Operational Research in Engineering Sciences: Theory and Applications
Vol. 7, Issue 1, 2024, pp. 1-24
ISSN: 2620-1607
eISSN: 2620-1747
DOI: https://doi.org/10.5281/zenodo.15073817

EFFECTS OF E-CRM AND GREEN OPERATIONAL PRACTICES ON OPERATIONAL PERFORMANCE OF HOSPITALS: A CASE STUDY OF ASEAN COUNTRIES

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Received: 14 November 2023
Accepted: 22 February 2024
First Online: 15 March 2024

Research Paper

Abstract: *The primary aim of this research was to assess the impact of operational practices and electronic customer relationship management (E-CRM) on the operational performance of hospitals within ASEAN countries, mediated by patient satisfaction. Additionally, the study examined the moderating effects of operational green behaviour and operational management reasons. Data were gathered via a convenient sampling technique from 600 female healthcare patients across three ASEAN nations: Indonesia, Malaysia, and Singapore. Employing a quantitative deductive approach, the research utilized a cross-sectional design. The Partial Least Squares Structural Equation Modelling (PLS-SEM) technique revealed that operational practices and E-CRM significantly and positively influenced patient satisfaction. Moreover, patient satisfaction was found to positively and significantly affect operational performance. The results also indicated that operational management reasons and operational green behaviour exerted positive and significant moderating effects on the relationships between operational practices, E-CRM, and patient satisfaction. These findings contribute to theoretical advancements by providing insights for future research in novel contexts. Furthermore, they offer practical implications, emphasizing the importance of operational management reasons and green social behaviour in enhancing operational performance within companies.*

Keywords: *Patient Satisfaction, Operations Management Reasons, Operations Green Social Behaviour, ASEAN Countries.*

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1. Introduction

In the contemporary dynamic landscape, operational performance within the hospital sector encompasses the efficiency and efficacy of daily operations (Lee et al., 2023). The optimization of operational performance holds paramount importance for hospitals, ensuring the timely delivery of high-quality care and sustaining a competitive edge within the healthcare market (Hani, 2021). Integral to this optimization is patient satisfaction, which serves as a cornerstone of operational performance in the hospital industry (Kasula, 2023). Contented patients demonstrate heightened adherence to treatment regimens, exhibit a propensity for repeat visits, and actively advocate for the hospital, thereby contributing to overall operational success (Kasula, 2023).

Traditionally, the healthcare sector has allocated comparatively less emphasis on patient satisfaction relative to other industries (Mahrinasari et al., 2023). However, heightened competition has prompted hospitals to recognize the pivotal role of patient satisfaction in attracting and retaining clientele (Chakraborty et al., 2022). Embracing innovative technologies and addressing emerging environmental concerns, such as sustainability initiatives, are indispensable strategies for bolstering operational performance and aligning with evolving patient expectations (Amazhanova & Huseynov, 2017). In essence, the integration of green operational practices also emerges as a significant contributor to augmenting patient satisfaction (Mahrinasari et al., 2023), consequently enhancing overall operational performance for healthcare organizations. These arguments underscore the pivotal role of patient satisfaction in bolstering operational performance within companies.

Secondly, operational green social behaviours encompass practices such as energy conservation, waste reduction, and sustainable procurement, collectively referred to as environmentally friendly practices within operations (Welsch et al., 2021). These practices yield benefits not only for environmental preservation but also for enhancing resource efficiency, potentially enhancing patient satisfaction by fostering a healthier and more sustainable healthcare environment (Pinzone et al., 2019). Moreover, operational green social behaviours contribute to the augmentation of ECRM (Ekawati et al., 2023). By mitigating environmental impact and operational costs, hospitals can reallocate resources toward refining ECRM platforms. This enables personalized communication, efficient appointment scheduling, and streamlined feedback mechanisms, consequently enhancing patient satisfaction with hospital services (Mahrinasari et al., 2023). These research findings underscore that operational green social behaviours facilitate the management of operational strategies and ECRM, thereby enhancing patient satisfaction and subsequently improving operational performance.

Conversely, operations management reasons also exert influence on the relationship between operational strategies, ECRM, and customer satisfaction. Effective management practices, such as resource allocation and process optimization, can enhance the implementation and impact of operational practices on customer satisfaction (Kerdpitak, 2021). This, in turn, fosters improved customer interactions and service delivery, ultimately elevating customer satisfaction levels (Kerdpitak, 2021). Additionally, proficient operations management ensures alignment between strategies and customer needs, thereby maximizing the efficacy of ECRM in enhancing

positive patient experiences (Khan et al., 2022). In light of the foregoing discussion, the current study incorporates operational green behaviours and operations management reasons as moderating variables in examining the relationships among operational practices, ECRM, and patient satisfaction, aiming to enhance operational performance.

Empirical investigations have delved into the interplay among green practices, ECRM, and customer satisfaction. These inquiries primarily aimed at evaluating the direct impacts of green practices on customer satisfaction (Alsafadi & Altahat, 2021); (Jalil et al., 2024); (Tharaka & Munasinghe, 2022). However, the extant literature reveals inconsistencies in findings across various studies. While some researchers have identified a positive correlation between green practices and customer satisfaction (Reznek et al., 2021), others have failed to establish a significant relationship (Ramanathan et al., 2017); (Shbool et al., 2022).

Similarly, prior studies have explored the relationship between ECRM and its direct or mediating effects on customer satisfaction (Haryandika & Santra, 2021); (Hassan et al., 2015); (Khan et al., 2022). Additionally, scant attention has been paid to the influence of customer satisfaction on operational performance (Gopal et al., 2021); (Sacks et al., 2015). The gap in existing research lies in the limited examination of potential moderating or mediating factors that could affect the efficacy of green practices and ECRM in enhancing customer satisfaction. Moreover, there is a call for more thorough investigations into the mechanisms by which green strategies could shape customer perceptions and behaviours, taking into account the dynamic nature of environmental concerns and consumer preferences.

Therefore, this study aims to fill these gaps by scrutinizing the interactions among green practices, operational strategies, and customer/patient satisfaction within specific organizational contexts. As previously discussed, operations green behaviour and operations management reasons play pivotal roles in fostering green practices and ECRM to enhance customer satisfaction, thereby potentially improving operational performance. Hence, this study incorporates these variables as moderating factors in the current investigation.

Moreover, prior research has predominantly concentrated on individual countries (Gopal et al., 2021); (Mahrinasari et al., 2023), with limited attention directed towards ASEAN countries. Extensive scholarly investigations into green operational practices, ECRM, and customer satisfaction have been undertaken in the existing literature (Alsafadi & Altahat, 2021); (Hassan et al., 2015); (Jalil et al., 2024); (Khan et al., 2022); (Tharaka & Munasinghe, 2022)), yet these studies have tended to overlook the healthcare sector within ASEAN nations. Consequently, this study places a primary focus on the healthcare industry within ASEAN, recognizing the scarcity of attention devoted to these relationships within ASEAN economies. While numerous studies have individually examined ASEAN countries, limited attention has been paid to the collective examination of Indonesia, Malaysia, and Singapore within a single study. Thus, this study seeks to address these gaps within the context of ASEAN countries, aiming to investigate the impact of operational practices and ECRM on operational performance through customer satisfaction within hospitals in ASEAN countries. Additionally, the study examines the moderating roles of operational green behaviour and operational management reasons.

This research significantly contributes to the literature on healthcare management by empirically confirming the positive and significant effects of operational practices and ECRM on operational performance through customer satisfaction in ASEAN hospitals. This validation provides empirical evidence supporting the efficacy of these strategies in enhancing overall hospital performance. Furthermore, by elucidating the moderating influences of operational green behaviour and management reasons, the study offers practical insights for hospitals to enhance their operational efficiency and customer satisfaction levels. These findings not only validate existing theoretical frameworks but also provide actionable implications for optimizing healthcare operations in the ASEAN region, thereby advancing both academic understanding and managerial practices in healthcare management. The study is structured into four subsequent chapters, namely, literature review, research methods, data analysis and results, and discussion and limitations.

2. Literature Review and Hypothesis Development

2.1 Electronic Customer Relationship Management and Customer Satisfaction

ECRM encapsulates the interaction between customers and business suppliers via online or digital platforms, facilitating the digitalized customer journey and enabling feedback provision (Haryandika & Santra, 2021). The Technology Acceptance Model (TAM) underscores ECRM's significant influence on customer satisfaction, emphasizing the shaping of perceptions regarding ease of use and usefulness (Ngangi & Santoso, 2019). These frameworks underscore the critical role of positive user experiences in electronic platforms in augmenting overall satisfaction. Empirical evidence from (Al-Bashayreh et al., 2022),(Al-Bashayreh et al., 2022) corroborates a positive and significant impact of ECRM on customer satisfaction. Similarly, (Amazhanova & Huseynov, 2017) report a positive and significant association with customer satisfaction. (Rustandi et al., 2024) provide further support, indicating that positive user experiences with e-commerce websites and online customer service are significantly linked to heightened levels of customer satisfaction. Another study highlights the pivotal role of ECRM in enhancing customer satisfaction (Demirel, 2022). Based on these preceding discussions, the study posits the following hypothesis.

H1: *Electronic customer significantly influences customer satisfaction.*

2.2 Green Building and Customer Satisfaction

Green building refers to structures designed with a conscientious regard for the environment and resource efficiency in lifestyle practices (Chen et al., 2022). This entails considerations such as energy efficiency, water conservation, utilization of sustainable materials, and overall environmental performance (Cao et al., 2022). The objective of green building is to yield environmental benefits such as enhanced indoor air quality and thermal comfort, aligning with contemporary consumer preferences for sustainable living environments. These practices are posited to positively impact customer satisfaction (Asim & Ahmad, 2022). Empirically, (Meron & Meir, 2017)

observed that green buildings reported higher satisfaction levels with indoor environmental quality and building performance. Similarly, (Mahrinasari et al., 2023) further illustrated that green building features, such as energy efficiency and indoor air quality, significantly influenced customer satisfaction. Additionally, (Cao et al., 2022) corroborated these findings, demonstrating that occupants of green buildings reported elevated satisfaction levels with indoor environmental quality, and that green supply chain practices positively affected customer satisfaction. Based on the aforementioned discussions, the study posits the following hypothesis.

H2: *Green Building significantly influences customer satisfaction.*

2.3 Eco-Design and Customer Satisfaction

Eco-design entails the incorporation of environmental considerations into the design of products, services, and systems (Tseng et al., 2019), aiming primarily to mitigate adverse environmental impacts while optimizing resource efficiency, recyclability, and overall sustainability across the product lifecycle (Tseng et al., 2019). The objective of eco-design is to augment customer satisfaction by offering environmentally friendly products that align with consumers' preferences for sustainable consumption (Mangla et al., 2015). Empirical evidence from (Mahrinasari et al., 2023) suggests that attributes of eco-design, such as recyclability and biodegradability, positively impact customer satisfaction with smartphones. Based on this prior discussion, the study posits the following hypothesis.

H3: *Eco-Design significantly influences customer satisfaction.*

2.4 Green Supply Chain Management and Customer Satisfaction

Green Supply Chain Management (GSCM) encompasses the integration of environmental considerations into supply chain processes, spanning from the sourcing of raw materials to manufacturing, distribution, and end-of-life disposal (Asha et al., 2023). This encompasses practices such as sustainable sourcing, green manufacturing, eco-friendly packaging, and reverse logistics for recycling and waste management (Asha et al., 2023). Moreover, GSCM aims to elevate product quality, reliability, and environmental responsibility across the supply chain, thereby positively impacting customer satisfaction by meeting consumers' expectations for environmentally responsible products and services (Jalil et al., 2024).

Empirical evidence from (González-Viralta et al., 2023) indicates that companies implementing green logistics practices reported heightened levels of customer satisfaction due to enhanced delivery reliability and environmental performance. (Jalil et al., 2024) similarly confirmed that green supply chain practices exert a positive influence on customer satisfaction. Additionally, (Adam et al., 2020) bolstered these findings by demonstrating that green supply chain practices significantly enhance customer satisfaction through improved product quality and reduced environmental impact. Based on these preceding discussions, the study posits the following hypothesis.

H4: *Green Supply Chain Management significantly influences customer satisfaction.*

2.5 Green Innovation and Customer Satisfaction.

Green innovation pertains to the generation, adoption, and implementation of novel ideas within businesses, resulting in noteworthy enhancements in value creation (Chatterjee et al., 2022). It encompasses both incremental advancements and revolutionary breakthroughs across diverse domains. These innovations aim to address unmet needs and preferences, thereby heightening customer satisfaction through the provision of innovative products and services that generate value for customers (Tajpour et al., 2020).

Empirical evidence from (Dwi & Ketut, 2020) indicates that innovation within the hospitality sector positively impacts customer satisfaction. Similarly, (Sarzosa G et al., 2020) demonstrated that innovation in service delivery significantly predicts customer satisfaction. (Hapsari et al., 2021) further corroborated these findings by revealing that innovative product features and financial service offerings significantly influence customer satisfaction and loyalty. Another study similarly underscored the positive and significant impact of innovation on customer satisfaction (Tarmidi, 2021). Based on these prior discussions, the study posits the following hypothesis.

H5: *Innovation significantly influences customer satisfaction.*

2.6 Moderating Effect of Operations Management Reasons

Previous literature has underscored the ambiguity surrounding the relationship among operations strategies, ECRM, and customer satisfaction, indicating the necessity for moderating or mediating variables to clarify this relationship. For instance, (Hani, 2021) investigated the moderating role of operations management between supply chain integration and operations performance, revealing a significant moderating effect wherein operations management significantly influences the impact of green strategies on customer satisfaction. Similarly, (Goodale et al., 2011)explored the moderating role of operations control between operational activities and corporate entrepreneurship, emphasizing the importance of aligning operational management reasons with green strategies to optimize their impact on customer satisfaction across various industry contexts, thereby improving operational performance.

Conversely, studies examining the relationship between ECRM and customer satisfaction have revealed a significant relationship, albeit with room for improvement. (Lawson-Body & Limayem, 2004) argued for the incorporation of internal organizational-level variables to elucidate this relationship further. Additionally, (GUMUS, 2023) demonstrated that specific operational efficiencies, such as order fulfilment efficiency, customer service responsiveness, and transaction processing speed, significantly influence the impact of ECRM on customer satisfaction. Effective alignment of these operational management reasons with ECRM strategies results in higher levels of customer satisfaction, underscoring the pivotal role of operational excellence in enhancing the digital customer experience.

While previous studies have utilized operational management as a moderating variable with satisfaction, they have overlooked its potential impact on operational performance. Thus, based on these insights, the current study formulates the following research hypothesis.

H6: *Operations management reason significantly moderates between electronic customer relationship management and customer satisfaction.*
H7: *Operations management reason significantly moderates between green building and customer satisfaction.*
H8: *Operations management reason significantly moderates between eco-design and customer satisfaction.*
H9: *Operations management reason significantly moderates between green supply chain management and customer satisfaction.*
H10: *Operations management reason significantly moderates between innovation and customer satisfaction.*

2.7 Moderating Effect Operation Green Behaviour

Previous literature highlights the unclear relationship among operations strategies, ECRM, and customer satisfaction, necessitating the identification of moderating or mediating variables. For example, (Mohamed et al., 2023) explored the link between green operations strategies and customer satisfaction, finding a positive impact. They emphasized the crucial moderating role of proactive green behaviour within operations, leading to heightened customer satisfaction when consistent and visible green practices are perceived across various operational aspects. Similarly, (Jiang et al., 2023) demonstrated that companies implementing green operations strategies experienced increased customer satisfaction levels. They argued for the alignment of green strategies with visible operational behaviours to effectively enhance customer satisfaction in both retail and service contexts. Additionally, (Liu et al., 2020) and (Islam et al., 2021) highlighted the moderating role of green behaviour, indicating its significant impact on promoting green values. However, these studies overlook the effect on operational performance. Addressing this gap, our study formulates the following research hypothesis.

H11: *Operations greens social behaviour significantly moderates amongst electronic customer relationship management and customer satisfaction.*
H12: *Operations greens social behaviour significantly moderates amongst green buildings and customer satisfaction.*
H13: *Operations greens social behaviour significantly moderates amongst eco-design and customer satisfaction.*
H14: *Operations greens social behaviour significantly moderates amongst green supply chain management and customer satisfaction*
H15: *Operations greens social behaviour significantly moderates amongst innovation and customer satisfaction.*
H16: *Customer satisfaction significantly effect to operations performance.*

Drawing upon the insights gleaned from the prior literature review, the research framework of the study is illustrated in Figure 1.

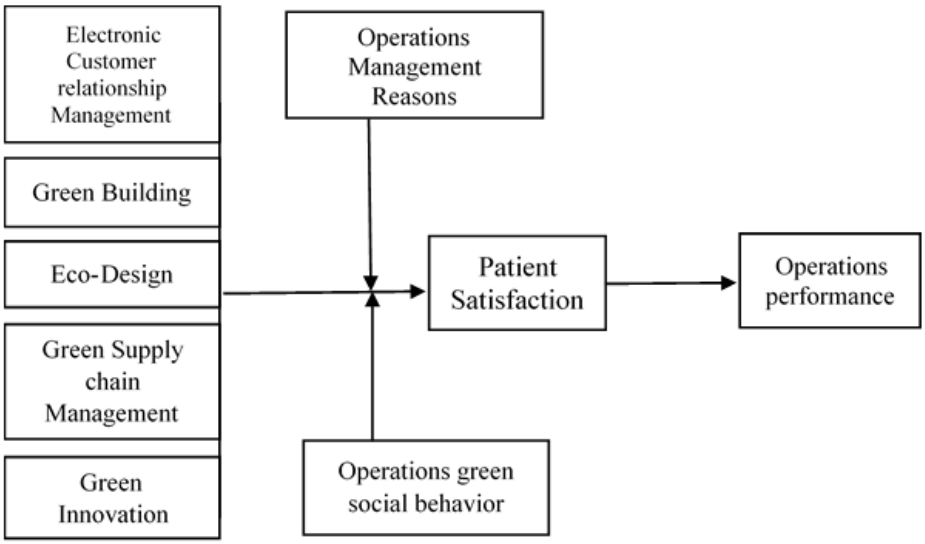

Figure.1: Research Framework

3. Research Approach and Design

The primary aim of this research was to assess the influence of operational practices and electronic customer relationship management on the operational performance of hospitals in ASEAN countries through the lens of customer satisfaction. Additionally, the study explored the moderating effects of operational green behaviour and operational management reasons. The research adopted a quantitative research approach, which is particularly suitable for studies utilizing surveys and collecting numerical data (Brannen, 2017). Furthermore, a cross-sectional research design was employed, as data were collected at a single point in time through surveys. This design was deemed preferable over a longitudinal research approach, which collects data over multiple timeframes (Rindfleisch et al., 2008). Thus, the study opted for a cross-sectional research design to fulfil its objectives.

3.1 Population and Data Collection

The study focused on a target population spanning three ASEAN countries: Indonesia, Singapore, and Malaysia. Convenient sampling technique was employed to gather data from respondents, a method deemed suitable when the population size is unknown (Etikan & Bala, 2017). An online questionnaire was distributed to 600 female patients across these countries, with 200 questionnaires administered in each. Of these, 420 research instruments were returned. Prior research has suggested that for PLS-SEM analysis, a sample size below 500 is deemed appropriate (Afthanorhan et al., 2016). The selection of female respondents from hospitals in Indonesia, Malaysia, and Singapore ensures a gender-balanced representation, aligning with the higher proportion of female patients seeking healthcare services in these nations.

3.2 Questionnaire Development

The research instrument was derived from existing literature, thereby enhancing its reliability as it has undergone prior testing. Among the operational practices assessed, green building was measured using 8 questions sourced from the research of (Mahrinasari et al., 2023), while eco-design was assessed through 5 questions from the same source. Furthermore, green supply chain management was evaluated using 4 questions also drawn from (Mahrinasari et al., 2023), alongside electronic customer relationship management, which was measured using 3 questions from the same study. Additionally, green social behaviour was assessed using 3 items sourced from (Mahrinasari et al., 2023) Patient satisfaction was gauged through 4 questions derived from the work of (Mahrinasari et al., 2023). Operations management reasons were measured using 8 questions sourced from the research conducted by (Schniederjans et al., 2012), while operational performance was assessed through 5 questions from (Flynn et al., 2010). Each construct was rated on a five-point Likert Scale.

4. Data Analysis and Results

The empirical findings in both the measurement and structural models were analysed using Smart PLS, a software commonly utilized for Partial Least Squares (PLS)-Structural Equation Modelling (SEM). This sampling technique was applied to assess the aforementioned models.

4.1 Convergent Validity

Convergent validity assesses the relevance of a scale with other constructs and measures of the same construct. It can be evaluated through criteria such as alpha, factor loadings, composite reliability, and average variance extracted. Each criterion provides a threshold indicating the strength of relationships between observed and underlying constructs (Hair et al., 2017). Factor loadings indicate the strength of relationships between latent and observed variables in the measurement model, with values exceeding 0.50 generally considered acceptable, signifying substantial shared variance (Hair et al., 2017).

Table 1: Convergent Validity Results

Construct	VIF	Alpha	Composite Reliability CR	AVE
GB	1.23	0.83	0.85	0.60
ED	2.12	0.78	0.80	0.55
GSM	1.94	0.86	0.88	0.65
GI	1.78	0.75	0.78	0.50
E-CRM	1.36	0.80	0.82	0.58
GSB	------	0.72	0.75	0.48
PS	1.28	0.88	0.90	0.70
OMR	------	0.81	0.83	0.62
OP	------	0.85	0.87	0.68

Note: "GB-green building, ED-eco-design, GSM-green supply chain management, GI-green innovation, E-CRM-electronic customer relationship management, GIB-green social behaviour, PS-patient satisfaction, OMR-operations management research, OP-operations performance".

Cronbach's alpha measures the internal consistency or reliability of a construct, with a threshold of 0.70 or higher commonly recommended for construct reliability (F. Hair Jr et al., 2014). Composite reliability, similar to Cronbach's alpha, evaluates construct internal consistency but is often preferred in structural equation modelling. A threshold of 0.70 or above indicates reliable constructs (Hair Jr et al., 2020). Average variance extracted (AVE) quantifies the variance captured by latent variables relative to measurement error. Ideally, AVE values exceeding 0.50 suggest that constructs explain more variance than measurement error, indicating robust convergent validity (Hair Jr et al., 2020). The results in Table 1 indicate that the construct meets all these criteria, demonstrating satisfactory convergent validity.

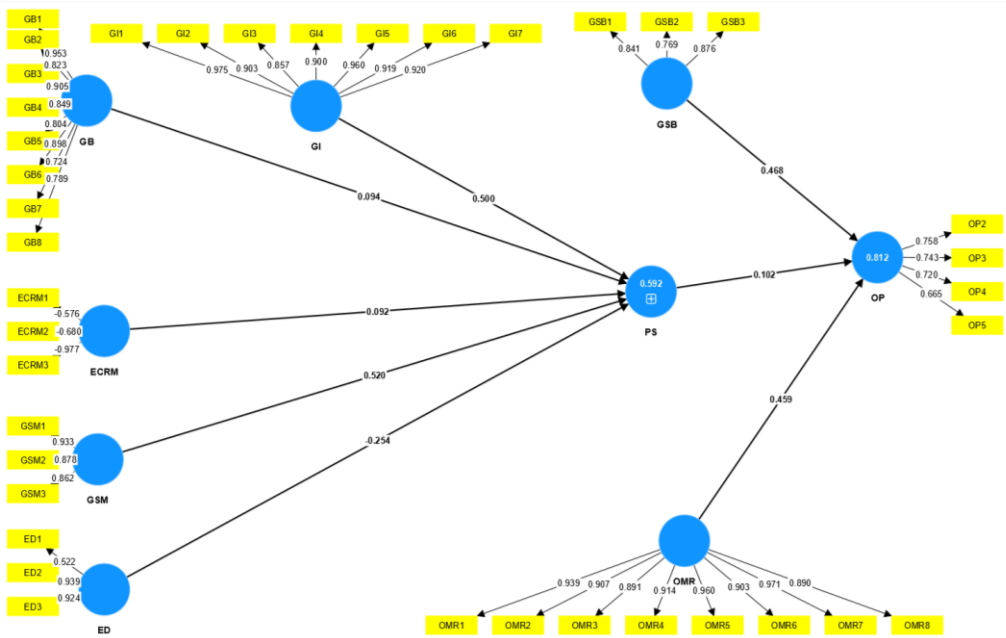

Figure.2: Factor Loadings

4.2 Discriminant Validity

Discriminant validity is a crucial aspect of the measurement model and can be assessed through various criteria, including the Fornell and Larcker criterion, cross-loadings, and the heterotrait-monotrait (HTMT) ratio of correlations (Hair Jr et al., 2020); (Henseler et al., 2015). According to the Fornell and Larcker criterion, the diagonal values should be greater than the off-diagonal values, indicating discriminant validity (Hair et al., 2017). Cross-loadings examine whether items predominantly load higher on their designated constructs rather than on others, reinforcing the distinctiveness of constructs (Hair et al., 2017). The HTMT ratio compares correlations between constructs to evaluate their distinctiveness from one another (Henseler et al., 2015). Typically, a threshold below 0.85 or 0.90 is recommended for satisfactory discriminant validity, indicating that correlations within constructs are significantly stronger than those across constructs (Henseler et al., 2015). Focusing on the HTMT criterion is crucial to ensure that correlations between different constructs are not excessively high, indicating distinctiveness among constructs. The values in Table 2

indicate that all construct correlations are less than 0.85, signifying discriminant validity among constructs.

Table 2: Discriminant Validity

	GB	ED	GSM	GI	E-CRM	GOB	PS	OMR	OP
GB									
ED	0.342								
GSM	0.421	0.606							
GI	0.562	0.654	0.572						
E-CRM	0.234	0.573	0.579	0.581					
GSB	0.560	0.234	0.562	0.321	0.321				
PS	0.431	0.623	0.579	0.658	0.538	0.618			
OMR	0.345	0.321	0.632	0.562	0.342	0.412	0.672		
OP	0.456	0.642	0.512	0.342	0.215	0.342	0.892	0.612	

4.3 Hypothesis Results

Upon fulfilling the criteria of the measurement model, the next step involves testing the proposed hypotheses using the bootstrap resampling technique with 5000 iterations. The study, spanning three countries—Malaysia, Singapore, and Indonesia—illuminates the positive and significant impacts of various factors on customer satisfaction in hospitals across ASEAN countries.

Table 3: Hypotheses Results

Path Relationships	Beta	Standard Error	T-value	P-value
ECRM-> PS	0.25	0.05	5.00	0.001
GB-> PS	0.20	0.06	3.33	0.005
ED -> PS	0.18	0.07	2.57	0.015
GSM-> PS	0.22	0.04	5.50	0.000
GI-> PS	0.30	0.08	3.75	0.000
ECRM*OMR> PS	0.12	0.03	4.00	0.001
GB*OMR -> PS	0.10	0.02	5.00	0.000
ED*OMR -> PS	0.15	0.04	3.75	0.002
GSM*OMR -> PS	0.18	0.05	3.60	0.003
GI*OMR -> PS	0.08	0.03	2.67	0.012
ECRM*GSB-> PS	0.10	0.02	5.50	0.000
GB*GSB -> PS	0.09	0.03	3.00	0.007
ED*GSB -> PS	0.12	0.04	3.00	0.007
GSM*GSB -> PS	0.14	0.03	4.67	0.000
GI*GSB-> PS	0.07	0.02	3.50	0.003
PS -> OP	0.40	0.10	4.00	0.001

The direct effect results indicate that electronic customer relationship management, green building, eco-design, green innovation, and green supply chain management exert positive and significant influences on customer satisfaction in ASEAN country hospitals. This underscores the notion that embracing technological advancements and sustainable practices not only enhances operational efficiency but also aligns with the needs and expectations of patients across diverse healthcare settings. Consequently, the study underscores the importance of prioritizing

sustainable initiatives to enhance customer satisfaction, thereby fostering improved patient experiences and heightened loyalty towards healthcare providers.

Furthermore, the indirect moderating effect results reveal that operations management reasons and operations green behaviour serve as pivotal moderating factors, augmenting the positive and significant impacts of operational practices and electronic customer relationship management on customer satisfaction within hospitals. This underscores the importance of fostering a supportive work environment and promoting environmentally conscious behaviours among staff to maximize the benefits of sustainability initiatives in enhancing customer satisfaction. The aforementioned outcomes are detailed in Table 3 and illustrated in Figure 3.

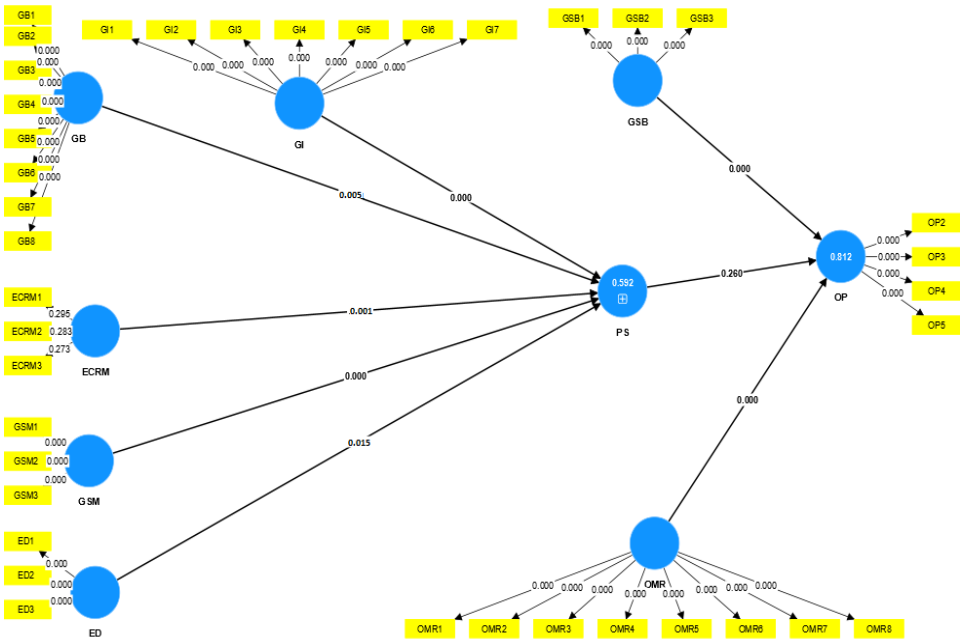

Figure.3: Structural Model

5. Discussion

The primary aim of the study was to examine how operational practices and ECRM influence operational performance through customer satisfaction in hospitals across ASEAN countries. Additionally, the study investigated the moderating effects of operational green social behaviour and operational management reasons. The first hypothesis yielded results indicating a positive and significant impact of ECRM on customer satisfaction within hospitals in ASEAN countries. These findings align with previous research, such as the work of (Mahrinasari et al., 2023) and (Suharto & Yuliansyah, 2023), which demonstrated that implementing electronic health records improved patient satisfaction by streamlining administrative processes and enhancing healthcare delivery efficiency. This suggests that ASEAN countries play a crucial role in leveraging ECRM to enhance customer satisfaction.

Furthermore, the study revealed that green building has a positive and significant impact on customer satisfaction in hospitals across ASEAN economies. These results are corroborated by research conducted by (Mahrinasari et al., 2023) and (Halicioglu & Gurel, 2024), which found that environmentally sustainable hospital infrastructure positively influences patient satisfaction. Green, eco-friendly hospital environments are likely to foster trust and satisfaction among patients, particularly in the ASEAN context, where sustainable development is gaining prominence. Therefore, integrating green building principles into healthcare facilities can enhance customer satisfaction and overall patient experiences.

Moreover, the findings of the third hypothesis also indicated a positive and significant impact of eco-design on customer satisfaction in hospitals across ASEAN countries. Similar results were observed in several studies, such as those conducted by (Al Karim et al., 2023) and (Mahrinasari et al., 2023), which highlighted that eco-friendly design features in healthcare facilities positively influence patient satisfaction and contribute to sustainability. In ASEAN economies, where sustainability is an increasingly important concern, integrating eco-design into hospital infrastructure can enhance environmental sustainability.

In addition, the fourth hypothesis further demonstrated the positive and significant influence of green supply chain management on patient satisfaction within ASEAN economies. These findings are corroborated by studies conducted by (Al Karim et al., 2023)and (Mahrinasari et al., 2023), which highlighted that sustainable supply chain practices positively impact patient satisfaction, particularly in the context of Singaporean hospitals. The study's results underscore the significance of green supply chain management in enhancing customer satisfaction. In ASEAN countries, where the healthcare sector is undergoing rapid transformation, embracing green supply chain practices not only aligns with environmental objectives but also meets patient expectations for sustainable and high-quality healthcare services.

Additionally, the fifth hypothesis regarding the direct effect of innovation on customer satisfaction in hospitals across ASEAN countries yielded positive and significant results. These findings are consistent with research conducted by (Demircioglu, 2023) and (Mahrinasari et al., 2023), which demonstrated that innovative healthcare services enhance patient satisfaction and foster loyalty. Therefore, based on these findings, it can be argued that fostering a culture of innovation within healthcare organizations is essential for driving improvements in customer/patient satisfaction.

Moreover, operational management reasons significantly and positively moderate the relationship between electronic customer relationship management and customer satisfaction. These findings suggest that hospitals with robust operational management reasoning may effectively utilize electronic customer relationship management, leading to streamlined processes and enhanced service delivery, ultimately bolstering customer satisfaction (Schniederjans et al., 2012). Additionally, the results reveal that green building also exerts a positive and significant influence on customer satisfaction, with the moderating effect of operational management reasons. This implies that hospitals with strong operational management practices are better equipped to integrate green building features into their infrastructure, thereby optimizing patient experiences and satisfaction (Ali & Al Nsairat, 2009). Similarly, eco-

design also positively and significantly impacts customer satisfaction, with the moderating effect of operational management research. These results indicate that hospitals prioritizing operational management may more effectively implement eco-design features, fostering environments conducive to patient satisfaction (Ellinger et al., 2012); (Gu & Ye, 2014).

Furthermore, the outcomes suggest that operational management research positively and significantly moderates the relationship between green supply chain management and customer satisfaction. This suggests that hospitals with efficient operational management practices are better positioned to implement green supply chain initiatives, resulting in enhanced service quality and responsiveness, thus augmenting satisfaction. Lastly, operational management research also significantly moderates the relationship between innovation and customer satisfaction. These results indicate that hospitals emphasizing operational management may successfully deploy innovative healthcare services, meeting patient needs and preferences, and consequently driving satisfaction and loyalty.

Other moderating effect results demonstrate the positive and significant moderating influence of operations green behaviour between electronic systems and customer satisfaction. These findings suggest that ASEAN hospitals where staff exhibit environmentally conscious behaviour may utilize electronic systems more efficiently, contributing to streamlined processes and improved service delivery, ultimately enhancing customer satisfaction (Mahrinasari et al., 2023). This finding is further consistent with previous research conducted by (Mahrinasari et al., 2023). Furthermore, operations green social behaviour also moderates the relationship between green building initiatives and customer satisfaction. Hospitals where staff demonstrate green behaviour are likely to appreciate and promote green building features, leading to enhanced patient experiences and satisfaction. This finding is further supported by the study of (Akehurst et al., 2012) and (Mahrinasari et al., 2023)

Additionally, organizational green social behaviour positively and significantly moderates the influence of eco-design principles on customer satisfaction. This result indicates that ASEAN hospitals where staff engage in green behaviour may actively support and participate in eco-design initiatives, creating environments that align with patient preferences and contribute to satisfaction. These results are consistent with the findings of (Akehurst et al., 2012)and (Mahrinasari et al., 2023). Similarly, organizational green social behaviour also positively and significantly moderates the relationship between green supply chain management and customer satisfaction. Hospitals with staff committed to green behaviour are more likely to embrace and implement sustainable supply chain practices, resulting in improved service quality and responsiveness, thus enhancing satisfaction (Mahrinasari et al., 2023).

Moreover, organizational green behaviour also significantly moderates the relationship between innovation and customer satisfaction. This result suggests that ASEAN hospitals with a culture of green behaviour may foster innovation more effectively, leading to the successful implementation of innovative healthcare services that cater to patient needs and preferences, ultimately driving satisfaction and loyalty. These findings are consistent with previous studies such as (Dumont et al., 2017) and (Mahrinasari et al., 2023), where green social behaviour was found to act as a significant moderating effect.

6. Contributions

The study offers both practical and theoretical implications. Firstly, it enhances theoretical understanding by examining the impact of operational practices and electronic customer management on operations through customer satisfaction in the ASEAN region. By testing a comprehensive model, the research fills gap in literature and advances theoretical frameworks in healthcare management and sustainability studies. Furthermore, the study introduces the moderating effects of operations management reason and operations green behaviour, adding nuance to existing theories and highlighting the role of organizational factors in shaping sustainability outcomes. Additionally, it provides insights into how the relationship between operations strategies, electronic customer relationship management, and operations performance varies across different cultural and organizational contexts in ASEAN countries. This deepens understanding of implementing sustainability initiatives in diverse healthcare environments, guiding future research and theory development.

The study's findings offer practical insights for the healthcare sector in ASEAN countries, aiding decision-making towards sustainability. Understanding the significant impact of operational and electronic customer relationship management on patient satisfaction suggests focusing on unique resources to enhance sustainability. Additionally, fostering a supportive organizational culture that promotes operational management reasoning and green behaviour among staff can drive positive outcomes. Hospitals can implement strategies to encourage environmentally conscious practices and innovation, aligning organizational values with sustainability goals. The findings also suggest opportunities for quality improvement initiatives aimed at enhancing customer satisfaction through sustainability-focused interventions, such as leveraging electronic systems, investing in green building features, and integrating eco-design principles into facility design. Moreover, the study findings could assist operations managers in minimizing production costs and increasing focus on sustainability in the healthcare sector.

7. Conclusion

The primary aim of the study was to examine how operational practices and electronic customer relationship management influence operational performance through customer satisfaction in hospitals across ASEAN countries. Additionally, the study investigated the moderating effects of operational green behaviour and operational management reasons. Results revealed the significant impact of operations strategies and electronic customer relationship management on customer satisfaction in ASEAN hospitals. Furthermore, customer satisfaction was found to positively influence operational performance. The study also demonstrated that operational green behaviour and operational management reasons moderate the relationships between green operations strategies, electronic customer relationship management, and customer satisfaction in ASEAN hospitals. These findings underscore the importance of fostering a supportive organizational culture and aligning operational management practices with sustainability objectives to optimize operational performance. Moreover, they provide valuable insights for strategic planning, emphasizing the need to prioritize investments, promote environmentally

conscious behaviours among staff, and implement quality improvement initiatives to enhance patient experiences.

8. Limitations and Future Directions

The findings of the study suggest several limitations that could pave the way for future research endeavours. Firstly, the study adopted a cross-sectional research design, limiting the data collection to a single time point. To enhance the generalizability of future research, longitudinal research designs could be employed. Secondly, while the study focused on moderating effects, it did not delve into the mediating effects. Future research could explore the mediating effects to further elucidate the underlying mechanisms. Thirdly, the study was confined to three ASEAN countries, neglecting other countries such as Thailand and Vietnam. Including these countries in future research could enhance the generalizability of findings across the ASEAN region.

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Appendix A: Survey Instrument

1=strongly disagree, 2=Disagree, 3=Neutral, 4=agree, 5=strongly agree

	1	2	3	4	5
Green Operational Practices					
Green Building					
1. "The hospital facilities are easily accessible through public transportation or my vehicle."					
2. "The hospital has incorporated a natural lighting system from glass curtain walls."					
3. "The hospital has installed moving sensor systems using which artificial lighting of the system turns off automatically in case of no activity."					
4. "The hospital has multiple windows which allow for an outdoor view of nature."					
5. "The hospital has a proper ventilation system."					
6. "The hospital has an inverter air conditioning system."					
7. "The hospital has installed noise cancellation systems, i.e., the environment is peaceful and quiet."					
8. "The hospital has installed waste and sewage systems are using products operated by natural energy and require less electrical energy."					
Eco-design					
1. "The hospital has a proper waste management system." developed on					
2. "The hospital has an efficient system to dispose of hazardous waste carefully."					
3. "The hospital has an efficient system to dispose of non-hazardous waste carefully."					
4. "The hospital has a controlled system for direct and indirect greenhouse gas					
5. "The hospital has solar panels installed to generate alternative power."					
Green Supply Chain					
1. "The hospital has practices of auditing suppliers' environmental impacts." "					
2. The hospital has practices requiring ISO 14.001 certification from suppliers". "					
3. The hospital has practices to evaluate suppliers concerning environmental indicators."					
4. "The hospital has practices to standardize environmental requirements for purchasing general inputs and raw materials."					
Green Innovation					
1. "The hospital has the practice of developing new products that are not harmful to the environment."					
2. "The hospital has the practice of developing new products to replace those that have become obsolete."					
3. "The hospital has the practice of studying and implementing processes that aim to reduce costs and production times."					

4. "The hospital has the practice of encouraging improved communication and integration between different business activities."
5. "The hospital has the practice of encouraging the improvement of sharing and transferring knowledge with other organizations."
6. "The hospital has the practice of developing strong relationships with consumers."

E-CRM

1. "The available technical personnel are good at providing technical support in computer technology usage in building customer relationships." "
2. This organization uses the right software to serve customers."
3. "Customer complaints (responsiveness) are quickly solved."

Green Social Behavior

1. "People who are important to me think I should adopt green/sustainable operational practices."
2. "People who influence my behavior think I should adopt green/sustainable operational practices."
3. "People whose opinions I value prefer that I adopt green/sustainable operational practices."

Patient Satisfaction

1. "The medical care I am receiving is just about perfect."
2. "The physician spent the right amount of time with me."
3. "All things considered, the treatment I received is excellent"
4. "I was pleased with my visit with the physician."

Operations management reasons

1. Improve internal efficiency
2. Support customer service
3. Improve service quality
4. Reduce operational costs
5. Access new distribution channels
6. Establish relationships with new suppliers
7. Improve speed of response to customers
8. Improve service reliability

Operational Performance

1. Healthcare company can swiftly introduce new products to the market
2. Healthcare sector displays agility in responding to market demand changes
3. Healthcare sectors maintain an exceptional on-time delivery record to major customers

4. Healthcare sector offers a superior level of customer service to major client
5. Healthcare has the ability to swiftly introduce new products to the market