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KEY DETERMINANTS OF ESIM ADOPTION INTENTION AMONG INDONESIAN CONSUMERS

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ABSTRACT

This study explores the factors influencing embedded SIM (eSIM) adoption intentions among consumers in Indonesia, where the technology is still relatively new. Using a quantitative research design, data was collected from 150 respondents through a structured questionnaire. Drawing on the 7Ps marketing mix and the Technology Acceptance Model (TAM) as theoretical frameworks, the analysis, conducted using Structural Equation Modeling (SEM), identifies two key factors—Process, and product—as significant determinants in promoting eSIM adoption in Indonesia. The study provides valuable insights for mobile network operators and marketers, suggesting that focusing on process product could help accelerate adoption. These findings enhance understanding of technology adoption in emerging markets and offer guidance on optimizing marketing strategies to encourage consumer acceptance of eSIM technology.

Keywords: Technology adoption, intention to adopt, marketing mix, 7Ps, eSIM,

1. INTRODUCTION

The telecommunications industry is witnessing a transformative shift with the growing adoption of embedded SIM (eSIM) technology. This shift was underscored by Apple's recent decision to eliminate the physical SIM card slot in U.S. models of the iPhone 14, marking a significant departure from conventional SIM card usage and a milestone for the 30-year-old SIM technology. By embracing eSIM, Apple has set a precedent that is likely to influence other smartphone manufacturers worldwide, pushing the industry toward a future where eSIM technology becomes the standard (Fiercewireless, 2023).

Globally, eSIM technology offers several advantages over traditional SIM cards, including the ability to switch carriers without the need to replace a physical card, support for a wider array of interconnected devices, and a reduction in plastic waste, aligning with sustainability goals (Statista, 2023). These benefits have spurred the interest of more than 230 network operators globally since 2018, with eSIM services still in an early phase of adoption. As digitalization and the Internet of Things (IoT) continue to expand, the potential of eSIM technology to reshape mobile connectivity across devices and industries grows immensely. With the number of connected devices expected to reach nearly 25 billion by 2025 (Ericsson, 2023), eSIM is becoming crucial for seamless integration across various sectors, including automotive and wearables, where mobile network operators (MNOs) are beginning to offer unified, convergent services under single contracts (Meukel et al., 2016).

In Indonesia, however, the uptake of eSIM technology is still limited, with most users relying on traditional SIM cards. Recent data highlights that physical SIM cards remain prevalent in Indonesia's mobile market, pointing to an opportunity for the growth of eSIM services. Despite the advantages of eSIM, including convenience and environmental benefits, little is known about the factors influencing Indonesian consumers' adoption of eSIM technology. No current research specifically addresses

consumer behavior and decision-making processes regarding eSIM in this region.

Understanding the factors that influence eSIM adoption is urgent due to the novelty and potential of this technology to provide significant efficiency and flexibility to users. In an era where connectivity needs are rapidly evolving, eSIM technology represents a progressive shift that can streamline mobile service management and expand connectivity options for Indonesian consumers and businesses. This research contributes a novel perspective by focusing on the unique context of Indonesia, a developing market with substantial mobile growth potential yet distinct consumer behavior compared to more developed markets. By addressing factors such as perceived utility, ease of switching, and sustainability concerns, this study provides insights into the specific drivers of eSIM adoption in Indonesia. The specific objective of this research is to analyze the determinants of eSIM adoption intention from a marketing perspective, examining how neuromarketing techniques influence consumer choices, identifying corporate strategies that affect purchasing decisions, and exploring the role of eSIM in fostering customer loyalty. This study also aims to assess the relevance of the 7Ps Marketing Mix as a framework for promoting eSIM technology in Indonesia, offering practical insights for telecommunications companies and mobile operators in a rapidly advancing technological environment.

As the adoption of IoT accelerates and industries increasingly rely on connected devices, understanding the dynamics of eSIM adoption becomes vital for telecommunications stakeholders, including mobile operators and original equipment manufacturers (OEMs) such as Apple and Samsung. By analyzing consumer behavior and the strategic implications of eSIM, this research contributes valuable insights into how eSIM technology can shape future market trends, strengthen customer relationships, and expand Indonesia's role in the global digital economy.

2. LITERATURE REVIEW

2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) has been a foundational framework for analyzing user acceptance and adoption of new technologies for over three decades. Davis et al. (2024) outline TAM's core components: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), which help predict the likelihood of user acceptance. Widely applied across diverse fields, TAM has been adapted for mobile library applications (Rafique et al., 2020), virtual platforms like Zoom (Alfadda et al., 2021), and metaverse-based learning tools (Al-Adwan et al., 2023), demonstrating its adaptability. In each case, TAM is extended by adding variables specific to each technology, reflecting its relevance and flexibility in various contexts.

The Technology Acceptance Model (TAM) continues to be a widely applied framework for understanding consumer behavior towards technology adoption. In a recent study by Musa et al. (2024), TAM is used to explore consumer behavior towards modern products and services like smartphones and online shopping. Their research reveals that perceptions of ease of use and usefulness are crucial in shaping adoption intentions, while also highlighting the influence of external factors such as trust and cultural variables. This study underscores the ongoing relevance of TAM in explaining technology acceptance across diverse consumer contexts.

TAM has also been extended to account for additional factors that influence adoption, such as privacy concerns. Acikgoz and Vega (2022) incorporate privacy cynicism into TAM to examine the use of voice assistants. They find that concerns over privacy significantly impact consumers' perceptions of both the ease of use and the usefulness of these technologies, thus affecting their overall acceptance. This extension highlights a limitation of the original TAM, especially in contexts where data security and trust are central to technology adoption.

Further applications of TAM can be seen in studies on emerging technologies

like virtual reality and internet banking. Huang et al. (2023) combine TAM with Flow Theory to investigate consumer behavior in virtual reality, finding that user engagement and perceived ease of use are essential for adoption. Similarly, Ly and Ly (2022) apply TAM to study internet banking adoption in Cambodia, demonstrating that security, trust, and usability are key factors. In the tourism sector, Mathew and Soliman (2021) extend TAM to assess the impact of digital content marketing, revealing that perceived usefulness and ease of use drive consumer behavior in the context of tourism services. These studies illustrate the versatility of TAM in adapting to various technological contexts and market conditions

2.3 Marketing Mix 7Ps

The 7Ps Marketing Mix—Product, Price, Place, Promotion, People, Process, and Physical Evidence—has evolved from its original 4Ps to provide a more comprehensive framework, especially pertinent in service-oriented and e-commerce contexts (Bosque & Herrero, 2011). Key studies highlight its relevance: Hinton (2004) shows that ease of use, privacy, and security significantly impact electronic payment adoption, while Wu et al. (2021) and Hameed et al. (2024) emphasize that perceived value and social influence drive mobile payment adoption among tourists. The added Ps—People, Process, and Physical Evidence—offer insights into the customer experience, including service delivery and the importance of environment in shaping perceptions (Clemes et al., 2014). The adaptability of the 7Ps is evidenced by recent shifts in consumer behavior due to digital transformation and external disruptions like the COVID-19 pandemic. Altay et al. (2022) underscore the need to modify the 7Ps in response to changing consumer demands in online grocery delivery, while Caliskan et al. (2021) highlight the integration of digital technologies as essential for competitiveness. Batat (2024) critiques the traditional 7Ps for being too product-centric and proposes the "Experiential Marketing Mix" (7E), which prioritizes consumer experiences across physical and digital ("phygital") spaces.

The 7Ps of the Marketing Mix Marketing mix play a significant role in shaping customer decisions across various industries, particularly in service-oriented sectors. In the context of hospitals in low-income countries, Ravangard et al. (2020) emphasize that factors like affordability (Price), service quality (Product), accessibility (Place), and the professionalism of staff (People) are critical in influencing patient selection. Additionally, the Process of service delivery, including waiting times and ease of procedures, along with Physical Evidence like cleanliness and medical facilities, heavily impact patient trust and decision-making. Similarly, in the railway transportation industry, Do and Vu (2020) highlight that service quality, pricing, and convenience in Place (e.g., station accessibility) are key determinants of customer satisfaction, with Promotion strategies and People (staff interactions) playing essential roles in enhancing customer experiences.

In the travel industry, the 7Ps significantly affect customer loyalty and profitability, as demonstrated by Elgarhy and Mohamed (2023). Travel agencies must offer attractive and competitive Products (e.g., travel packages), pricing strategies, and accessible booking platforms (Place) to meet customer expectations. Effective Promotion through marketing campaigns and People (e.g., knowledgeable travel agents) enhances customer trust and satisfaction. Additionally, the efficiency of booking processes (Process) and the quality of Physical Evidence (e.g., website and branding) contribute to customer loyalty. Overall, the studies highlight that a well-rounded approach to the 7Ps leads to improved customer satisfaction, which mediates loyalty and ultimately drives profitability across service sectors

2.3.1 Price

The **Price** element refers to the cost of the service and its perceived value by customers. In low-income countries, Ravangard et al. (2020) note that

affordability is a key factor in hospital selection, as patients often have limited financial resources. Do and Vu (2020) highlight that **Price** is a significant determinant in railway transportation services, where cost-effectiveness is crucial for consumers who may prioritize budget-friendly options. For travel agencies, Elgarhy and Mohamed (2023) point out that **Price** is a critical factor in attracting customers. Agencies must balance competitive pricing with the perceived value of their travel offerings to drive customer satisfaction and loyalty.

Price influences consumer decision-making by balancing cost and perceived quality. Customers weigh costs against anticipated value, with fair pricing playing a critical role in purchase willingness (Saldanha et al., 2021). In Bottom of the Pyramid (BoP) markets, pricing must reflect consumers' economic conditions while ensuring accessibility, as Purohit et al. (2021) note. Studies by Wichmann et al. (2022) emphasize that adaptive pricing aligned with market conditions enhances competitiveness and customer attraction, particularly in dynamic sectors like street food tourism (Praesri et al., 2022). Flexible, market-based pricing is also essential for B2B firms, allowing responsiveness to changing demand in today's "new normal" environment (Lim, 2023).

2.3.2 Product

The Product element of the 7Ps refers to the core service or offering that a company provides to its customers. In the context of hospitals, Ravangard et al. (2020) highlight that healthcare services such as medical treatments, surgeries, and patient care are essential in influencing patient choice. In the railway industry, Do and Vu (2020) discuss that the quality of the transportation service itself, such as train comfort, punctuality, and cleanliness, significantly affects customer satisfaction. Similarly, Elgarhy and Mohamed (2023) emphasize that in the travel agency sector, the Product includes travel packages and experiences, which must meet customer expectations regarding quality and customization to foster loyalty.

Product characteristics within the 7Ps are crucial for technology adoption, particularly in emerging markets like Indonesia, where product features can significantly impact consumer intent. Ong et al. (2024) emphasize that elements such as design, features, and perceived utility affect adoption in digital marketplaces. For electronic products like eSIMs, Martín (2009) identifies quality, functionality, and reliability as influential factors. Studies reveal that functional factors like convenience and compatibility are more critical than hedonic motivations in driving adoption intentions (Hernández et al., 2009). Furthermore, product alignment with customer needs and sustainability objectives is essential. Ahmed et al. (2023) and Lahtinen et al. (2020) suggest that product innovation addressing environmental impact and consumer needs can enhance engagement and adoption.

2.3.3 Place

The Place element focuses on the location and accessibility of the service. Ravangard et al. (2020) indicate that the proximity and accessibility of hospitals play a crucial role in patients' decision-making, particularly in low-income settings where transportation may be limited. In the railway sector, Do and Vu (2020) discuss that the accessibility of train stations, routes, and timely connections are essential in shaping customer satisfaction. Similarly, Elgarhy and Mohamed (2023) mention that for travel agencies, the convenience of both physical locations and online platforms influences customers' decisions to engage with the services.

The "Place" element of the 7Ps emphasizes accessibility and customer convenience, making it pivotal in distribution strategy. Studies underscore that geographic and demographic considerations in distribution—such as proximity to consumers and competitors' locations—play a significant role in market penetration and customer satisfaction (Ailawadi, 2009). Hortaçsu et al. (2009) further highlight how distribution channels influence purchasing behavior by enhancing accessibility. In the healthcare sector, Lim (2021) discusses

"place" as a critical component for integrated care, underscoring the need for strategic location planning to ensure service accessibility. Abedian et al. (2022) use game theory to demonstrate how optimized distribution strategies can improve market reach, while Othman et al. (2021) indicate that strategic placement, combined with after-sales service, enhances customer loyalty in retail.

2.3.4 Promotion

Promotion encompasses all communication efforts aimed at informing and persuading customers about a service. Ravangard et al. (2020) note that in hospitals, Promotion is often achieved through word-of-mouth, local advertising, or endorsements from trusted figures, especially in low-income countries. For railway services, Do and Vu (2020) highlight promotional campaigns and discounts as effective tools to attract customers. In the travel agency sector, Elgarhy and Mohamed (2023) emphasize the importance of promotional activities, such as special offers and partnerships with airlines and hotels, to boost awareness and influence customers' choices.

Promotion within the 7Ps underscores the role of strategic communication in engaging and influencing consumer behavior across diverse platforms, including mobile and retail applications (Lim et al., 2023). Effective promotional strategies integrate both online and offline channels to maximize reach and impact consumer adoption decisions, utilizing tailored messages to enhance brand perception and engagement. Strategic communication through digital channels has become increasingly essential as businesses adapt to shifting consumer expectations in a digitally integrated marketplace.

2.3.5 People

The People element refers to the staff and their interaction with customers. Ravangard et al. (2020) underline that patients often prefer hospitals where staff are caring, professional, and attentive, highlighting the significant role of People in healthcare service delivery. Similarly, Do and Vu (2020) emphasize that in railway transportation, the behavior and professionalism of staff can greatly influence customer perceptions of the service. Elgarhy and Mohamed (2023) point out that in the travel agency industry, knowledgeable and helpful agents build trust and improve the overall customer experience, ultimately fostering loyalty.

The People element in the 7Ps marketing mix plays a crucial role in the successful adoption of technology, as both employees and customers influence its effectiveness. For employees, proper training, positive attitudes, and a culture of innovation are key to leveraging new technologies in service delivery. Customer adoption is equally important, and businesses must address concerns such as digital literacy and trust in technology by providing personalized assistance and clear communication. A seamless integration of human interaction with technology ensures that both employees and customers feel comfortable using new systems, ultimately enhancing the overall customer experience and driving successful technology adoption.

2.3.5 Process

The Process element in the 7Ps marketing mix is crucial when adopting new technologies to improve service delivery. Technology adoption, such as automation, artificial intelligence (AI), and customer relationship management (CRM) systems, can streamline processes, reduce errors, and enhance efficiency. For instance, the use of electronic health records (EHRs) in healthcare allows for faster data processing, while self-check-in kiosks in the airline industry improve customer convenience. However, if technology is poorly integrated or employees are inadequately trained, it can disrupt service delivery, leading to delays and customer dissatisfaction. Effective adoption of technology in service processes is essential for optimizing customer experiences and ensuring operational efficiency (Do & Vu, 2020; Ravangard et al., 2020).

Furthermore, customers' perceptions of service quality are influenced by how technology is integrated into service processes. Customers increasingly expect seamless, efficient, and fast services, which

technology can help provide. For example, mobile banking apps and digital payment systems in banking enhance customer satisfaction by simplifying processes. However, poor implementation of new technologies, such as a confusing user interface or technical glitches, can result in frustration and negative perceptions. Businesses must remain adaptable to technological advancements and continuously refine their processes to meet evolving customer expectations while avoiding disruptions (Elgarhy & Mohamed, 2023; Ravangard et al., 2020).

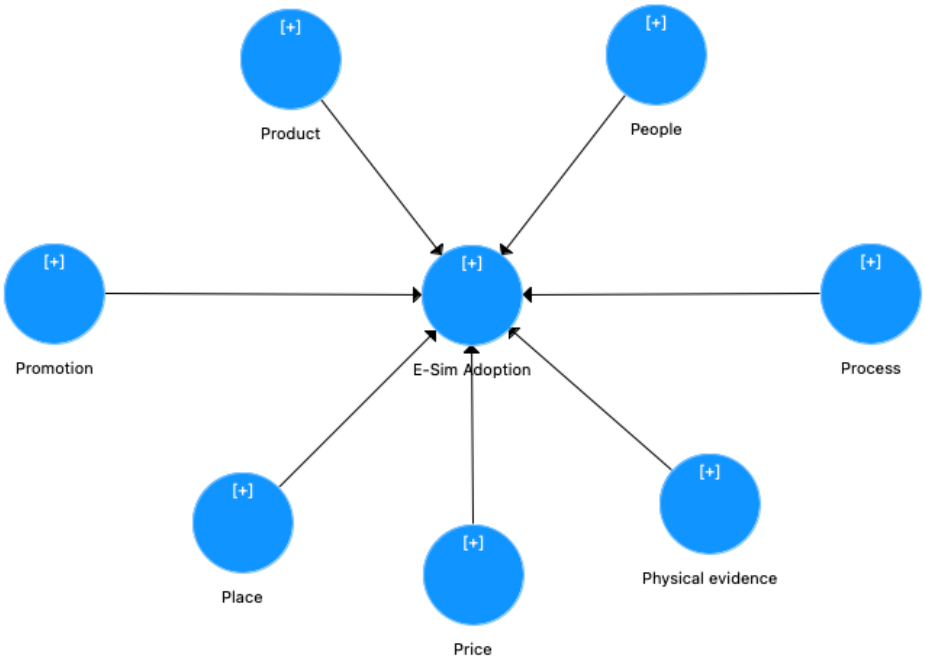
2.3.5 Physical Evidence

The Physical Evidence element of the marketing mix plays a crucial role in influencing customer perceptions, particularly in service industries where the intangible nature of the service is a major consideration. When it comes to technology adoption, Physical Evidence refers to the tangible aspects that support the use of technology, such as hardware, user interfaces, and physical environments. In the context of hospitals, Ravangard et al. (2020) suggest that modern medical equipment and well-maintained facilities provide visible reassurance to patients about the quality of care and the hospital's technological capability. Similarly, for railway services, Do and Vu (2020) argue that the presence of digital ticketing kiosks and mobile applications as part of the Physical Evidence encourages the adoption of technology by offering ease of access and convenience, which enhances overall customer satisfaction. These physical manifestations of technology help build trust and credibility in the service provider's capability to deliver a modern and efficient service.

In the travel industry, Elgarhy and Mohamed (2023) emphasize that Physical Evidence in the form of digital platforms such as user-friendly websites, mobile apps, and interactive kiosks can significantly influence customers' acceptance of technology. By providing clear, functional, and engaging interfaces, agencies can effectively enhance customer experience and satisfaction, thus fostering loyalty. The physical manifestation of technology—such as seamless booking systems, digital check-ins, and informative touchpoints—plays a key role in enabling customers to feel more confident and comfortable in adopting technological solutions. As these examples show, Physical Evidence is not only about the visible cues like signage or facilities but also encompasses the tangible aspects of technology that help bridge the gap between traditional services and modern expectations.

Based on the theoretical and empirical foundations discussed above, Figure 1 summarizes the conceptual model for this research.

Figure 1. Conceptual Framework



3. METHODOLOGY

3.1 Research Design

This study employed a confirmatory research design to rigorously examine and confirm the influence of key factors on eSIM adoption in Indonesia. The research began with a qualitative phase, where interviews were conducted with eSIM product sellers, users, distributors, and mobile phone shops selling eSIM-compatible devices. Insights from these interviews informed the development of a structured questionnaire, distributed via Google Forms. To measure responses, a 7-point Likert scale was used, focusing on variables hypothesized to influence consumer attitudes and intentions toward eSIM technology.

In contrast to exploratory research, this study's confirmatory design aimed to validate specific hypotheses derived from existing literature and qualitative findings. Using Confirmatory Factor Analysis (CFA), this study tested the relationships between observed variables and their underlying constructs to ensure that each factor significantly contributed to the overall model of eSIM adoption. This approach allowed for a more precise and theory-driven assessment of the latent variables influencing adoption intentions, consistent with the goal of validating a predefined factor structure (Kline, 2016).

CFA was conducted within the broader framework of Structural Equation Modeling (SEM) to assess model fit and confirm factor loadings. This confirmatory approach facilitated a structured understanding of complex adoption behaviors by rigorously testing the hypothesized relationships between factors. Furthermore, the confirmatory design aligned with the growing need in marketing research to move beyond descriptive insights, instead emphasizing the verification of theoretical constructs and their predictive validity (Byrne, 2013).

This methodological rigor provided a robust foundation for testing hypotheses about consumer intentions and the drivers of eSIM adoption, offering insights applicable to emerging digital technology adoption within the telecommunications sector.

3.2 Sampling and Data Collection

The study targeted smartphone users in Indonesia, particularly those familiar with or using eSIM technology. Convenience sampling was employed to recruit participants who were accessible and willing to participate, including those visiting Telkomsel Grapari centers, cellular shopping events, and local mobile phone outlets in and around Manado. This approach ensured the sample was relevant and suitable for addressing the study's objectives, capturing essential data to explore eSIM adoption trends. Initial questionnaire testing was conducted to refine the questions for clarity and reliability, resulting in a final sample of 150 valid responses from an initial 164 collected.

Swedberg (2020) highlights the adaptability of sampling methods in exploratory studies, allowing flexibility to capture in-depth information, while Jain (2021) and Campbell et al. (2020) underscore purposive and snowball sampling's role in refining sample characteristics as new insights emerge. Here, convenience sampling was chosen for its practicality, ensuring efficient data collection while focusing on smartphone users with eSIM capabilities (Sekaran & Bougie, 2016).

The respondent sample consisted of 150 individuals, with a gender distribution of 70% female and 30% male. Age-wise, the largest groups were Generation Y (33.7%) and Generation X (32.7%), followed by Generation Z (20%) and Baby Boomers (14%). In terms of employment, half of the respondents (50%) were private employees, while 19.3% were engaged in other professions. Entrepreneurs and government employees each accounted for 13.3%, with students making up 13.3% of the sample as well. Regarding mobile phone brand preferences, Samsung was the most popular, with 22.7% of respondents using the brand, followed closely by iPhone at 21.3%. Other frequently used brands included Oppo (16%), Vivo (12%), and Xiaomi (10.7%). Smaller shares were held by Realme (9.3%) and Redmi (6%), while 2% of respondents used other brands.

Geographically, the majority of respondents were from North Sulawesi (52%), with smaller groups from Central Sulawesi, Southeast Sulawesi, and East Java (each 11.3%). Additional respondents came from North Maluku (6%), Gorontalo (4%), South Sulawesi (2.7%), and Central Kalimantan (1.3%). This demographic profile as displayed in table 1, demonstrates a varied mix across gender, age, employment status, mobile brand preferences, and geographical location.

Table 1. Respondents' Demographic Profile

Demographic Category	Subcategory	Percentage (%)	Frequency (n)
Gender	Female	70%	105
	Male	30%	45
Age	Generation Y	33.70%	51
	Generation X	32.70%	49
	Generation Z	20%	30
	Baby Boomers	14%	21
Employment Status	Private Employee	50%	75
	Other Professions	19.30%	29
	Entrepreneur	13.30%	20
	Government Employee	8.70%	13
	Student	13.30%	20
Mobile Phone Brand	Samsung	22.70%	34
	iPhone	21.30%	32
	Oppo	16%	24
	Vivo	12%	18

	Xiaomi	10.70%	16
	Realme	9.30%	14
	Redmi	6%	9
	Other	2%	3
Geographical Location	North Sulawesi	52%	78
	Central Sulawesi	11.30%	17
	Southeast Sulawesi	11.30%	17
	East Java	11.30%	17
	North Maluku	6%	9
	Gorontalo	4%	6
	South Sulawesi	2.70%	4
	Central Kalimantan	1.30%	2

3.3 Measurement Instrument

A structured questionnaire was used as the primary measurement instrument, divided into two main sections: demographics and the primary survey items. The demographics section gathered background information, while the second section contained statements rated on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree) to gauge factors influencing eSIM adoption, such as user needs, product differentiation, and consumer loyalty. The survey items were derived from prior relevant studies (e.g., Mandagi et al., 2021; Walean et al., 2024; Inaray et al., 2024; Mandagi & Centeno, 2024; Mandagi et al., 2024; Wantah et al., 2024; Walean et al., 2023).

This instrument's reliability and validity were ensured by pre-testing with a sample group, which refined the questions to capture accurate data on the determinants of eSIM adoption. As Sekaran and Bougie (2016) and Sugiyono (2017) note, a well-structured questionnaire is essential in quantitative studies to systematically gather relevant data from respondents.

3.4 Data Analysis

Data was analyzed using SmartPLS, which supports SEM through the Partial Least Squares (PLS) method. SmartPLS is well-suited for exploratory research, particularly when dealing with complex models or limited sample sizes (Cheah et al., 2020; Memon et al., 2021). The analysis procedure began with a reliability and validity assessment to ensure the measurement instrument's accuracy and consistency, assessing internal reliability through Cronbach's alpha and composite reliability (Sürücü & Maslakçi, 2020; Dash & Paul, 2021). Next, the measurement model was evaluated through convergent and discriminant validity tests to confirm that indicators accurately represented their respective constructs, using factor loadings, average variance extracted (AVE), and cross-loadings.

The structural model and hypothesis testing phase involved using SmartPLS's bootstrapping feature to evaluate path coefficients and their significance, including goodness-of-fit assessments to verify the model's robustness in explaining the relationships among variables (Elangovan & Sundaravel, 2021; Lestari et al., 2020). Through SmartPLS, the study effectively examined the influence of innovation and business strategy on consumer adoption intentions and market competitiveness, providing insights into the implications of digital transformation and eSIM adoption in mobile telecommunications.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistic

Table 2. Descriptive Statistic

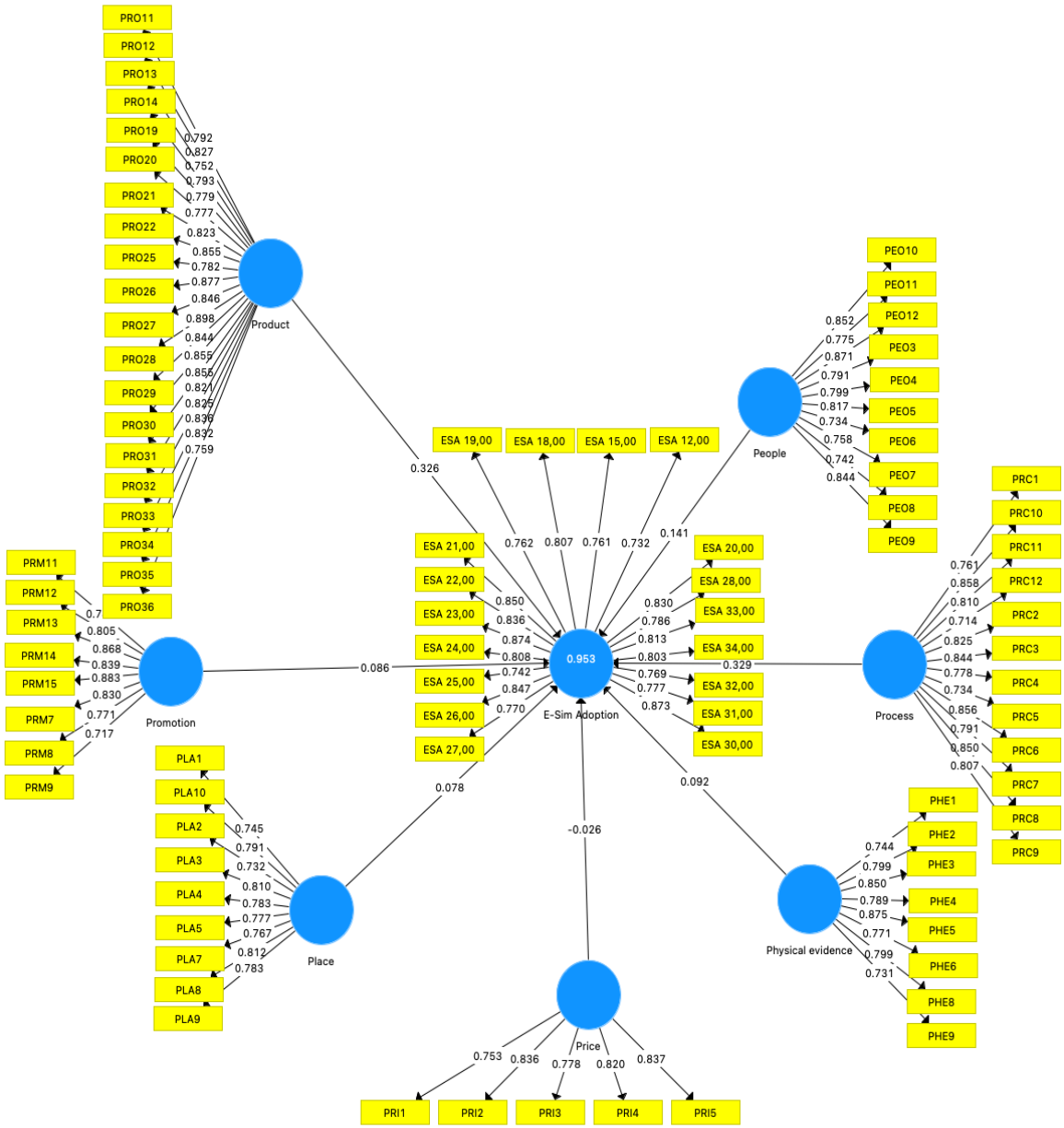
	N	Min	Max	Mean	Std Deviation	Variance
E-Sim Adoption	150	1	7	5.25	1.475	1.176
People	150	1	7	5.564	1.383	1.913
Physical Evidence	150	1	7	5.942	1.287	1.656
Place	150	1	7	5.827	1.282	1.644
Price	150	1	7	5.673	1.236	1.528
Process	150	1	7	5.75	1.153	1.329
Product	150	1	7	5.66	1.288	1.659
Promotion	150	1	7	5.506	1.333	1.777

4.2 Measurement Model

The purpose of the measurement model in SEM is to establish the relationships between observed variables (indicators) and their underlying latent constructs. It ensures that the constructs are measured accurately by assessing construct validity (both convergent and discriminant validity) and evaluating the reliability of the indicators (Hair et al., 2018). The measurement model also plays a crucial role in testing the overall fit of the model and identifying problematic indicators, which allows researchers to refine the model.

The first step in evaluating the measurement model is to assess the factor loading values across constructs. The results of the measurement model analysis, shown in Figure 2, indicate that all factor loading values exceed 0.7, reinforcing the construct validity. High loadings on eSIM adoption items, such as ESA 21 (0.85) and ESA 23 (0.874), confirm that these items effectively capture users' intentions to adopt eSIM, driven by factors like convenience, environmental benefits, and cost-effectiveness. Additionally, the Process construct demonstrated strong loadings, highlighting that the simplicity of eSIM activation is a key factor in adoption. Together, these findings emphasize the importance of Process, Place, and Price as crucial determinants in promoting eSIM adoption in Indonesia.

Figure 2. Measurement Model



The Fornell-Larcker Criterion summarize in table 4 assesses the discriminant validity of constructs in a model by comparing the square root of the AVE on the diagonal with the correlations between constructs off the diagonal. For most constructs, the AVE values are higher than the correlations, indicating good discriminant validity, meaning that the constructs are distinct from each other. However, some pairs of constructs, such as E-Sim Adoption and People, have relatively high correlations (e.g., 0.889), suggesting potential overlap between them. Despite this, the AVE values remain sufficiently high, which suggests that the constructs are generally distinct, though further refinement may be needed for those with high correlations.

Tabel 4 Fornell-Larcker Criterion

	E-Sim Adoption	People	Physical Evidence	Place	Price	Process	Product	Promotion
E-Sim Adoption	**0.803**							
People	0.889	**0.800**						
Physical Evidence	0.918	0.863	**0.796**					
Place	0.918	0.816	0.891	**0.778**				
Price	0.854	0.813	0.768	0.861	**0.806**			
Process	0.938	0.847	0.864	0.933	0.894	**0.804**		
Product	0.941	0.835	0.896	0.875	0.820	0.881	**0.822**	
Promotion	0.911	0.865	0.901	0.848	0.764	0.850	0.902	**0.809**

Table 6 presents key indicators of construct reliability and validity for the model. Cronbach's Alpha values are all above the commonly accepted threshold of 0.7, indicating good internal consistency for each construct, with Product having the highest value (0.975). rho_A and Composite Reliability values also show high reliability, with all constructs exceeding the recommended threshold of 0.7, suggesting that the constructs are measured consistently. The AVE values range from 0.606 to 0.676, with most constructs exceeding the threshold of 0.5, indicating adequate convergent validity. However, the Place construct has the lowest AVE (0.606), suggesting that it may have slightly weaker convergent validity compared to others. Overall, the results indicate strong construct reliability and validity, with only minor concerns for the Place construct

Table 6. Construct Reliability and Validity

	Cronbach's Alpha	**rho_A**	**Composite Reliability**	**Average Variance Extracted (AVE)**
E-Sim Adoption	0.967	0.968	0.970	0.645
People	0.937	0.940	0.946	0.639
Physical evidence	0.917	0.921	0.932	0.634
Place	0.919	0.920	0.932	0.606
Price	0.864	0.869	0.902	0.649
Process	0.950	0.952	0.956	0.646
Product	0.975	0.975	0.977	0.676
Promotion	0.924	0.925	0.938	0.655

4.3. Structural Model

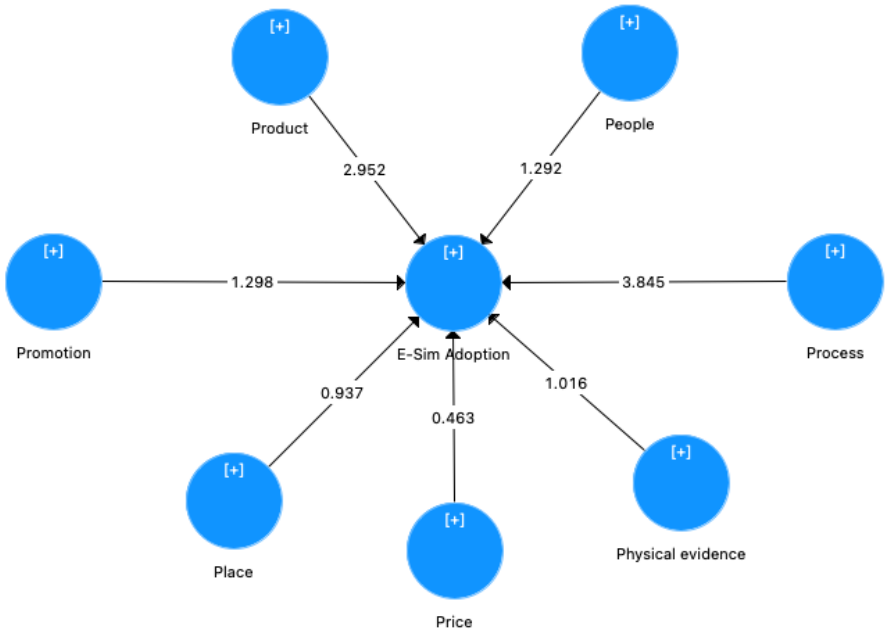
The structural model testing results in table 7 and figure 3reveal that only Process (path coefficient = 0.32, p-value = 0.000) and Product (path coefficient = 0.352, p-value = 0.003) have a statistically significant positive impact on E-Sim Adoption. The other elements of the marketing mix, including People**,** Physical Evidence**,** Place**,** Price**, and** Promotion, do

not show significant effects, as their p-values exceed the 0.05 significance threshold, indicating that these factors do not significantly influence E-Sim Adoption in this model.

Table 7. Structural Model Testing Result

Path Coefficient	Sample Mean (M)	T Statistics (|O/STDEV|)	P Values	Significant?
People -> E-Sim Adoption.	0.159	1.292	0.197	No
Physical evidence -> E-Sim Adopt.	0.073	1.016	0.31	No
Place -> E-Sim Adoption	0.071	0.937	0.349	No
Price -> E-Sim Adoption	-0.024	0.463	0.643	No
Process -> E-Sim Adoption	0.32	3.845	0.000	Yes
Product -> E-Sim Adoption	0.352	2.952	0.003	Yes
Promotion -> E-Sim Adoption	0.073	1.298	0.195	No

Figure 3. Structural Model



The findings of this study underscore the significant roles that Process and Product play in the adoption of eSIM technology, consistent with existing literature on technology adoption and the 7Ps marketing mix framework.

The Process element, which reflects how technology is integrated into service delivery, has a strong positive effect on eSIM Adoption (Path Coefficient = 0.32, T Statistics = 3.845, p-value = 0.000). This result highlights the importance of optimizing service processes when adopting new technologies, a theme echoed in previous studies. For instance, Do and Vu (2020) emphasize that technology adoption, including systems like CRM or AI, can streamline processes and improve service delivery. In the case of eSIM, a seamless, efficient adoption process would likely align with customers' increasing expectations for convenience and speed, as seen in mobile banking and digital payment systems (Elgarhy & Mohamed, 2023). However, as

Ravangard et al. (2020) point out, poorly integrated technology or insufficient employee training can hinder service delivery, making effective process management critical. The positive effect of Process in this study suggests that the adoption of eSIM would benefit from a focus on simplifying and optimizing customer interactions, ensuring that the integration is smooth, and the user experience is intuitive.

Similarly, the Product element has a significant impact on eSIM Adoption (Path Coefficient = 0.352, T Statistics = 2.952, p-value = 0.003), aligning with findings in other sectors where product quality and features directly influence consumer decisions. Ravangard et al. (2020) note that the quality of healthcare services, such as medical treatments, strongly affects patient choices, and Do and Vu (2020) find that the quality of railway transportation services, such as punctuality and comfort, is essential to customer satisfaction. In the context of eSIM, product features such as compatibility, convenience, and functionality are crucial for driving adoption. Previous research (Hernández et al., 2009; Martín, 2009) has highlighted that consumers prioritize practical, functional factors over hedonic ones when adopting new technologies, which supports the findings here. In emerging markets like Indonesia, where eSIM adoption is still growing, the product's alignment with consumer needs and expectations, as well as its reliability and user-friendly design, plays a crucial role in encouraging adoption (Ong et al., 2024; Lahtinen et al., 2020). The significant impact of Product suggests that businesses should focus on enhancing the eSIM product's utility, ensuring it delivers tangible benefits like ease of use, compatibility, and cost-effectiveness.

These results offer insights into the central importance of both the Process and Product in technology adoption. Companies focusing on refining the adoption process and ensuring that the eSIM product meets consumer expectations will likely see greater success in encouraging adoption. The findings also suggest that traditional marketing elements, such as People, Physical Evidence, Place, Price, and Promotion, may not play as significant a role in driving eSIM adoption, emphasizing the need for businesses to prioritize product and process optimization to meet the evolving needs of tech-savvy consumers in emerging markets.

5. CONCLUSION

The findings of this study provide valuable insights into the factors influencing eSIM Adoption, with a focus on the marketing mix (7Ps) framework. The results highlight that Process and Product are the only elements with a statistically significant positive impact on eSIM Adoption, while the other 7Ps elements, such as People, Physical Evidence, Place, Price, and Promotion, do not show significant influence. These findings offer important theoretical contributions by emphasizing the need to consider process optimization and product relevance as central to the adoption of technology, aligning with the Technology Acceptance Model (TAM), which stresses the importance of perceived ease of use and usefulness. Moreover, the study challenges traditional views by suggesting that factors beyond conventional marketing elements might be more influential in technology adoption, which calls for a broader perspective on adoption models.

Theoretical implications of this study underscore the relevance of extending the 7Ps marketing mix framework to understand technology adoption, particularly in service-oriented sectors. The significant roles of Process and Product support the TAM's emphasis on ease of use and usefulness as critical drivers of adoption. However, the lack of significance for People, Physical Evidence, Place, and Promotion suggests that the traditional marketing mix may need to be revised or extended to incorporate additional constructs that better capture the nuances of technology adoption in a rapidly evolving market. This finding opens the door for future research to refine existing models and theories in the context of emerging technologies like eSIM.

From a practical standpoint, organizations seeking to increase eSIM

Adoption should prioritize improving their service processes and ensuring the product meets user expectations. Focusing on efficient, seamless adoption processes and delivering a reliable, user-friendly product will likely be the most effective strategy. The findings suggest that investments in traditional marketing elements, such as People, Physical Evidence, Place, and Promotion, may not provide the expected impact in this specific context, allowing businesses to allocate resources more strategically towards product development and process optimization.

This study has several limitations, which should be considered when interpreting the results. First, the focus on eSIM technology means that the findings may not be applicable to other technological innovations. Additionally, the cross-sectional nature of the study limits the ability to assess the long-term impacts of the 7Ps on eSIM Adoption, and the sample may not be fully representative of diverse demographic and psychographic groups. The findings are also limited by geographic scope and may not fully capture the perspectives of users in different regions or cultural contexts.

Future research should address several key areas to enhance understanding of eSIM Adoption. Investigating additional demographic and psychographic factors, such as education level, income, and technology attitudes, could offer deeper insights into the drivers of adoption. Longitudinal studies are needed to track adoption trends over time as eSIM technology becomes more familiar to consumers. Furthermore, exploring cultural and social influences, particularly in diverse regions, would help uncover local perceptions, barriers, and adoption patterns. Understanding how eSIM adoption varies across different cultures can provide valuable context for marketers in global markets, especially in emerging economies like Indonesia. Additionally, examining cross-industry applications, particularly within the Internet of Things (IoT), could reveal new opportunities for eSIM in enabling broader connectivity across devices, unlocking its potential in commercial sectors beyond telecommunications. These areas of research will contribute to a more comprehensive understanding of eSIM Adoption, offering valuable insights into market challenges, growth potential, and strategic directions, particularly in emerging markets like Indonesia.

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