. Kubo, and V. Pingali, "The consumer welfare implications of governmental policies and firm strategy in markets for medicines," *J. Health Econ.*, vol. 44, pp. 255–273, Dec. 2015, doi: 10.1016/j.jhealeco.2015.09.001.
[23] Rosli, Yeow, and Eu-Gene, "Adoption of audit technology in audit firms," in *24th Australasian Conference on Information Systems (ACIS) 2013*, RMIT University; Melbourne, Australia, 2013, pp. 1–12.
[24] D. Skarmeas, C. S. Katsikeas, and B. B. Schlegelmilch, "Drivers of commitment and its impact on performance in cross-cultural buyer-seller relationships: The importer's perspective," *J. Int. Bus. Stud.*, vol. 33, no. 4, pp. 757–783, Dec. 2002, doi: 10.1057/palgrave.jibs.8491043.
[25] A. Bandura, "The explanatory and predictive scope of self-efficacy theory," *J. Soc. Clin. Psychol.*, vol. 4, no. 3, pp. 359–373, Sep. 1986, doi: 10.1521/jscp.1986.4.3.359.
[26] K. Annaraud and K. Berezina, "Predicting satisfaction and intentions to use online food delivery: What really makes a difference?," *J. Foodserv. Bus. Res.*, vol. 23, no. 4, pp. 305–323, Jul. 2020, doi: 10.1080/15378020.2020.1768039.
[27] G. See-Kwong, N. Soo-Ryue, W. Shiun-Yi, and C. Lily, "Outsourcing to online food delivery services: Perspective of F&B business owners," *J. Internet Bank. Commer*., vol. 22, no. 2, pp. 1–18, Jul. 2017.
[28] A. S. Masten, K. M. Best, and N. Garmezy, "Resilience and development: Contributions from the study of children who overcome adversity," *Dev. Psychopathol.*, vol. 2, no. 4, pp. 425–444, Oct. 1990, doi: 10.1017/s0954579400005812.
[29] J. Vargo and E. Seville, "Crisis strategic planning for SMEs: finding the silver lining," *Int. J. Prod. Res.*, vol. 49, no. 18, pp. 5619–5635, Sep. 2011, doi: 10.1080/00207543.2011.563902.
[30] R. J. Calantone, D. A. Griffith, and G. Yalcinkaya, "An empirical examination of a technology adoption model for the context of China," *J. Int. Mark.*, vol. 14, no. 4, pp. 1–27, Dec. 2006, doi: 10.1509/jimk.14.4.1.
[31] J. Li, J. Xia, and E. J. Zajac, "On the duality of political and economic stakeholder influence on firm innovation performance: Theory and evidence from Chinese firms," *Strategic Manage. J.*, vol. 39, no. 1, pp. 193–216, Jan. 2018, doi: 10.1002/smj.2697.
[32] J. N. Makena, "Factors that affect cloud computing adoption by small and medium enterprises in Kenya," *Int. J. Comput. Appl. Technol. Res.*, vol. 2, no. 5, pp. 517–521, Sep. 2013, doi: 10.7753/ijcatr0205.1003.
[33] F. Zhao *et al.*, "Shaping behaviors through institutional support in British higher educational institutions: Focusing on employees for sustainable technological change," *Front. Psychol.*, vol. 11, p. 584857, Dec. 2020, doi: 10.3389/fpsyg.2020.584857.
[34] A. L. Ostrom and D. Iacobucci, "The effect of guarantees on consumers' evaluation of services," *J. Serv. Mark.*, vol. 12, no. 5, pp. 362–378, Oct. 1998, doi: 10.1108/08876049810235405.
[35] W. Sha, "Examining mediators of structural assurance constructs in business-to-consumer E-commerce," 2004. [Online]. Available: https://aisel.aisnet.org/cgi/viewcontent.cgi?article=2060&context=amcis2004. (Accessed: 12-Nov-2022).
[36] Y. Lin, R. K. Marjerison, J. Choi, and C. Chae, "Supply chain sustainability during COVID-19: Last mile food delivery in China," *Sustainability*, vol. 14, no. 3, p. 1484, Jan. 2022.
[37] M. S. Rahman, M. Ko, J. Warren, and D. Carpenter, "Healthcare Technology Self-Efficacy (HTSE) and its influence on individual attitude: An empirical study," *Comput. Human Behav.*, vol. 58, pp. 12–24, May 2016.
[38] T. H. Alaskar, K. Mezghani, and A. K. Alsadi, "Examining the adoption of Big data analytics in supply chain management under competitive pressure: evidence from Saudi Arabia," *J. Decis. Syst.*, vol. 30, no. 2–3, pp. 300–320, Jul. 2021.
[39] D. Darai, D. Sacco, and A. Schmutzler, "Competition and innovation: an experimental investigation," *Exp. Econ.*, vol. 13, no. 4, pp. 439–460, Dec. 2010.
[40] A. Wijenayaka, "Conceptualization of factors affecting customer satisfaction on online food delivery among young executives in Sri Lanka," Dec. 29, 2021, doi: 10.31219/osf.io/893gn.
[41] C. Hong, H. (Hailey) Choi, E.-K. (Cindy) Choi, and H.-W. (David) Joung, "Factors affecting customer intention to use online food delivery services before and during the COVID-19 pandemic," *J. Hosp. Tour. Manag.*, vol. 48, pp. 509–518, Sep. 2021, doi: 10.1016/j.jhtm.2021.08.012.
[42] S. K. Majumdar and S. Venkataraman, "New technology adoption in US telecommunications: The role of competitive pressures and firm-level inducements," *Res. Policy*, vol. 22, no. 5–6, pp. 521–536, Nov. 1993, doi: 10.1016/0048-7333(93)90016-b.
[43] P. G. Correa, A. M. Fernandes, and C. J. Uregian, "Technology adoption and the investment climate: Firm-level evidence for eastern Europe and central Asia," *World Bank Econ. Rev.*, vol. 24, no. 1, pp. 121–147, Jan. 2010, doi: 10.1093/wber/lhp021.
[44] M. Khalifa and M. Davison, "SME adoption of IT: the case of electronic trading systems," *IEEE Trans. Eng. Manage.*, vol. 53, no. 2, pp. 275–284, May 2006, doi: 10.1109/tem.2006.872251.
[45] P. Chatzoglou and D. Chatzoudes, "Factors affecting e-business adoption in SMEs: an empirical research," *J. of Enterprise Inform. Manag.*, vol. 29, no. 3, pp. 327–358, Jan. 2016, doi: 10.1108/JEIM-03-2014-0033.
[46] M. Viswanathan, J. A. Rosa, and J. A. Ruth, "Exchanges in marketing systems: The case of subsistence consumer–merchants in Chennai, India," *J. Mark.*, vol. 74, no. 3, pp. 1–17, May 2010, doi: 10.1509/jmkg.74.3.1.
[47] T. H. Nguyen, M. Newby, and M. J. Macaulay, "Information Technology Adoption in Small Business: Confirmation of a Proposed Framework," *J. Small Bus. Manage.*, vol. 53, no. 1, pp. 207–227, Jan. 2015.
[48] L. S. Reddy and K. R., "Justifying the judgmental sampling matrix organization in outsourcing industry," *GBAMS Vidushi*, vol. 8, no. 02, Jul. 2016, doi: 10.26829/vidushi.v8i02.9728.
[49] J. J. Curtis, "Judgmental sampling," *Transplantation*, vol. 91, no. 12, p. 1320, Jun. 2011, doi: 10.1097/tp.0b013e31821d91c8.
[50] A. S. Singh and M. B. Masuku, "Sampling techniques & determination of sample size in applied statistics research: An overview," *Int. J. of Economics, Commerce and Manage.*, vol. 2, no. 11, pp. 1–22, 2014
[51] W. Reinartz, M. Haenlein, and J. Henseler, "An empirical comparison of the efficacy of covariance-based and variance-based SEM," *Int. J. Res. Mark.*, vol. 26, no. 4, pp. 332–344, Dec. 2009, doi: 10.1016/j.ijresmar.2009.08.001.
[52] B. M. Byrne, *Structural equ. modeling with AMOS*, 3rd ed. London, England: Routledge, 2016.
[53] M. Bradford and J. Florin, "Examining the role of innovation diffusion factors on the implementation success of enterprise resource planning systems," *Int. J. of Accounting Infor. Sys.*, vol. 4, no. 3, pp. 205–225, Sep. 2003, doi: 10.1016/S1467-0895(03)00026-5.
[54] J. C. Groth and M. R. Kinney, "Cost management and value creation," *Manag. Decis.*, vol. 32, no. 4, pp. 52–57, Jun. 1994, doi: 10.1108/00251749410058680.
[55] D. Bunker, K. Kautz, and A. L. T. Nguyen, "The role of value compatibility in information technology adoption," in *The Transfer and Diffusion of Information Technology for Organizational Resilience*, Boston: Kluwer Academic Publishers, 2006, pp. 53–70, doi: 10.1007/0-387-34410-1_4.
[56] S. Chu, H. Yang, M. Lee, and S. Park, "The impact of institutional pressures on green supply chain management and firm performance: Top management roles and social capital," *Sustain.*, vol. 9, no. 5, pp. 1-21, May 2017, doi: 10.3390/su9050764.
[57] M. F. Zhang, J. F. Dawson, and R. B. Kline, "Evaluating the use of covariance-based structural equation modelling with reflective measurement in organizational and management research: A review and recommendations for best practice," *Br. J. Manag.*, vol. 32, no. 2, pp. 257–272, Apr. 2021, doi: 10.1111/1467-8551.12415.

[58] H. I. Ballout, "Career commitment and career success: moderating role of self-efficacy," *Career Dev. Int.*, vol. 14, no. 7, pp. 655–670, Nov. 2009, doi: 10.1108/13620430911005708.
[59] L. G. Tornatzky and K. J. Klein, "Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings," *IEEE Trans. Eng. Manage.*, vol. EM-29, no. 1, pp. 28–45, 1982, doi: 10.1109/tem.1982.6447463.
[60] K. Frenken, "A fitness landscape approach to technological complexity, modularity, and vertical disintegration," *Struct. Chang. Econ. Dyn.*, vol. 17, no. 3, pp. 288–305, Sep. 2006, doi: 10.1016/j.strueco.2006.01.001.
[61] P. J. Curran, K. A. Bollen, P. Paxton, J. Kirby, and F. Chen, "The noncentral chi-square distribution in misspecified structural equation models: Finite sample results from a Monte Carlo simulation," *Multivariate Behav. Res.*, vol. 37, no. 1, pp. 1–36, Jan. 2002, doi: 10.1207/S15327906MBR3701_01.
[62] J. F. Hair, J. J. Risher, M. Sarstedt, and C. M. Ringle, "When to use and how to report the results of PLS-SEM," *Eur. Bus. Rev.*, vol. 31, no. 1, pp. 2–24, Jan. 2019, doi: 10.1108/ebr-11-2018-0203.
[63] M. Sarstedt, J. F. Hair Jr, J.-H. Cheah, J.-M. Becker, and C. M. Ringle, "How to specify, estimate, and validate higher-order constructs in PLS-SEM," *Australas. Mark. J. (AMJ)*, vol. 27, no. 3, pp. 197–211, Aug. 2019, doi: 10.1016/j.ausmj.2019.05.003.
[64] R. Yasirandi and B. Thanasopon, "A survey of food delivery innovation evolution in developing countries: Insights from Indonesia," in *2023 Int. Conf. Advancement Data Science, E-learning Inf. Sys. (ICADEIS)*, IEEE, Aug. 2023, doi: 10.1109/icadeis58666.2023.10271029.
[65] S. Ali, N. Khalid, H. M. U. Javed, and D. M. Z. Islam, "Consumer Adoption of Online Food Delivery Ordering (OFDO) Services in Pakistan: The Impact of the COVID-19 Pandemic Situation," *J. Open Innovation: Tech., Market, and Complex.*, vol. 7, no. 1, pp. 1-21, Dec. 2020, doi: 10.3390/joitmc7010010.

BIOGRAPHIES OF AUTHORS

Rahmat Yasirandi is a lecturer at the School of Computing and a researcher at the Center of Excellence Technological Society (CAATIS), Telkom University, Indonesia. He holds a Bachelor's degree in Informatics from Telkom University, Indonesia, and a Master's degree in Information Technology from the Bandung Institute of Technology, Indonesia. Currently, he is a doctoral candidate with research area in IS/IT Adoption at the School of Information Technology, King Mongkut's Institute of Technology Ladkrabang, Thailand, supported by a scholarship for foreign program. He can be contacted at email: 64607077@kmitl.ac.th.

Bundit Thanasopon is an Assistant Professor at the School of Information Technology, King Mongkut's Institute of Technology Ladkrabang, Thailand, where he has been a faculty member since 2016. He graduated with B.Eng. degree in Computer Engineering from Chulalongkorn University, Thailand and M.Sc. in Knowledge and Information Systems Management from University of Southampton, UK. He then completed his Ph.D. in management from the University of Hull, UK, in 2015. He can be contacted at email: bundit@it.kmitl.ac.th.