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STRATEGIC ANALYSIS OF ECOTOURISM INDUSTRY IN SABAH: APPLICATION OF COMBINED SWOT/TOWS AND AHP

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ABSTRACT

Sabah is a wonderful place for a special holiday, offering inspiring natural scenery, diverse landscapes, unique cultures, exciting adventures, beautiful beaches, and fantastic cuisine for the adventurous taste buds. Therefore, Sabah is one of the top tourist destinations, both among tourists and local people. The purpose of this paper is to conduct a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of tourism in Sabah, which covers both internal and external factors. The analysis will be further enhanced to decide the best decision made by utilizing the Analytic Hierarchy Process (AHP) to determine priorities among SWOT factors. Therefore, the SWOT-AHP analysis is a strategy tool used for a qualitative study. The key determinants that influence the coastal, maritime, inland, and ecotourism in Sabah are as follows: Sabah has a rich biodiversity, Sabah has limited infrastructure; however, there is opportunity as there is growing interest in ecotourism, and the potential threat is due to the environmental degradation, which threat the ecosystems. Nevertheless, this paper also has limitations as it only focuses on a limited number of crucial internal and external elements. Thus, further research is essential in identifying the optimal strategy for ecotourism in Sabah.

Keywords: Tourism industry, Ecotourism, SWOT analysis, TOWS matrix, Analytic Hierarchy Process (AHP), Sabah

INTRODUCTION

Tourism refers to the activity of tourists. It is a social, cultural, and economic phenomenon that comprises the movement of people to other countries or foreign places beyond their usual environment for business or personal purposes. Tourism destination, on the other hand, is a physical space with or without administrative and analytical boundaries where a tourist may spend a night (UN Tourism, n.d.). It is further subdivided into several categories, including educational tourism, health tourism, and medical tourism. This study covers coastal, marine, and inland water tourism and ecotourism. Coastal, maritime, and inland water tourism refers to shore-based tourist activities such as swimming, surfing, sunbathing, and other seaside recreational, relaxing, and sporting activities that take place along the shore of a sea, lake, or river.

Furthermore, maritime tourism refers to sea-based activities like cruising, yachting, boating, and nautical sports, as well as the land-based services and infrastructure that support them. Inland water tourism occurs in aquatically affected habitats inside land limits, which include lakes, rivers, ponds, streams, groundwater, springs, cave waters, and other inland wetlands (UN Tourism, n.d.). In addition, ecotourism is a type of nature-based tourism activity in which visitors are motivated to see, learn, discover, experience, and appreciate biological and cultural diversity while maintaining a responsible attitude towards the ecosystem's integrity and the well-being of the community. It raises knowledge about biodiversity protection, the environment, and heritage sites among both residents and tourists (UN Tourism, n.d.).

Sabah is among the leading destinations for tourism. Sabah has posted 2.6 million visits from visitors in 2023, surpassing the 2.2 million target, due to aggressive and targeted marketing activities. Consequently, the Sabah Tourism Board set a more aggressive target of 2.8 million visitors, bringing the Malaysian state closer to its pre-COVID-19 high of 4.2 million. Besides, as a result of the initiatives of building tourism in the state,

Sabah Tourism Board received a silver medal at the Putra Aria Brand Awards in 2023 under transportation, travel, and tourism categories (BIMP-EAGA, 2024). Association of Accredited Advertising Agents Malaysia established the Putra Aria Brand Awards in 2022 with the goal of finding companies with a significant connection to Malaysian consumers (Putra Aria Brand Awards, n.d.).

However, there are several research issues have been identified in existing literature, which include a lack of integrated planning between tourism and environmental conservation, insufficient infrastructure, and growing environmental pressures. In addition, maritime and inland water tourism remain less explored in comparison to forest-based ecotourism. Therefore, most studies focus on isolated aspects such as marine parks, diving sites, or jungle ecotourism, without analyzing and addressing cross-sectoral challenges such as climate resilience. Thus, there is a lack of localized data on tourist behaviour, community benefits from tourism activity, and environmental impacts across different tourism types.

The main motivation for this study stems from the urgent need to support sustainable tourism strategies that enhance both Sabah's economic resilience and safeguard its unique ecosystems. Hence, by addressing these research gaps, this study aims to contribute to more inclusive, environmentally responsible, and community-centered tourism development models. This is important as there is increasing awareness of sustainability in post-pandemic travel preferences.

In short, by acknowledging Sabah as a top tourism destination, this paper will explore the strengths, weaknesses, opportunities, and threats (SWOT) analysis of the tourism of Sabah in detail. The identified SWOT will then be utilized to form strategies, which refer to the TOWS Matrix.

SWOT AND AHP MODEL

SWOT ANALYSIS

The first SWOT analysis, the SOFT model, was developed as an instrument for one of the first strategic planning systems, the Systems of Plans (Stewart, 1963). It facilitated company managers to carry out long-term organisational planning (Lada et al., 2024; Puyt et al., 2023). Stewart's Plans System facilitates planning for any activity and at any time, with three levels of planning: next-generation goods and markets (operational planning), the generation immediately following (development planning), and the generation following that (strategic planning). According to Stewart's view, each corporation is made up of autonomous patterns such as systems, organisations, and processes, thus, numerous players can contribute to a complicated but cohesive chain of thought (Steiner & Cannon, 1966).

SWOT analysis is a business analysis strategy that can be applied by an organization to all its products, services, and markets to determine the most appropriate way to develop them in the future. The methodology entails analyzing the weaknesses and strengths of the organization, as well as the market opportunities and threats that it faces (Team FME, n.d.). SWOT analysis is the terminology for a technique used to identify and analyze internal and external influences impacting the viability of a project, product, location, or standalone entity (Namugenyi et al., 2019).

Action planning is required as it obliges organizations to find a replacement solution or a better measure to augment the businesses after the external threats and internal weaknesses have been identified and documented, together with their instances of data. Therefore, those organizations that do not find and employ action plans or a way forward to correct organizational problems, the entire exercise of SWOT exercise proves to be futile (Namugenyi et al., 2019).

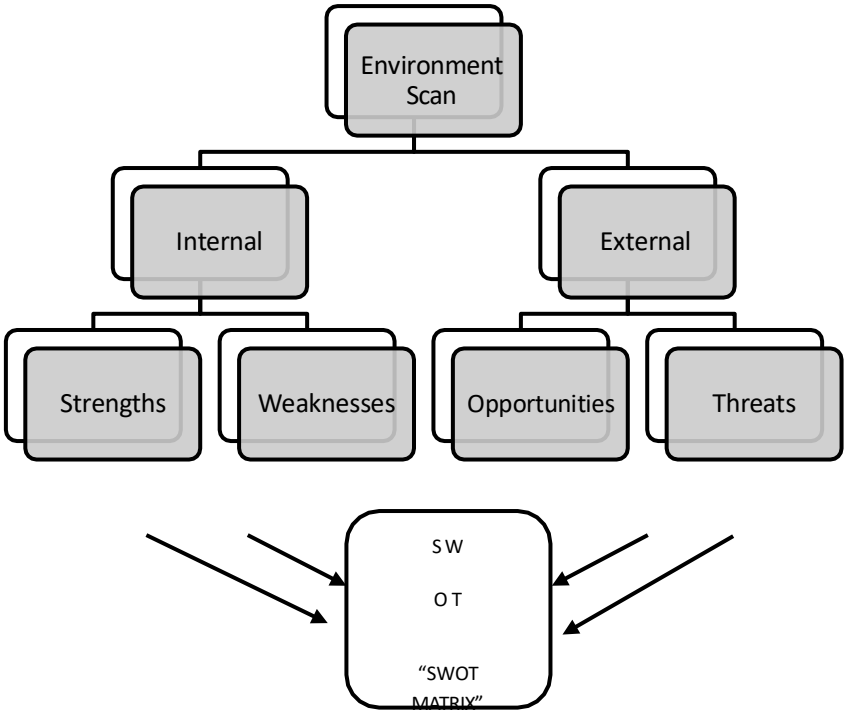

Figure 1: Framework of SWOT Analysis

ANALYTHIC HIERARCHY PROCESS

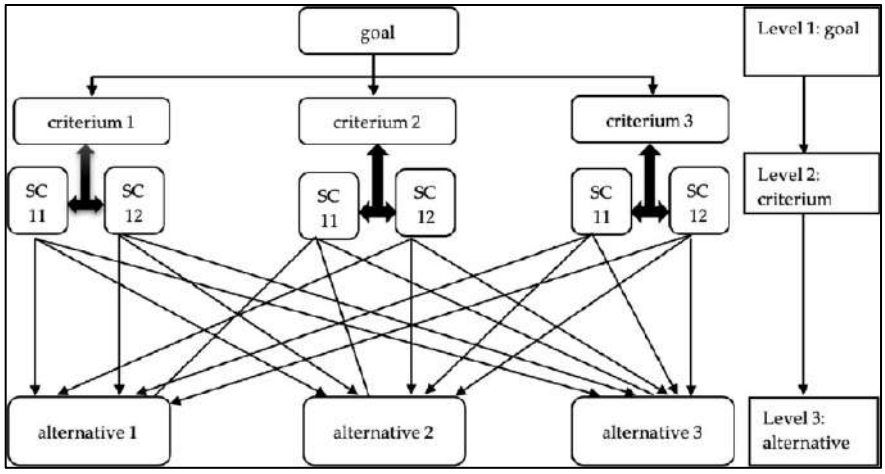

Figure 2: Analytic Hierarchy Process (AHP)

AHP is a broad measurement theory that is used to form ratio scales from discrete and continuous paired comparisons. Comparisons may be made either based on actual measurements or a simple scale representing the relative intensity of preferences and feelings. It is particularly concerned with non-consistency deviations, measurement, and interdependence among and between groups of elements in its structure (Saaty, 1987).

When creating hierarchies, one must include as much relevant material as possible to fully portray the problem, analyse the environment around the problem, identify the problems or traits that contribute to the solution, and identify the individuals involved with the problem. Organising the objectives, qualities, concerns, and stakeholders in a hierarchy serves two functions. First, it presents an overview of the situation's complicated

linkages. Second, it assists decision-makers in determining if the concerns at each level are of the same magnitude, allowing them to correctly compare such homogeneous parts (Thomas L. Saaty, 1989).

Table 1: Pairwise comparison scale

Importance	**Explanation**
1	Two criterion contribute equally to the objective
3	Experience and judgement slightly favor one over another
5	Experience and judgment strongly favor one over another
7	Criterion is strongly favored and its dominance is demonstrated in practice
9	Importance of one over another affirmed on the highest possible order
2, 4, 6, 8	Used to represent compromise between the priorities listed above

The Analytic Hierarchy Process (AHP) is used in this paper to ascertain the relative significance of the SWOT elements. The prioritisation process will begin with an assessment of the relative relevance of the criteria, after the study of the issue and the construction of its hierarchy. A comparison is conducted according to the criteria specified at the higher level, and the factors are systematically evaluated in groups based on the corresponding degrees of influence at each level. During AHP, several pairwise comparisons are performed using a standardized comparison scale consisting of nine levels (Görener et al., 2012).

The outcome of the pairwise comparison on n criteria can be succinctly represented by ($n \times n$) evaluation matrix B, where every component $b_{ij}(i, j = 1, 2, 3, \ldots, n)$ is the quotient of the weights of the criteria (Görener et al., 2012). The pairwise comparison can be visually represented using a square and reciprocal matrix. It is visible as seen below.

$$B = (bij)n\times n = \begin{matrix} b11 & b12 & \ldots & b1n \\ b21 & b22 & \ldots & b2n \\ bn1 & bn2 & \ldots & bnn \end{matrix}$$

In the last stage, each matrix is normalized and the relative weights are determined. The relative weights are determined by the principal eigenvector (w) associated with the maximum eigenvalue (λ_{max}), as shown below.

$$B_{\mathrm{w}} = \lambda_{max}\, W$$

If the pairwise comparisons exhibit total consistency, the matrix B will have a rank of 1 and the maximum eigenvalue $\lambda_{max} = n$. In this scenario, weights can be derived by normalizing either the rows or columns of B. The quality of the AHP's output is directly linked to the consistency of the judgments made during pairwise comparisons. The consistency is determined by the relationship between the entries of B, where B: $b_{ij} \times b_{jk} = b_{ik}$. The consistency index (CI) can be computed by employing the subsequent formula.

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

The ultimate consistency ratio (CR) is used to assess the level of consistency in the evaluations. The CR is calculated by dividing the CI by the random index (RI), as illustrated below.

$$CR = \frac{CI}{\overline{RI}}$$

The value of 0.1 is the predetermined upper limit for CR. If the final consistency ratio exceeds this threshold, the review technique must be repeated to improve consistency.

Table 2.0: Random Index

N	1	2	3	4	5	6	7	8	9	10
Random Consistency Index (RI)	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Source: Saaty (1980)

SWOT-TOWS-AHP MODEL

A method for deciding that evaluates the superiority of a range of alternatives was developed by Thomas L. Saaty, called the Analytic Hierarchy Process (AHP). The methodical assessment of the performance of each alternative concerning each criterion, after organising complex issues into a hierarchy of criteria and alternatives, helps to prioritise and make decisions. It helps to set priorities and make decisions.

Conversely, a SWOT analysis functions as a conceptual framework utilized to assess and evaluate a business endeavor, approach, entity, or undertaking. It is a framework specifically designed for strategic planning. Strengths, weaknesses, opportunities, and threats are all incorporated into this framework. The four domains of a SWOT analysis comprise internal factor classifications, such as strengths and weaknesses, and external factor classifications, including opportunities and threats, which are divided into two dimensions (GÜREL, 2017). An individual facet of the organization is discussed in each of these sections. Used properly, SWOT may be a useful starting point for effective strategy development (Kurttila et al., 1999).

SWOT is a crucial tool for developing strategies, providing a comprehensive understanding of all factors that can influence decision-making and strategic planning, both positively and negatively (Mary et al., 2017; Saygin, 2018). Additionally, as a sustainability extension of SWOT, Weihrich (1982) developed the TOWS matrix as an evolution of SWOT analysis. Thus, the TOWS matrix is designed to identify the systematic relationship between strengths, weaknesses, opportunities, and threats (Weihrich, 1982). After obtaining the results from the SWOT and TOWS analyses, the quest for optimal strategies for coastal, maritime, inland, and ecotourism in Sabah is conducted using AHP.

The idea in utilizing AHP within a TOWS framework is to systematically evaluate TOWS factors and assess their intensities (Kurttila et al., 1999). Through the integration of these two methodologies, the TOWS-AHP model is capable of furnishing a systematic framework that assists strategic planning and decision-making. This facilitates the process for organizations to discern and prioritize their strategic goals and activities by considering not only the opportunities and threats originating from the external environment, but also their

internal capabilities and limitations. The end outcome was hence improved strategic decision-making that was both more knowledgeable and more efficient.

The AHP technique operates by establishing the hierarchy of significance for different alternatives and the criteria employed to assess these alternatives. To begin, the criteria are ranked according to their significance in terms of achieving the goal, and then the priorities are established for those criteria. After that, the priorities are established by analyzing how well the various options perform concerning each of the criteria mentioned before. In conclusion, a process that involves assigning weights and combining them is utilized to ascertain the overall importance of the options concerning the contribution that they provide to the intended outcome (Vargas & St, 2022).

METHODOLOGY AND APPLICATION

The incorporation of the Analytic Hierarchy Process (AHP) into the SWOT analysis serves the primary purpose of conducting a methodical evaluation of the SWOT criteria and determining the degree to which they are comparable in terms of their significance. The framework of the Analytic Hierarchy Process (AHP), which was derived from the strengths, weaknesses, opportunities, and threats, utilizing this paper, is described in this paper. Three components constitute the organizational structure of the AHP: the decision objective, the SWOT groups, and the components that are integrated into each TOWS group. Figure 2 illustrates the hierarchical structure of the SWOT analysis that was taken into consideration.

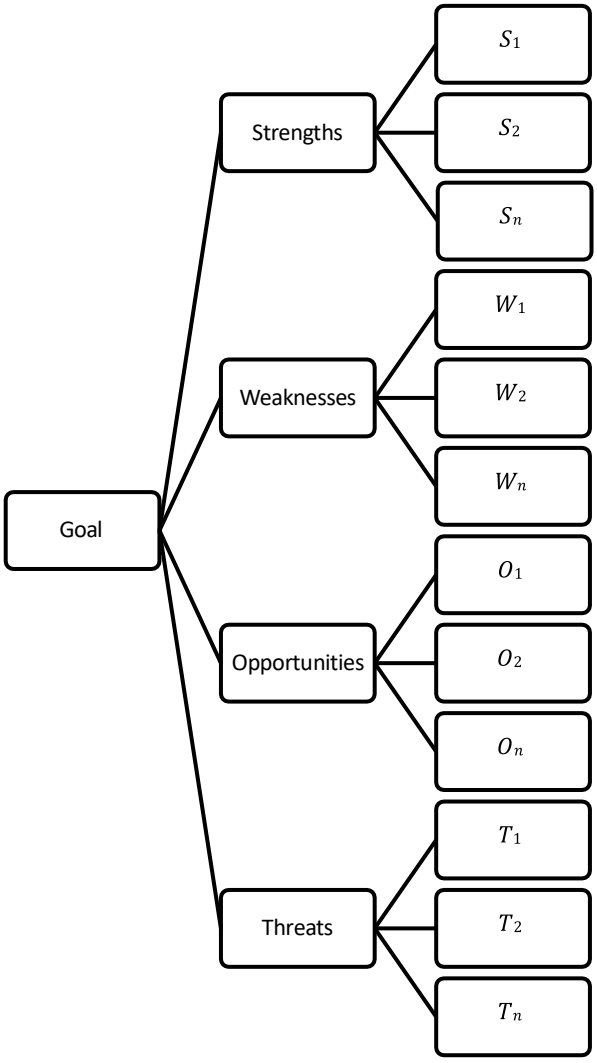

Figure 3: Hierarchical Structure of the SWOT Matrix

The purpose of this paper is to conduct a SWOT analysis of the tourism industry, specifically ecotourism, maritime, coastal, and inland water tourism via the Analytic Hierarchy Process (AHP). The analysis is done mostly based on Sabah, Malaysia. Saaty's comparison scale is utilized consistently throughout the process to enable pairwise comparisons and for each pair of SWOT criteria to be ranked on their relative importance. The summed matrix was applied to find vector weights or priorities for the constituents and groups of concern. This was done through combining the AHP with digitized TOWS factors.

To facilitate a more comprehensive understanding of the framework for strategic management derived from SWOT and AHP, a three-phase model has been constructed. A model is constructed as part of the first stage of the process. The second phase focuses on adjusting the factors, while the third phase prioritizes the evaluation model.

This is followed by the construction of a matrix and the execution of a SWOT analysis. The SWOT matrix has been updated to include the relevant aspects of the ecotourism industry in Sabah, which have been identified.

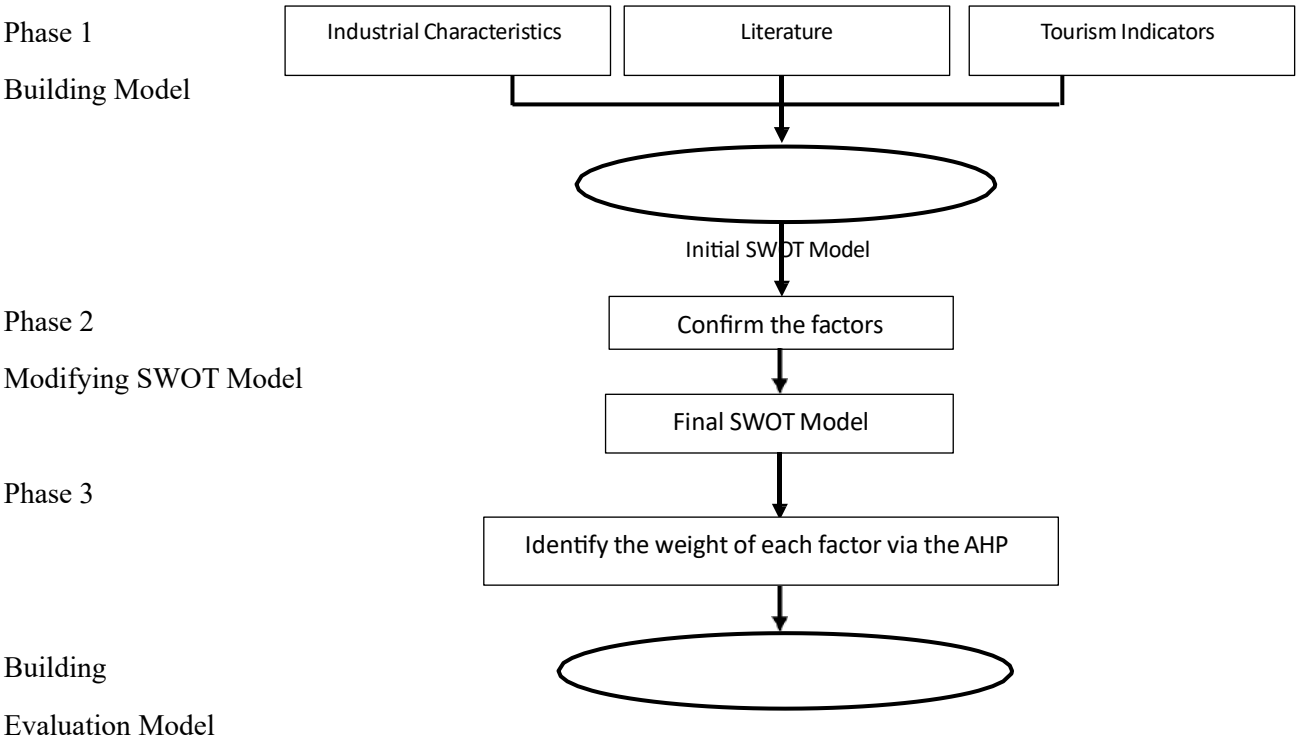

Figure 4: Phases of Proposed Methodology

SWOT ANALYSIS OF ECOTOURISM IN SABAH

The SWOT analysis of coastal, maritime, inland, and ecotourism in Sabah, as well as its external challenges, is presented in the following table.

Table 3: SWOT Analysis for the coastal, maritime, inland, and ecotourism industry in Sabah

Strengths (S)	**Weaknesses (W)**
(S1) Sabah has a rich biodiversity (Hasanal, 2009)	(W1) Sabah has limited infrastructure (Danting et al., 2018).
(S2) Involvement of Sabah state government in promoting ecotourism (Velnisa Paimin et al., 2014).	(W2) Experience lack of skilled human resource (Doksil & KJ TAN, 2025).
(S3) Marine ecotourism hotspots (Sabah Tourism Board, n.d.).	(W3) Economic disparities among local communities (Mayan *et al*., 2017).
(S4) Community engagement (Chong *et al.,* 2021).	(W4) Lack accessibility (Lee, 2019).
(S5) Offers a wide range of adventure activities (Hasanal, 2009).	
(S6) Easy access to key ecotourism markets (Kunjuraman & Hussin, 2020).	
Opportunities (O)	**Threats (T)**
(O1) Growing interest in ecotourism (STB/KePKAS, 2019 ; Sabri, 2024).	(T1) Environmental degradation threat ecosystems (UNEP, n.d.).
(O2) Embracing technology to improve engagement and accessibility to maritime sites (Konar et al., 2024).	(T2) Climate change pose risks to coastal and visitor ecotourism (Arabadzhyan et al., 2020). tourism
(O3) Expand its ecotourism offerings beyond traditional nature-based activities (Sabah Tourism Board, n.d.).	(T3) Face global competition (BERNAMA, 2022).
(O4) Regional collaborations for growth (STB/KeKPKAS, 2019).	(T4) Economic vulnerabilities (Hampton et al., 2023) .

RESULTS OF TOWS MATRIX

TOWS matrix is a conceptual tool for structured analysis to enable matching the organizational internal strengths and weaknesses with the external opportunities and threats. The SO strategy seeks to exploit the maximum strength and opportunity of the organization. The ST strategy is founded on the organizational strengths, which can defend against environmental threats. The WO strategy is designed to minimize weaknesses while maximizing opportunities. Lastly, the WT (Weaknesses-Threats) strategy emphasizes minimizing weaknesses and threats to a bare minimum (Weihrich, 1982).

Table 4: TOWS Matrix for the coastal, maritime, inland, and ecotourism industry in Sabah

Internal Factors / **External Factors**	**Strengths (S)** **S1: Sabah has a rich biodiversity.** **S2: Involvement of Sabah state government in promoting ecotourism.** **S3: Marine ecotourism hotspots.** **S4: Community engagement.** **S5: Offers a wide range of adventure activities.** **S6: Easy access to key ecotourism markets.**	**Weaknesses (W)** **W1: Sabah has limited infrastructure.** **W2: Experience lack of skilled human resource.** **W3: Economic disparities among local communities. W4: Lack accessibility.**
Opportunities (O) **O1: Growing interest in ecotourism.** **O2: Embracing technology to improve visitor engagement and accessibility to ecotourism sites.** **O3: Expand its ecotourism offerings beyond traditional nature-based activities.** **O4: Regional collaborations for growth.**	**SO Strategies** SO1: Leverage Sabah's rich biodiversity and marine ecotourism hotspots to attract the growing ecotourism market. (S1, S3, O1) SO2: Utilize government support and community engagement to implement technology for better visitor experience. (S2, S4, O2) SO3: Expand adventure activities and capitalize on ecotourism markets to offer unique experiences beyond traditional nature-based tourism. (S5, S6, 03)	**WO Strategies** WO1: Improve infrastructure and accessibility through embracing smart technologies. (W1, W4, O2) WO2: Address skill shortages through regional training programs and knowledge sharing collaborations. (W2, O4) WO3: Reduce economic disparities by expanding ecotourism activities to include local entrepreneurship. (W3, O3)

	SO4: Foster regional collaborations by showcasing strong community participation and diverse ecotourism offerings. (S4, S5, O4)	
Threats (T) **T1: Environmental degradation threat ecosystems. T2: Climate change pose risks to coastal and maritime tourism.** **T3: Face global competition. T4: Economic vulnerabilities.**	**ST Strategies** ST1: Utilize biodiversity and marine hotspots to promote conservation-focused tourism that counters environmental degradation and climate change. (S1, S3, T1, T2) ST2: Engage communities in sustainable practices to mitigate environmental risks. (S4, T1, T2) ST3: Emphasize unique ecotourism offerings to differentiate Sabah from global competitors. (S5, T3)	**WT Strategies** WT1: Develop capacity-building programs to address skill gaps and prepare for global competition. (W2, T3) WT2: Improve infrastructure to reduce vulnerability to environmental degradation and climate change. (W1, T1, T2) WT3: Increase local economic participation and enhance accessibility to reduce economic vulnerability. (W3, W4, T4)

The study by Awangku Hasanal Bahar Pengiran Bagul has highlighted a number of advantages of Sabah's ecotourism, including its abundant biodiversity, cultural heritage, diverse range of adventure activities, and exceptional opportunities for animal encounters. The author added that Sabah's rich living legacy makes it eligible for the ecotourism sector and makes it one of the world's twelve mega-diversity sites (Hassanal Bahar & Bagul, 2009). With its extensive coastline, abundant marine life, and advantageous location in the South China Sea, Sabah is well-positioned to gain from the transition to a sustainable economic model (Doksil & KJ TAN, 2025).

Furthermore, the third-largest island in the world is Borneo. Despite its small size, the island has all of Borneo's top attractions. For instance, stand-up paddle boarding at Sapi Island, scuba diving at Semporna and Tun Sakaran Marine Park, and sea walking to observe vibrant tropical fish, rays, and coral reefs are some of Sabah's most popular water sports. White water rafting is also available in locations like Kiulu, Kedamaian, and Padas River. Jet boat rides are another type of water sport (Sabah Tourism Board, n.d.).. Thus, eco-friendly resorts, marine conservation programs, and community-based tourism are examples of sustainable tourism initiatives that can boost economic gains while safeguarding delicate ecosystems. As a result, Sabah's coastal industries and wealth of marine resources present a strategic opportunity for sustained economic growth (Doksil & KJ TAN, 2025).

There is also potential for ecotourism. That means Sabah has been hosting the ASEAN Tourism Human Resources Management and Development Network for Ecotourism Programme, a regional network that promotes the development of the tourism industry. The kinabatangan region has been selected as part of the sustainable tourism destinations to conserve wildlife and encourage green ecotourism, as the State Government is keen to advance Sabah's tourism industry, particularly in ecotourism. This is because the Kinabatangan River supports Borneo's indigenous orangutan and proboscis monkey, hence one of the richest ecosystems in the world (STB/KePKAS, 2019).

But even with all of its potential, Sabah continues to face significant obstacles. Climate change and environmental threats are among the most evident challenges. Extreme weather events, coral bleaching, and rising sea levels pose a threat to marine ecosystems and coastal communities. Sabah's waters are also contaminated by industrial discharge, oil spills, and plastic waste, all of which are detrimental to marine life. Thus, inadequate waste management systems lead to excessive pollution from urban areas, tourism, and coastal industries (Doksil & KJ TAN, 2025). The limited use of digital solutions and smart technology presents another difficulty. Finally, there is a scarcity of oceanographers, marine engineers, and other qualified workers in the Blue Economy sectors. Furthermore, the innovation and growth have been hindered by inadequate training programs for fishermen, tourism operators, and coastal entrepreneurs.

The TOWS Matrix will be analysed and assessed using the Analytic Hierarchy Process (AHP). First, Saaty's comparison scale—a numerical metric with a range of 1 to 9—is used to compare the TOWS groups. Table 4 provides a summary of the comparisons' results. The TOWS matrix's elements are then examined, taking into account each of the TOWS categories as they are examined.

RESULTS OF TOWS-AHP

Table 5.0: Pairwise comparison of TOWS factors

TOWS	**SO**	**ST**	**WO**	**WT**	**Importance**
Degree of TOWS					
Groups					
Strengths-Opportunities (SO)	1.00	5.00	7.00	9.00	0.657
Strengths-Threats (ST)	0.20	1.00	3.00	5.00	0.203
Weaknesses-Opportunities (WO)	0.14	0.33	1.00	3.00	0.094
Weaknesses-Threats (WT) CR = 0.063	0.11	0.20	0.33	1.00	0.046

Table 6.0: Strengths – Opportunities (SO) Strategy Group

Strengths-Opportunities (SO)	SO1	SO2	SO3	SO4	Importance Degrees
(SO1)	1.00	4.00	6.00	9.00	0.611
(SO2)	0.25	1.00	4.00	7.00	0.255
(SO3)	0.17	0.25	1.00	3.00	0.092
(SO4)	0.11	0.14	0.33	1.00	0.042
CR = 0.071					

Table 7.0: Strengths – Threats (ST) Strategy Group

Strengths-Threats (ST)	ST1	ST2	ST3	Importance Degrees
(ST1)	1.00	4.00	9.00	0.708
(ST2)	0.25	1.00	5.00	0.231
(ST3)	0.11	0.20	1.00	0.060
CR = 0.074				

Table 8.0: Weaknesses – Opportunities (WO) Strategy Group

Weaknesses-Opportunities (WO)	WO1	WO2	WO3	Importance Degrees
(WO1)	1.00	6.00	8.00	0.761
(WO2)	0.17	1.00	3.00	0.166
(WO3)	0.12	0.33	1.00	0.073
CR = 0.077				

Table 9.0: Weaknesses – Threats (WT) Strategy Group

Weaknesses-Threats (WT)	WT1	WT2	WT3	Importance Degrees

(WT1)	1.00	4.00	9.00	0.708
(WT2)	0.25	1.00	5.00	0.231
(WT3)	0.11	0.20	1.00	0.060
CR = 0.074				

Ultimately, the comprehensive priority ratings for the TOWS aspects of coastal, maritime, inland, and ecotourism in Sabah have been computed. The table labelled Table 9 displays the main priorities comprehensively.

Table 10: The Overall Priority Scores of SWOT Factors

TOWS Group	Group Priority	TOWS Factors	Factor Priority within the Groups	Overall Priority of Factor
Strengths-Opportunities (SO)	0.657	**SO1: Leverage Sabah's rich biodiversity and marine ecotourism hotspots to attract the growing ecotourism market. (S1, S3, O1)**	**0.611**	**0.401**
		SO2: Utilize government support and community engagement to implement technology for better visitor experience. (S2, S4, O2)	0.255	0.168
		SO3: Expand adventure activities and capitalize on ecotourism markets to offer unique experiences beyond traditional nature-based tourism. (S5, S6, O3)	0.092	0.060
		SO4: Foster regional collaborations by showcasing strong community participation and diverse ecotourism offerings. (S4, S5, O4)	0.042	0.028
Strengths-Threats (ST)	0.203	**ST1: Utilize biodiversity and marine hotspots to promote conservation-focused tourism that counters environmental degradation and climate change. (S1, S3, T1, T2)**	**0.708**	**0.144**

		ST2: Engage communities in sustainable practices to mitigate environmental risks. (S4, T1, T2)	0.231	0.047
		ST3: Emphasize unique ecotourism offerings to differentiate Sabah from global competitors. (S5, T3)	0.060	0.012
Weaknesses-Opportunities (WO)	0.094	**WO1: Improve infrastructure and accessibility through embracing smart technologies. (W1, W4, O2)**	**0.761**	**0.072**
		WO2: Address skill shortages through regional training programs and knowledge sharing collaborations. (W2, O4)	0.166	0.016
		WO3: Reduce economic disparities by expanding ecotourism activities to include local entrepreneurship. (W3, O3)	0.073	0.006
Weaknesses-Threats (WT)	0.046	**WT1: Develop capacity-building programs to address skill gaps and prepare for global competition. (W2, T3)**	**0.708**	**0.033**
		WT2: Improve infrastructure to reduce vulnerability to environmental degradation and climate change. (W1, T1, T2)	0.231	0.011
		WT3: Increase local economic participation and enhance accessibility to reduce economic vulnerability. (W3, W4, T4)	0.060	0.002

By referring to the above results (Table 10), with the highest overall priority scores, it indicates that Sabah needs to leverage its rich biodiversity and marine ecotourism hotspots to attract the growing ecotourism market, which is significant for a tourism destination (0.401).

CONCLUSION

This paper uses the TOWS-AHP tool to identify the key strategic variables for ecotourism in Sabah. The results of the analysis have revealed the subsequent priority classification for each TOWS group: Strengths-Opportunities (SO) comprise 65.7%, Strengths-Threats (ST) comprise 20.3% of the total, Weaknesses-Opportunities (WO) represent 9.4%, and Weaknesses-Threats (WT) account for 4.6%. According to the TOWS-AHP results, the component that has the most significance is "Leverage Sabah's rich biodiversity and marine ecotourism hotspots to attract the growing ecotourism market." The crucial element is categorized within the SO1 (S1, S3, O1) group. This matter holds utmost significance, with an overall priority score of 0.401 (40.1%).

Other strengths to minimize the threats in the ecotourism industry in Sabah are by utilizing biodiversity and marine hotspots to promote conservation-focused tourism that counters environmental degradation and climate change (S1, S3, T1, T2), with a score of 14.4%. Additionally, there is a weakness that can be minimized through maximizing the opportunity for ecotourism in Sabah by improving infrastructure and accessibility through embracing smart technologies (W1, W4, O2) 7.2%. Nevertheless, to tackle the threats, Sabah needs to develop capacity-building programs to address skill gaps and prepare for global competition (W2, T3) with a score of 3.3 %.

Critical decisions or management strategies can be aided or supported by employing TOWS factor priorities that have been established. Furthermore, the findings of this study can be utilized to develop a range of suitable strategic options for the coastal, maritime, inland, and ecotourism sectors in Sabah. However, future research is still needed to identify any uncertainties.

REFERENCES

Arabadzhyan, A., Figini, P., García, C., González, M. M., Lam-González, Y. E., & León, C. J. (2020). Climate change, coastal tourism, and impact chains – a literature review. *Current Issues in Tourism*, *24*(16), 2233–2268. https://doi.org/10.1080/13683500.2020.1825351

BERNAMA. (2022, October 30). *Govt aims to brand Malaysia as world's best ecotourism destination*. Astro AWANI. Retrieved May 10, 2025, from https://international.astroawani.com/malaysia-news/govt-aims-brand-malaysia-worlds-best-ecotourism-destination-388525

BIMP-EAGA. (2024, February 1). Sabah tops 2023 tourism target, Sets more ambitious goal this year | BIMP-EAGA. Retrieved April 21, 2025, from https://bimp-eaga.asia/article/sabah-tops-2023-tourism-target-sets-more-ambitious-goal-year

Chong, F. J. ., Le, G. ., Abdul Aziz, N. A. ., Pengiran Bagul, A. H. B. P. B., & Saikim, F. H. . (2021). Community preparedness in ecotourism development and their role in maintaining the natural resources in Kadamaian area, Sabah. *Journal of Tropical Biology & Conservation (JTBC)*, *18*, 115–129. https://doi.org/10.51200/jtbc.v18i.3448

Doksil, M., & KJ TAN, I. T. (2025, February 15). Blue economy and development in Sabah and its challenges. Borneo Post Online. https://www.theborneopost.com/2025/02/15/blue-economy-and-development-in-sabah-and-its-challenges/

Görener, A., Toker, K., & Uluçay, K. (2012). Application of Combined SWOT and AHP: A Case Study for a Manufacturing Firm. Procedia - Social and Behavioral Sciences, 58, 1525–1534. https://doi.org/10.1016/j.sbspro.2012.09.1139

Hassanal Bahar, A., & Bagul, P. (2009). *Success of Ecotourism Sites and Local Community Participation in Sabah*. https://www.researchgate.net/publication/28800894

Kangas, J., 1992. Multiple-use planning of forest resources by using the analytic hierarchy process. Scandinavian Journal of Forest Research, 7, 259- 268.

Kunjuraman, V., & Hussin, R. (2020). Exploring potential ecotourism products in Sabah, Malaysia. Journal of Tourism, Hospitality & Culinary Arts, 12(1), 158-176.

Kurttila, M., Pesonen, M., Kangas, J., & Kajanus, M. (1999). Ž. Utilizing the analytic hierarchy process AHP in SWOT analysis a hybrid method and its application to a forest-certification case.

Lada, S.; Chekima, B.; Ansar, R.; Lim, M.F.; Bouteraa, M.; Abdul Adis, A.A.; Abd Karim, M.R.; Yong, K. Strategic alternatives for Muslim-friendly homestay in Sabah Malaysia: A SWOT/TOWS analysis. *J. Islam. Mark.* **2024**, *15*, 1534–1559.

Lee, S. (2019, November 28). Sabah to be more accessible for elderly tourists, tourists with disabilities. *The Star*. https://www.thestar.com.my/news/nation/2019/01/25/sabah-to-be-more-accessible-for-elderly-tourists-tourists-with-disabilities

Mary, M., Florence, K., Mary, M., & Christine, K. (2017). Using tows matrix as a strategic decision-making tool in managing KWS product portfolio. African Multidisciplinary Journal of Research, 2(1), 1–27

Mayan, S. N. 'Ain ., & Nor, R. M. . (2017). Prospects and Challenges of Ecotourism Sector and Poverty Eradication in Sabah: The Case of Orangutans and Mabul Island. *Global Journal of Social Sciences Studies*, *3*(1), 1–12. https://doi.org/10.20448/807.3.1.1.12

Namugenyi, C., Nimmagadda, S. L., & Reiners, T. (2019). Design of a SWOT analysis model and its evaluation in diverse digital business ecosystem contexts. Procedia Computer Science, 159, 1145–1154. https://doi.org/10.1016/j.procs.2019.09.283

Putra Aria Brand Awards. (n.d.). Putra Aria Brand Awards | Association of Accredited Advertising Agents Malaysia (4AS). https://www.ariaawards.my/

Saaty, R. W. (1987). THE ANALYTIC HIERARCHY PROCESS-WHAT IT IS AND HOW IT IS USED (Vol. 9, Issue 5).

Sabah Tourism Board. (n.d.). *Top water sports activities you can enjoy in Sabah | Sabah Tourism Board*. https://sabahtourism.com/article/top-water-sports-activities-you-can-enjoy-in-sabah/

Sabri, M. Y. B. (2024, November 26). *Sustainable tourism: How Malaysia is leading the charge for Eco-Friendly Travel*. Portal Berita. https://berita.rtm.gov.my/highlights/senarai-berita-highlights/senarai-artikel/sustainable-tourism-how-malaysia-is-leading-the-charge-for-eco-friendly-travel.

Saygin, S. D. (2018). Strategies to enhance sustainability of land resources in arid regions. Arid environments and sustainability. In H. Arman, & I. Yuksel (Eds.), Arid environments and sustainability (pp. 4–20). Rijeka: IntechOpen. https://doi.org/10.5772/intechopen.72492.

STB/KePKAS, T. (2019, October 30). *35pc of visitors in Sabah into ecotourism*. Ministry of Tourism, Culture and Environment Sabah (KePKAS). https://kepkas.sabah.gov.my/35pc-of-visitors-in-sabah-into-ecotourism/

STB/KePKAS, T. (2019, October 27). *Sabah as Asean eco-tourism hotspot*. Ministry of Tourism, Culture and Environment Sabah (KePKAS). https://kepkas.sabah.gov.my/sabah-as-asean-eco-tourism-hotspot/

Steiner, G.A., Cannon, W.M., 1966. Multinational Corporate Planning. MacMillan Publishing Co., Inc.

Stewart, R.F., 1963. A Framework for Business Planning (No. 162), Long Range Planning Service. Stanford Research Institute, Menlo Park, California.

Stewart, R.F., Doscher, M.O., 1963. The Corporate Development Plan (No. 183). Stanford Research Institute, Menlo Park, California.

Team FME. (n.d.). SWOT analysis. In www.free-management-ebooks.com. https://talentandculture.wvu.edu/files/d/6ed4bddf-91fe-4f08-9904-c13b8b30cbe8/swot-analysis-tool.pdf

Thomas L. Saaty. (1989). How to make a decision: The Analytic Hierarchy Process. European Journal of Operational Research.

UNEP. (n.d.). Facts about the nature crisis. UNEP - UN Environment Programme. https://www.unep.org/facts-about-nature-crisis

UN Tourism. (n.d.). Glossary of tourism terms | UNWTO. Retrieved April 26, 2025, from https://www.unwto.org/glossary-tourism-terms#T

Vargas, L., & St, C. (2022). The Analytic Hierarchy Process. http://www.springer.com/series/6161

Weihrich, H. (1982). *The TOWS Matrix A Tool for Situational Analysis* (Vol. 15, Issue 2).

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STRATEGIC ANALYSIS OF BANCASSURANCE IN SABAH USING SWOT-TOWS-AHP FRAMEWORK

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ABSTRACT

Bancassurance has emerged as an important financial service distribution model that integrates banking and insurance products through a single platform. Despite its growth potential, the development of bancassurance in Sabah remains constrained by geographical challenges, low insurance penetration, limited financial literacy, and infrastructure limitations. This study aims to identify the key internal and external factors influencing bancassurance development in Sabah, formulate strategic alternatives, and prioritize the most suitable strategies using an integrated SWOT-TOWS-AHP framework. Data were collected through focus group discussions involving 16 industry practitioners from banking, insurance, and financial advisory sectors, supported by secondary data from industry reports and academic literature. The SWOT analysis identified four strengths, four weaknesses, four opportunities, and four threats affecting the sector. These factors were subsequently transformed into 18 strategic alternatives using the TOWS matrix and prioritized through the Analytic Hierarchy Process (AHP). The results revealed that Strength-Opportunity (SO) strategies received the highest priority (47.9%), followed by Strength-Threat (28.7%), Weakness-Opportunity (12.9%), and Weakness-Threat (10.4%) strategies. The highest-ranked strategy was deploying trusted bank staff to underserved rural communities. The findings provide practical guidance for banks, insurers, and policymakers in enhancing bancassurance penetration and promoting financial inclusion in Sabah.

Keywords: Bancassurance, Strategic Management, Analytic Hierarchy Process (AHP), Financial Inclusion, Rural Financial Services

1.0 INTRODUCTION

In today's fast changing financial services environment marked by digital transformation, customer centricity and growing regulatory hurdles, bancassurance has emerged as a compelling distribution model the world over. *Bancassurance* is a form of partnership between banks and insurance companies, where insurance products are made available through bank branches leveraging banks' huge customer base and existing infrastructure (Staikouras, 2006). This approach has gained popularity in Malaysia because it is a cost effective, convenient and it provides integrated financial services in a single platform (Bank Negara Malaysia, 2022).

The financial sector in Sabah, Malaysia's second largest state, has seen challenges of geographic fragmentation, lower financial literacy rates and digital infrastructure limitations. (Lu, Kosim, & Abdul Rahman, 2024). However, as bancassurance creeps into rural and urban segments, there is a compelling opportunity to address an increasing demand for integrated financial services amongst rural and urban population to bridge the gap in insurance penetration and financial inclusion. The bancassurance mechanism provides an efficient and scalable

mechanism to enhance the penetration of life and general products in Sabah, particularly taking into consideration that the insurance penetration rate in Sabah is still below the national average rate (LIAM, 2021), and there exists a heterogeneous socio—economic composition of the population in the state.

Despite its promising prospects, the implementation of bancassurance in Sabah faces significant hurdles. Some of the factors include low consumer confidence in bank-based insurance agents, regulatory hurdles, restrictions on data sharing and human capital limitations. Further external challenges include economic volatility, changing customer demands as well as a rising competition from insurtech firms and digital banks. The internal competencies and external risks are multifaceted issues that need a strategic, data driven approach to evaluate diligence. To overcome these challenges, the SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis, augmented by the TOWS matrix and the Analytic Hierarchy Process (AHP) can be a great strategic tool. This framework provides a tool for effective bancassurance strategy development, prioritization and the recommendation of effective and customized strategy for the bancassurance phenomenon in the context of Sabah's specific market condition. (Benzaghta et al., 2021; Gallego-Ayala & Juizo, 2011).

SWOT and TOWS analyses are standard strategic tools for the internal strengths and weakness as well as external opportunities and threats of a business and the TOWS matrix utilizes these analyses to formulate strategies by means of SO (Strengths-Opportunities), WO (Weaknesses-Opportunities), ST (Strengths-Threats) and WT (Weaknesses-Threats). While traditional SWOT- TOWS analysis provides a good starting point it sometimes lacks a prioritization aspect when used in complex, qualitative rich environments such as Sabah's multifaceted financial sector. This gap is filled by integrating the Analytic Hierarchy Process (AHP) into the analysis which allows for quantification and ranking of strategic factors based on pairwise comparisons. (Saaty, 2008; Albayrak & Erensal, 2004) Across diverse sectors such as tourism, agriculture and sustainability management, this hybrid SWOT-TOWS-AHP framework has been proven to be effective most recently in guiding strategic development of Muslim friendly homestays in Sabah (Lada et al., 2024) through aiding data driven decisions which balance internal capabilities with market potential. Using these demonstrated successes as a springboard, the current study builds on the same integrated methodology to examine the Sabah's bancassurance sector, a sector that parallels structural constraints and great growth opportunities to develop targeted, evidence driven strategies in a similarly constrained environment.

Thus, this study applies a hybrid SWOT-TOWS-AHP approach for conducting a strategic analysis of bancassurance in Sabah with the following specific objectives: (1) identifying critical internal and external factors influencing bancassurance development, (2) formulating strategic alternatives through the TOWS matrix, and (3) prioritizing these strategies using AHP methodology by leveraging on documented case studies and empirical findings. The practical insights from the research are capable of providing direction to appropriate strategies for managing bancassurance growth in East Malaysia while the methodological advancements deliver contributions on how an integrated strategic planning model can be applied in financial service settings. The study employs a systematic analysis to generate actionable recommendations to the banks, insurers, regulators and policymakers on how to establish sustainable, competitive and customer-oriented bancassurance solutions in response to the unique demographic and economic features of Sabah's communities which are crucial for the financial inclusion of underdeveloped places such as Sabah.

2.0 METHODOLOGY

Research Design

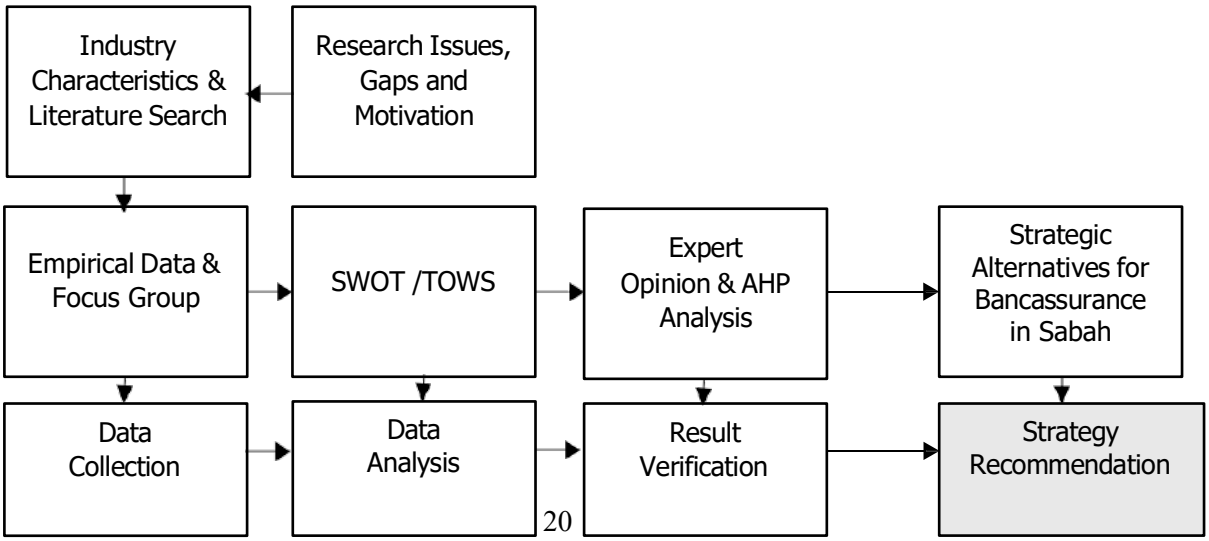
The researchers used a mixed-methods design divided into three sections to investigate bancassurance in Sabah using an integrated SWOT-TOWS-AHP framework. The process starts by establishing the primary aim and outlining the key research objectives of the study. Based on these objectives, a series of questions is developed to guide each session of the focus group discussions. First, researchers examine and study existing information, including Bank Negara Malaysia's annual reports, data on bancassurance in the country, literature covering East Malaysia's financial services and regulations about Sabah's financial sector. The information gained from these sources enables spotting main SWOT factors and leads to the development of targeted questions on the problems and upcoming opportunities facing Sabah's bancassurance environment.

In second phase, the technique involves deeper qualitative research and confirmation with experts by sampling core stakeholders, who are experienced in managing banks, offering insurance, overseeing financial rules and working with microfinance in rural Sabah. In this chapter, semi-structured interviews based on SWOT elements, analysis of the organization's report documents and reviewing regional case studies are used to confirm the results from the first research phase. As a result of this approach, both the experience of practitioners and the consistent evidence are utilized in forming the assessment strategy.

During the last phase, integrated analysis is carried out using focus group discussions in urban such as Kota Kinabalu and Sandakan and semi-urban like Ranau and Keningau locations, with careful attention in choosing the venue that represent all areas geographically and ensure access for everyone. At these sessions, the team works with structured plans yet allows for any unexpected ideas to emerge and these are all carefully noted and recorded with permission from all participants. Taking the TOWS matrix and running it through AHP ensures a smart combination of historical data, experts' opinions and observations of regulatory impact, resulting in a detailed decision-making plan. By combining various research approaches, this study increases its reliability and makes sure the analysis stays important to practitioners.

Figure 1 below illustrates the overall research flow, beginning from the establishment of goals to strategy generation through TOWS and prioritization using the Analytic Hierarchy Process (AHP).

Figure 1: Flow of the study



Data Collection: Focus Group

The primary method of data collection in this study involved examining and analyzing existing information. This involves in reviewing Bank Negara Malaysia's annual reports, national data on bancassurance, literature related to East Malaysia's financial services, and regulatory documents concerning Sabah's financial sector. These secondary data provide a strong foundation to understands the strategic environment of bancassurance in Sabah and help in developing related insights.

In order to complement and validate these findings, focus group discussions were also employed in this study. It consisted of two sessions each with 6–10 participants, most being bank managers, insurance agents and financial planners with related experience. Bancassurance participants went through semi structured discussions which include internal strengths and weaknesses, external opportunities and threats relating to bancassurance, both in urban and rural settings. Open dialogue was encouraged during these sessions which were accompanied by notetaking and audio recording to keep the sessions on track. The discussions were then cross verified with industry experts to make the study more reliable and with more strategic relevance.

Data Analysis: SWOT-AHP

SWOT analysis is a strategic planning tool used to analyze and evaluate the relative strengths and weaknesses of a business or an initiative and the market or environmental opportunities and threats it might face (Benzaghta et al., 2021). This study therefore employs SWOT analysis model to identify the factors that may impact the development and performance of bancassurance in Sabah. Nevertheless, the state is unique in terms of its geographic, economic and infrastructural landscape, hence the need to assess these factors as in designing viable strategies of enhancing bancassurance accessibility and effectiveness in this particular case.

Objective 1: Identifying the internal and external factors impacting bancassurance performance in Sabah. (SWOT Analysis)

The first objective of this study is to identify factors internal and external to the company that affect the performance of bancassurance in Sabah. Drawings from real world insights are extracted from the focus group discussions with bank staff, insurance agents and financial stakeholders. Detailed views on the levels of trust, infrastructure, market gaps, advantages and protection from regulation and also competitive threats are captured by these discussions which inform the SWOT framework.

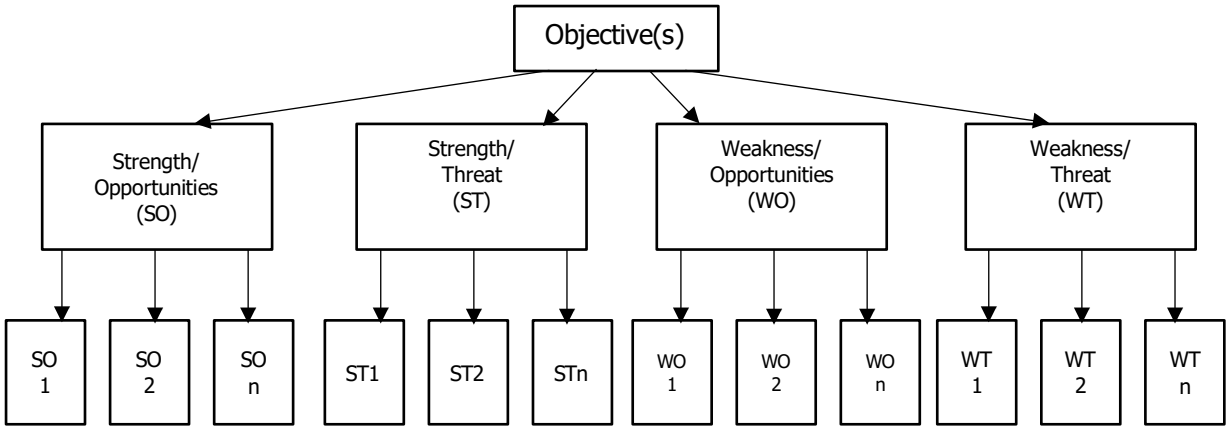
Objective 2: Determining the Best Strategy for Bancassurance in Sabah (TOWS-AHP Analysis)

The second objective is to identify and prioritize the strategic actions using TOWS-AHP approach. The SWOT findings are converted to TOWS strategies (SO, WO, ST, WT) which are finally assessed by the Analytic Hierarchy Process (AHP). This approach allows systematic comparison and ranking of strategic alternatives based on expert judgment and pairwise comparisons.

The AHP framework consists of three components: (a) the strategic objective (i.e., enhancing bancassurance reach and performance), (b) SWOT/TOWS strategic categories, and (c) their respective sub-factors. The hierarchical depiction of the TOWS framework is illustrated in Figure 2. The hierarchical structure facilitates a structured evaluation process that attributes weights to each criterion and consequently aids data based strategic recommendations. (Gallego-Ayala & Juizo, 2011). The integrated SWOT – TOWS – AHP model through the study will provide for the strategic planning for bancassurance in Sabah to

be based on stakeholder insights and prioritised according to their relevance and feasibility in the local context.

Figure 2: Hierarchical structure of the TOWS matrix



Source: Gallego-Ayala & Juizo (2011)

Expert Opinion and AHP Pair-wise Comparison

In this respect, expert opinions stand as one of the crucial tools for validating research findings, especially when the research touches the strategic evaluation frameworks such as SWOT – TOWS – AHP. Six professionals experienced in banking, insurance and financial services sectors were approached regarding this study to review and confirm the SWOT factors found in the focus group sessions. These are senior academics, bank executives and insurance industry practitioners, who possess deep knowledge and life experiences of the financial landscape in Sabah. The preliminary list of strengths, weaknesses, opportunities and threats was provided to them so that they could review and comment on it which was subsequently used to refine the strategic inputs.

After this an AHP questionnaire (Analytic Hierarchy Process) was distributed to the same group of experts. Then, using Saaty's (2008) nine points scale, each expert did pair wise comparison between the SWOT factors to determine their relative importance in relation to each strategic category. This is a way of providing a structured and quantifiable way of prioritisation of factors, so that strategy formulation is done based on expert judgement and relevant to local financial environment. Table 3 presents the list of experts who contributed to the validation and AHP scoring process.

Table 3: List of Experts

Expert	Position	Organisation
1	Regional Manager	Bank Simpanan Nasional (East Malaysia Division)
2	Senior Financial Advisor	Prudential Assurance Sabah
3	Associate Professor Dr.	Faculty of Business, Universiti Malaysia Sabah
4	Branch Operations Head	CIMB Bank Kota Kinabalu
5	Insurance Education Officer	Malaysia Financial Planning Council (MFPC) – Sabah Chapter
6	Professor Dr.	Faculty of Accountancy, Universiti Teknologi MARA, Sabah

AHP Calculation

The primary concept behind integrating the Analytic Hierarchy Process (AHP) into the TOWS framework is to methodically evaluate the TOWS factors and render them comparable in terms of their significance (Kangas et al., 2003). AHP involves breaking down complex decisions into a hierarchical structure of criteria and alternatives and then comparing them pairwise to determine their relative importance. Here's a step-by-step guide on how to perform AHP calculations:

Step 1: Hierarchy Formation

Identify the decision you need to make and break it down into a hierarchical structure with multiple levels. The hierarchy typically consists of three levels: the goal, criteria, and alternatives.

Step 2: Pairwise Comparisons

For each pair of elements in the same level (criteria or alternatives), determine their relative importance by making pairwise comparisons. Use a scale from 1 to 9, where 1 indicates equal importance and 9 indicates extreme importance (refer to Table 4 below).

Table 4: AHP Pair-wise comparison scale

Expert opinion on pair-wise ranking of importance of sub-criteria and main criteria in the hierarchy	Scale
If option A and option B are equally important	1
If Option A is moderately more important than Option B	3
If option A is strongly more important than option B	5
If option A is very strongly more important than option B	7
If option A is extremely more important than option B	9
If option A and option B are equally important	1
Used to represent a compromise between the priorities listed above	(2,4,6,8)

Source: Saathy (2008; 1980)

Step 3: Consistency Check

Ensure consistency in your pairwise comparisons by calculating the consistency ratio (CR). CR helps you determine if your judgments are coherent. To compute CR, use the following steps:

i. Calculate the matrix of pairwise comparison values.
ii. Compute the weighted sum for each criterion or alternative by multiplying each value in the matrix by its corresponding weight and summing the results.
iii. Divide the weighted sum of each element by its weight to get the priority vector.
iv. Compute the largest eigenvalue (λmax) of the matrix.
v. Compute the consistency index (CI) using the formula: CI = (λmax - n) / (n - 1), where n is the number of criteria or alternatives.
vi. Find the consistency index (RI) from a pre-defined table based on the order of the matrix (e.g., for a 3x3 matrix, RI is 0.58).
vii. Calculate the consistency ratio (CR) by dividing CI by RI. If CR is less than 0.1, your judgments are considered consistent.

Step 4: Weight Calculation

After ensuring consistency, calculate the weights for criteria and alternatives using the priority vectors obtained from pairwise comparisons.

Step 5: Score Calculation

Finally, calculate the overall score for each alternative by multiplying the weights of criteria with their scores for each alternative and summing up the results. Below is a simplified formula for calculating the weighted sum of priorities:

$$\text{Weighted sum} = \sum_{i=1}^{\eta} \omega i \cdot Ai$$

Where:
- ωi is the weight of its criterion or alternative.
- *A*i s the priority or score of its criterion or alternative.
- η is the total number of criteria or alternatives.

This formula is used at different levels of the hierarchy, such as calculating the weighted sum of criteria priorities to determine the overall priority of alternatives. According to Saaty (2008) the AHP methodology is summarized as:

a. The problem is designed as a hierarchy containing the objectives, the alternatives, and the factors/sub-factors for evaluating the alternatives.
b. Establish priorities among the variables of the hierarchy by making a series of judgements based on pair-wise comparisons of the elements.
c. Incorporate these judgements to yield a set of overall priorities for the hierarchy.
d. Make consistency check of the judgements.
e. Conclude based on the results of this process.

3.0 RESULTS

Two focus group sessions were conducted between February to April 2025 which were the primary data for this study. There are 16 participants in total which were professionals involved in bancassurance operations in Sabah. These participants originated from a variety of institutions such as commercial banks, takaful and insurance providers and financial advisory firms. The individuals selected were directly involved in bancassurance planning, sales or regulatory compliance, therefore had the relevant insight into the internal and external factors that are driving the industry at the state level. The participants comprised from urban centers like Kota Kinabalu, Sandakan and Tawau and rural or semi urban areas like Ranau, Keningau and Kota Marudu. The perspectives are drawn from a wide geographic and operational realm, facilitating a broad and holistic perspective to Sabah's bancassurance landscape.

SWOT Analysis

This research systematically integrates the focus groups findings to the empirical data using the performance metrics of bancassurance (LIAM Year 2022 and 2023), financial inclusion reports (BNM Year 2022) as well as the academic studies of Jalani & Easwaramoorthy. (2024) and Wahab et.al., (2018) and further have the consistent patterns of the practitioner experiences and the documented data. By using thematic analysis and cross-verification strategic factors is distilled into a validated SWOT framework that reflect both qualitative stakeholder perspectives and quantitative evidence to ground TOWS strategies in operational realities and market data. The final list organized according to the sub-theme of strengths (S), weaknesses (W), opportunities (O), and threats (T) is shown in Table 5.

Table 5: SWOT Matrix

Category	Code	Key Point	Explanation	Reference
Strength	S1	High Trust in Traditional Financial Institutions	People in Sabah, particularly older demographics, tend to trust bank staff more than online channels for financial products.	Jalani & Easwaramoorthy, 2024
	S2	Lower Operational Cost Compared to Standalone Insurance Branches	Bancassurance allows insurers to expand into semi-urban and rural Sabah through existing bank outlets, avoiding infrastructure costs.	LIAM, 2023
	S3	Banks' Familiarity with Local Communities	Bank staff in small towns are often community members themselves, increasing trust and uptake.	Wahab, Bunyau, & Islam, 2018
	S4	Supportive Regulatory Environment	Bank Negara Malaysia promotes inclusive insurance access, including to underserved Sabah regions, through bancassurance.	Bank Negara Malaysia, 2022
Weakness	W1	Lack of Insurance Expertise Among Bank Staff	Many rural branches lack trained personnel to explain insurance products clearly.	MDRT Malaysia, 2022
	W2	Overdependence on Urban Markets	Most bancassurance business comes from urban Sabah (KK,	LIAM East Malaysia
			Penampang), with poor penetration inland.	Roadshow Report, 2022
	W3	Poor Digital Infrastructure in Interior Areas	Digital-based bancassurance has limited reach due to unstable internet in rural Sabah.	MCMC Digital Connectivity Report, 2023
	W4	High Turnover Among Insurance Agents and Bank Staff Selling Insurance	Frequent staff turnover disrupts customer relationship continuity, reduces follow-up rates, and increases training costs.	Phillips, E. (2023)
Opportunity	O1	Untapped Rural Market	Many Sabahans remain uninsured or underinsured, especially in rural districts.	BNM Financial Inclusion Index, 2022
	O2	Youth and Civil Servant Segments	UMS students, young professionals, and government employees are ideal targets for bancassurance products like savings-linked insurance.	DOSM Sabah Demographics Report, 2023
	O3	Tourism Sector Workers Needing Protection	Many workers in ecotourism, diving, and hospitality need affordable protection plans.	Chan, Marzuki, & Mohtar, 2021
	O4	Mobile Bancassurance Models	Banks can introduce mobile vans or agents with tablets to reach off-grid communities.	Ministry of Finance Malaysia, 2024

Threat	T1	Limited Financial Literacy	Many rural Sabahans are unfamiliar with insurance concepts, making sales difficult.	FEN Malaysia, 2023
	T2	Dependence on Government Subsidies	Many lower-income Sabahans prioritize government aid over commercial insurance.	EPU Sabah Budget Report, 2023
	T3	Growing Competition from Takaful Agents	Islamic insurance (Takaful) agents are active in Sabah and may offer more culturally resonant services.	Takaful Malaysia Annual Report, 2023
	T4	Distrust from Past Mis-selling Cases	Poor customer experiences or misunderstood products erode trust in banks selling insurance.	InsuranceInfo, 2019

TOWS Matrix

This study employed TOWS matrix to analyze the strategic relationships between internal capabilities (strengths/weaknesses) and external environment (opportunities/threats) in bancassurance sector of Sabah. Through expert analysis and empirical validation 18 actionable strategies are found represented in four additional quadrants: SO (Strengths-Opportunities), ST (Strengths-Threats), WO (Weaknesses-Opportunities) and WT (Weaknesses-Threats). Table 6 demonstrates these evidence-based strategies towards the second research objective which is to provide banks and insurers with prioritized approaches that would help banks and insurers penetrate the market, mitigate risks and leverage the uniqueness of Sabah's financial landscape. Focus group insights are integrated with bancassurance performance analytics (LIAM, 2023), as well as the provisions from the regulatory guidelines (BNM, 2022) to enhance practical applications.

Table 6: Results of TOWS Analysis

External Factors / Internal Factors	**Opportunities (O)**	**Threats (T)**
Strengths (S)	**SO-1**: Deploy trusted bank staff (S1, S3) to promote microinsurance to untapped rural areas (O1). **SO-2**: Utilize banks' rural presence (S2, S3) to offer savings-linked insurance for youth & civil servants (O2). **SO-3**: Launch mobile bancassurance vans (O4) using existing bank networks (S2) to access off-grid populations. **SO-4**: Train community-based staff (S3) to market affordable plans tailored to tourism sector workers (O3). **SO-5**: Leverage Bank Negara's regulatory push (S4) to roll out inclusive insurance pilots in underserved areas (O1–O4).	**ST-1**: Use high community trust (S1, S3) to rebuild confidence after mis-selling (T4) via education campaigns. **ST-2**: Introduce Shariah-compliant bancassurance options with BNM support (S4) to counter Takaful (T3). **ST-3**: Compensate for poor digital infra (T3) by deploying physical service delivery through banks (S2, S3). **ST-4**: Drive literacy efforts using bank trust (S1) and regulatory frameworks (S4) to tackle low awareness (T1). **ST-5**: Promote hybrid safety-net plans aligned with gov assistance (T2), supported by bank trust (S1) and policy (S4).
Weaknesses (W)	**WO1**: Train selected bank staff for rural markets (W1, W2) and deploy with mobile tools (O1, O4).	**WT1**: Partner with BNM and NGOs to deliver joint financial

	WO2: Launch affordable starter packs (W2) for youth & tourism workers (O2, O3) via mobile models (O4). **WO3**: Create an offline learning app for rural agents (W1, W3) to upskill for engagement in low-connectivity areas (O1, O2). **WO4**: Introduce hybrid digital-physical tools (W3) to penetrate rural Sabah using mobile agents (O4).	literacy roadshows addressing (W1 & T1) **WT2**: Launch retention packages for agents/staff (W4) to build trust and reduce mis-selling risks (T4). **WT3**: Offer mutual style microinsurance pools (W2) for low-income rural communities relying on aid (T2). **WT4**: Certify rural bancassurance agents to compete ethically with culturally aligned Takaful agents (T3, W1).

AHP Analysis and Strategic Alternative

The table below shows the importance of the degree of TOWS factors (TOWS standardized matrix). The research findings rank each TOWS group by its importance as SO (47.9%), ST (28.7%), WO (12.9%) and WT (10.4%). In this case, SO strategies are considered the most important factor, followed by ST, WO, and finally WT strategies. This weighting scheme suggests that the analysis strongly prioritizes leveraging internal strengths to capitalize on external opportunities (SO) while also using strengths to mitigate threats (ST). The relatively lower priority given to WO and WT strategies indicates that addressing weaknesses, whether to exploit opportunities or counter threats, is currently of secondary importance in Sabah's bancassurance sector.

Table 7: Importance of degree of TOWS factors (TOWS standardized matrix)

Strategy No.	Variables	S	W	O	T	Weight	Rank
1	SO	1	1.000	2.000	2.000	47.9%	1
2	ST	1.000	1	1.000	1.000	28.7%	2
3	WO	0.500	0.500	1	0.500	12.9%	3
4	WT	0.500	1.000	0.500	1	10.4%	4

Number of comparisons = 6; Consistency Ratio (CR) = 9.7%; Principal eigenvalue = 20.679; Eigenvector solution: 7 iterations, delta = 2.4E-8.

Based on the overall priority scores factors in Table 8, the study involved 153 pairwise comparisons using the Analytic Hierarchy Process (AHP) with a scale of 1 to 9. The obtained consistency ratio (CR) was 0.97 (9.7%), indicating reasonably consistent judgments and satisfactory reliability in the decision-making process. Based on the results of the AHP analysis, this study successfully identified the best strategy options based on their rank.

Table 8: Overall priority scores of TOWS factors

TOWS Group	Group Priority	TOWS Factors	Factor Priority (Within Group)	Overall Priority	Rank
SO	47.9%	SO1 - Deploy trusted bank staff to untapped rural areas.	30.8%	14.8%	1

		SO2 - Offer savings-linked insurance for youth & civil servants.	21.7%	10.4%	2
		SO3 - Launch mobile bancassurance vans to off-grid populations.	14.6%	7.0%	5
		SO4 - Train community-based staff to market affordable plans.	13.5%	6.5%	6
		SO5 - Leverage Bank Negara's regulatory.	19.2%	9.2%	3
ST	28.7%	ST1 - Use high community trust to rebuild confidence.	18.1%	5.2%	9
		ST2 - Introduce Shariah-compliant bancassurance options.	21.5%	6.2%	7
		ST3 - Deploying physical service delivery through banks.	16.0%	4.6%	10
		ST4 - Drive literacy efforts using bank trust and regulatory.	18.8%	5.4%	8
		ST5 - Promote hybrid safety-net plans.	25.3%	7.3%	4
WO	12.9%	WO1 - Train selected bank staff.	26.9%	3.5%	13
		WO2 - Launch affordable starter packs.	29.2%	3.8%	12
		WO3 - Create an offline learning app.	17.7%	2.3%	16
		WO4 - Introduce hybrid digital-physical tools.	25.4%	3.3%	14
WT	10.4%	WT1 - Partner with BNM and NGOs.	24.5%	2.5%	15
		WT2 - Launch retention packages for agents/staff.	12.7%	1.3%	18
		WT3 - Offer mutual style microinsurance pools.	20.6%	2.1%	17
		WT4 - Certify rural bancassurance agents to compete ethically.	44.1%	4.5%	11

*** Number of comparisons = 153; Consistency Ratio CR = 0.97 (9.7%); Principal eigenvalue = 20.679; Eigenvector solution: 7 iterations, delta = 2.4E-8*

The overall results from above highlight the priority scores of TOWS factors across different groups, including Strength-Opportunity (SO), Strength-Threat (ST), Weakness-Opportunity (WO), and Weakness-Threat (WT). In particular, the top solutions within the SO group are deploy trusted bank staff to untapped rural areas (rank 1) and offer savings-linked insurance for youth and civil servants. (rank 2), whereas in the ST group, promote hybrid safety net plans ranks highest. The main focus strategy in the WO group that rank 1 within group is to launch affordable starter packs and in WT group is on certify rural bancassurance agents to ethically compete. The findings enable Sabah's bancassurance sector to have a clear and strategic direction by pinpointing the most important focus areas in each category that they must leverage on their strengths, overcome their weaknesses, tap on opportunities and prepare for threats holistically.

4.0 DISCUSSION

(1) *What is the best strategy to pursue by bancassurance providers in Sabah based on TOWS-AHP analysis?*

The TOWS-AHP analysis that carried out in this study purposed to examine the relation between SO, ST, WO and WT as a means to evaluate, devise and propose the most suitable strategy in line with the priority and ranking for bancassurance providers in Sabah. Based on the top 5 priority factors outlined in the analysis for the Strength-Opportunity (SO) group, the suggestion with the highest overall priority is "Deploy trusted bank staff to untapped rural areas" (SO1, 14.8%), followed by "Offer savings-linked insurance for youth & civil servants" (SO2, 10.4%), "Leverage Bank Negara's regulatory support" (SO5, 9.2%), "Promote hybrid safety-net plans" (ST5, 7.3%), and "Launch mobile bancassurance vans" (SO3, 7.0%). As a result, bancassurance providers in Sabah should give priority to staffing rural areas with trusted bank staff, developing insurance products that link to people's savings, taking advantage of regulations that encourage inclusive insurance, offering hybrid safety-net insurance and

providing bancassurance services via mobile networks. Concentrating on these significant areas enables providers to offer financial services to a wide range of people in Sabah.

"Sabah's unique geographical challenges and diverse population require innovative approaches to financial inclusion. Bancassurance providers have a critical role to play in bridging the protection gap, particularly in rural and underserved communities." (i.e., Industry Expert 1, 3, and 5).

Strategy Option 1: Deploy trusted bank staff to rural areas (SO1)

Deploying trusted bank staff to rural areas in order to promote microinsurance represents become the main approach to financial inclusion. With the help of existing bank employees who are known to the community (S1, S3), providers can solve the problem of lacking trust that affects rural insurance use (T4). This method includes training bank employees to provide microinsurance information using the local language, delivering financial classes in village halls and making marketing materials that fit the culture. Knowing that a familiar face runs the branch shows people the product is credible. It also helps in increasing consumer's awareness of insurance and helps the bank build relationships with the community that ensure loyal customers and financial security in Sabah.

Strategy Option 2: Offer savings-linked insurance for youth & civil servants (SO2)

Creating savings-linked insurance products caters to the rising wish by youth and civil servants for financial products that are simple and available in one form (O2). With these products, new customers can enjoy the safety of insurance and the comfort of using a savings account. Civil servants need plans that fit with their payroll arrangements, but youths might find products more enjoyable when these have a mobile app and engaging aspects (Bank Negara Malaysia, 2021). Building on banks' current collaborations with government bodies and schools (S2), companies can look after people who have useful jobs but might not be protected from risks. This strategy also helps cultivate insurance awareness among younger demographics, building a pipeline of future customers (Islamic Financial Services Board, 2023).

Strategy Option 3: Leverage Bank Negara's regulatory support (SO5)

Following the rules and suggestions from Bank Negara Malaysia, providers can start trying out new insurance plans for underserved customers (O1-O4). This requires participating in testing environments for new products, taking advantage of financial inclusion grants and meeting reduction targets set at the national level for protecting vulnerable groups. The latest regulatory reforms have provided chances for simpler and more affordable microinsurance with efficient distribution processes (BNM Financial Inclusion Framework, 2022). Taking part in discussions with regulators and getting involved in joint efforts for financial inclusion allows bancassurance providers to influence policy and access new markets first. This approach proves useful in meeting Sabah's population needs and still maintaining high compliance standards.

Strategy Option 4: Promote hybrid safety-net plans (ST5)

Using hybrid safety-net products that combine support from insurance and from government benefits (T2) can strengthen the financial resilience of people living in poverty. These unique products can be set up to work with current social safety net systems by providing subsidized premiums to the lower-income group or automatically enrolling those currently assisted by the government (World Bank, 2023). Collaborating with welfare and social service agencies and using banks' infrastructure for payments (S2) allows insurers to simplify and speed up both enrolment and claims. The model makes it easier for more people to get insurance and

strengthens the whole safety network for the community. In Sabah, people from vulnerable communities face frequent problems with unstable economies and natural disasters (Department of Statistics Malaysia, 2022).

Strategy Option 5: Launch mobile bancassurance vans (SO3)

Mobile bancassurance vans overcome the difficulties of Sabah's infrastructure by providing insurance to remote communities (T3). With these special vehicles, insurers can go to rural areas, plantations and coastal towns to give fast product details, sign up new clients and handle simple claims on the spot. Agents who can speak the community's local dialect and know their needs well can be assign in these vans (Microinsurance Network, 2021). This method works together with digital tools by putting humans in touch with customers when needed and using devices that operate even without an internet connection. It is easier to offer electronic money services to women and the elderly by using special mobile units (UNCDF, 2022).

FUTURE RESEARCH

Bancassurance is expected to evolve with the growing demand of inclusive and accessible financial protection products in regions such as Sabah, where these products remain underserved. Such support may consist of the creation of insurance solutions tailored to the financial needs of low incomes and rural populations, including simplified insurance solutions and microinsurance solutions (Churchill & Matul, 2012). Bancassurance operations are also expected to improve customer outreach and service efficiency on the back of integration of digital platforms and financial technologies (Organisation for Economic Co-operation and Development [OECD], 2021). With tighter competition in the market, perhaps banks and insurers will pivot to new delivery models and customer centric services. It could give rise to emerging hybrid financial products and distribution strategies that can better be tuned with the socio-economic realities of different customer groups. In addition, regulatory innovation, digital literacy and promoting financial resilience are among future trends that could be promoted as joint collaborations between banks, insurers and government bodies (Bank Negara Malaysia, 2022). Future research is needed on bancassurance involving variables like consumer trust, preferences in distribution channel and the effect of digital tools on the engagement (Tennyson, 2011; PwC, 2020). Strategic analysis tools like IE Matrix, SPACE matrix and QSPM may be used to select an optimal growth strategy.

5.0 CONCLUSION

By conducting the strategic analysis of bancassurance environment in Sabah, it shows that Sabah has great potential to grow the penetration of bancassurance and create financial inclusion through the effective partnerships of bank and insurance. An ideal foundation exists for expansion of bancassurance services in Sabah, given the already existing banking infrastructure, an already high level of trust in already existing community-based financial institutions, increasing interest on protection oriented financial products. Nevertheless, the realization of this potential is constrained by a number of internal weaknesses. Specifically, low public awareness of insurance, low financial literacy levels and a lack of trained front-line personnel. Externally, the sector is challenged by other factors such as regulatory complexity, diminished consumer trust and especially, by the lack of access to supply for certain remote areas both geographically and in terms of the socio-economic background. These issues must be taken into consideration to fully realize bancassurance potential in the region.

This study proposes strategic options to overcome these barriers which provide a holistic framework. The strategies it proposes apply to the enhancement of public trust and

financial knowledge through targeted financial education campaigns in rural areas, the equipping of bank staff and insurance agents with the right training to render more customer–centric services and leveraging digital channels to render services accessible to different populations. In addition, insurance can be bundled with existing banking products and hybrid safety net solutions such as microinsurance that is subsidized and linked to government aid programs may be a viable way to reach accessible communities. If these efforts can be aligned with local needs and socio-economic context then these initiatives can act as a mitigating tool of financial vulnerability.

By bringing banks, insurers, government bodies and community organisations together in a strategic partnership, Sabah could be the East Malaysian corner where inclusive financial protection works. The use of integrated, people centred strategies enhances the operational efficiency and scale of bancassurance but supports larger development goals as well such as poverty reduction and resilience building. Though, bancassurance in Sabah can eventually be a transformative tool to bridge financial protection gaps and stimulate long-term socio-economic growth in the state through sustained commitment and innovation.

	AHP prior	2025.05.31 02:3G:05																
	18																	
	SO1	SO2	SO3	SO4	SO5	ST1	ST2	ST3	ST4	ST5	WO1	WO2	WO3	WO4	WT1	WT2	WT3	WT4
1	1	3.00	2.00	4.00	6.00	5.00	1.00	2.00	4.00	6.00	3.00	2.00	4.00	2.00	3.00	5.00	3.00	1.00
2	0.33	1	2.00	3.00	1.00	4.00	1.00	2.00	4.00	6.00	3.00	2.00	4.00	2.00	2.00	5.00	3.00	1.00
3	0.50	0.50	1	2.00	1.00	3.00	1.00	2.00	4.00	1.00	2.00	1.00	3.00	2.00	2.00	4.00	2.00	1.00
4	0.25	0.33	0.50	1	1.00	2.00	1.00	2.00	4.00	1.00	3.00	2.00	4.00	2.00	2.00	4.00	2.00	1.00
5	0.17	1.00	1.00	1.00	1	5.00	3.00	4.00	2.00	1.00	4.00	3.00	4.00	3.00	3.00	5.00	3.00	2.00
6	0.20	0.25	0.33	0.50	0.20	1	2.00	3.00	1.00	1.00	3.00	2.00	3.00	2.00	2.00	4.00	2.00	1.00
7	1.00	1.00	1.00	1.00	0.33	0.50	1	1.00	4.00	1.00	2.00	2.00	3.00	1.00	2.00	4.00	2.00	1.00
8	0.50	0.50	0.50	0.50	0.25	0.33	1.00	1	1.00	1.00	2.00	2.00	3.00	2.00	2.00	4.00	3.00	1.00
G	0.25	0.25	0.25	0.25	0.50	1.00	0.25	1.00	1	1.00	4.00	3.00	4.00	3.00	3.00	5.00	3.00	2.00
10	0.17	0.17	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1	5.00	4.00	5.00	5.00	4.00	6.00	4.00	2.00
11	0.33	0.33	0.50	0.33	0.25	0.33	0.50	0.50	0.25	0.20	1	2.00	3.00	2.00	4.00	3.00	2.00	1.00
12	0.50	0.50	1.00	0.50	0.33	0.50	0.50	0.50	0.33	0.25	0.50	1	3.00	2.00	4.00	3.00	2.00	1.00
13	0.25	0.25	0.33	0.25	0.25	0.33	0.33	0.33	0.25	0.20	0.33	0.33	1	2.00	1.00	3.00	2.00	1.00
14	0.50	0.50	0.50	0.50	0.33	0.50	1.00	0.50	0.33	0.20	0.50	0.50	0.50	1	4.00	3.00	2.00	1.00
15	0.33	0.50	0.50	0.50	0.33	0.50	0.50	0.50	0.33	0.25	0.25	0.25	1.00	0.25	1	3.00	2.00	1.00
16	0.20	0.20	0.25	0.25	0.20	0.25	0.25	0.25	0.20	0.17	0.33	0.33	0.33	0.33	0.33	1	0.50	0.50
17	0.33	0.33	0.50	0.50	0.33	0.50	0.50	0.33	0.33	0.25	0.50	0.50	0.50	0.50	0.50	2.00	1	0.50
18	1.00	1.00	1.00	1.00	0.50	1.00	1.00	1.00	0.50	0.50	1.00	1.00	1.00	1.00	1.00	2.00	2.00	1
	0.148	0.104	0.07	0.065	0.0G2	0.052	0.062	0.046	0.054	0.073	0.035	0.038	0.023	0.033	0.025	0.013	0.021	0.045
	20.67G	0.G72																

Original AHP Result

REFERENCES

Albayrak, E., Erensal, Y.C. Using analytic hierarchy process (AHP) to improve human performance: An application of multiple criteria decision-making problem. *Journal of Intelligent Manufacturing* **15**, 491–503 (2004). https://doi.org/10.1023/B:JIMS.0000034112.00652.4c

Bank Negara Malaysia. (2021). *Financial inclusion and Islamic finance framework*. https://www.bnm.gov.my

Bank Negara Malaysia. (2022). *Annual report 2022*. https://www.bnm.gov.my/publications/ar

Bank Negara Malaysia. (2022). *Policy document on bancassurance/bancatakaful*. https://www.bnm.gov.my/documents/20124/948107/PD_Banca.pdf

Benzaghta, M. A., Elwalda, A., Mousa, M. M., Erkan, I., & Rahman, M. (2021). SWOT analysis applications: An integrative literature review. Journal of Global Business Insights, 6(1), 54-72. https://www.doi.org/10.5038/2640-6489.6.1.1148

Chan, J. K. L., Marzuki, K. M., & Mohtar, T. M. (2021). Local community participation and responsible tourism practices in ecotourism destination: A case of Lower Kinabatangan, Sabah. *Sustainability, 13*(23), 13302. https://doi.org/10.3390/su132313302

Churchill, C., & Matul, M. (Eds.). (2012). *Protecting the poor: A microinsurance compendium* (Vol. 2). International Labour Office.

Department of Statistics Malaysia. (2022). *Household income and basic amenities survey report: Sabah*. https://www.dosm.gov.my

Department of Statistics Malaysia. (2023). *Sabah demographics report*. https://www.dosm.gov.my/portal-main/release-content/statistics-yearbook-sabah-2023

Financial Education Network. (2023). *National Strategy for Financial Literacy 2019–2023: Progress Report*. https://www.fenetwork.my/wp-content/uploads/2023/05/FEN-National-Strategy-Progress-Report-THE-COMPLETE-REPORT-FINAL.pdf

Gallego-Ayala, J., & Juizo, D. (2011). Strategic implementation of integrated water resources management in Mozambique: An AHP-based prioritization. *Physics and Chemistry of the Earth, Parts A/B/C, 36*(14–15), 1103–1111. https://doi.org/10.1016/j.pce.2011.07.040

InsuranceInfo. (2019). *Mis-selling of investment-linked insurance products*. Retrieved from https://insuranceinfo.com.my/case-study/mis-selling-of-investment-linked-insurance-products/

Islamic Financial Services Board. (2023). *Islamic financial services industry stability report 2023*. https://www.ifsb.org/wp-content/uploads/2023/10/Islamic-Financial-Services-Industry-Stability-Report-2023_En.pdf

Jalani, N. F., & Easwaramoorthy, M. (2024). *The influence of trust and perceived risk on mobile banking app usage among Malaysian consumers*. arXiv. https://arxiv.org/pdf/2411.16689

Kangas, J, Kurttila, M., Kajanus, M. and Kangas, A. (2003), Evaluating the management strategies of a forestland estate-the SO-S approach, Journal of Environmental Management, 69, pp. 349-358.

Lada, S., Ahmad, S. Z., & Karim, M. S. A. (2024). Strategic development of Muslim-friendly homestays in Sabah using SWOT-TOWS-AHP framework. *Tourism and Hospitality Research, 24*(1), 87–102. https://doi.org/10.1108/JIMA-04-2023-0133

LIAM. (2021). *Annual Report 2021*. Life Insurance Association of Malaysia. https://www.liam.org.my/pdf/annual_report_2021.pdf

Life Insurance Association of Malaysia. (2022). *Annual report 2022*. https://www.liam.org.my/pdf/annual_report_2022.pdf

Life Insurance Association of Malaysia. (2023). *Annual report 2023*. https://www.liam.org.my/pdf/annual_report_2023.pdf

Lu, M.-P., Kosim, Z., & Abdul Rahman, N. A. (2024). Financial wellbeing of poor households: Role of digital financial inclusion. *Jurnal Ekonomi Malaysia, 58*(3), 1–15. https://doi.org/10.17576/JEM-2024-5803-1

MCMC. (2024). MCMC takes steps to resolve internet issues in four Sabah areas. *Malaysian Communications and Multimedia Commission*. https://www.komunikasi.gov.my/en/public/news/19413-mcmc-takes-steps-to-resolve-internet-issues-in-four-sabah-areas

Microinsurance Network. (2021). *Innovative distribution models for inclusive insurance*. https://www.microinsurancenetwork.org

Million Dollar Round Table. (2022). Insurance trends to watch out for in Malaysia. *MDRT Global Services*. https://www.mdrt.org/en/learn/2022/html/TL2022-insurance-trends-to-watch-out-for-in-malaysia

Ministry of Finance Malaysia. (2024). *Budget 2025 Speech*. https://belanjawan.mof.gov.my/pdf/belanjawan2025/ucapan/ub25-en.pdf

Noor, N. S. M., Arifin, J., Ghazali, P. L., Razak, R. A., & Rahman, H. A. (2024). Financial Literacy Levels among Youth: The Perspectives from Undergraduate Students. International Journal of Academic Research in Business and Social Sciences, 14(7), 1498–1510. http://dx.doi.org/10.6007/IJARBSS/v14-i7/22031

Organisation for Economic Co-operation and Development. (2021). *Digitalisation and insurance: Trends and innovations*. https://www.oecd.org/finance/insurance

PricewaterhouseCoopers. (2020). *Insurance 2025 and beyond: Scenarios and implications for the sector*. https://www.pwc.com.cy/en/services/assets/insurance-2025-and-beyond.pdf

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *International Journal of Services Sciences, 1*(1), 83–98. https://doi.org/10.1504/IJSSCI.2008.017590

Staikouras, S. K. (2006). Business opportunities and market realities in financial conglomerates. *The Geneva Papers on Risk and Insurance - Issues and Practice, 31*(1), 124–148. https://doi.org/10.1057/palgrave.gpp.2510060

Takaful Malaysia. (2023). *Annual report 2023*. https://www.takaful-malaysia.com.my/corporate-governance/annual-reports/

Tennyson, Sharon L., Consumers' Insurance Literacy (July 27, 2011). Networks Financial Institute Policy Brief No. 2011-PB-06, Available at SSRN: https://ssrn.com/abstract=1896316

Phillips, E. (2023). Strategies to reduce employee turnover in the insurance industry [Doctoral dissertation, Walden University]. Walden University ScholarWorks. https://scholarworks.waldenu.edu/dissertations/12185

Wahab, S. A., Bunyau, P., & Islam, R. (2018). Microcredit for rural poverty alleviation and social well-being: A study of Sabah, Malaysia. International Journal of Academic Research in Business and Social Sciences, 8(11), 104–117. https://doi.org/10.1111/ASWP.12133

World Bank Group. (2023). *Malaysia economic monitor: Strengthening social protection systems*. https://www.worldbank.org/en/country/malaysia/publication/malaysia-economic-monitor-reports

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STRATEGIC ANALYSIS OF THE ONLINE EDUCATION INDUSTRY AMONG UNIVERSITY STUDENTS USING SWOT AND AHP APPROACH

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ABSTRACT

This study examines the strategic factors influencing the development of online education in Malaysia, particularly among university students, using an integrated SWOT-AHP framework. The rapid expansion of online education in higher education institutions has created new opportunities for learning flexibility and accessibility, while simultaneously presenting challenges related to assessment integrity, lecturer readiness, digital infrastructure, and equitable access to technology. The study applies SWOT analysis to identify the key strengths, weaknesses, opportunities, and threats affecting the effectiveness and sustainability of online education. Subsequently, the Analytic Hierarchy Process (AHP) is employed to evaluate and prioritise these strategic factors through pairwise comparison and consistency analysis. The findings reveal that weaknesses represent the most critical strategic category, with assessment integrity emerging as the highest-priority issue requiring immediate attention to maintain academic credibility. Lecturer digital readiness and government support for digital infrastructure were also identified as significant factors influencing the success of online education initiatives. The study provides practical insights for higher education institutions and policymakers in developing targeted strategies to enhance the quality, accessibility, and reliability of online learning. By integrating SWOT and AHP methodologies, this research offers a systematic and evidence-based approach for strategic planning and decision-making in the Malaysian online education sector.

Keywords: Online education, SWOT analysis, Analytic Hierarchy Process (AHP), University students, Strategic planning, Malaysia

1.0 Introduction

The online education industry refers to the delivery of teaching and learning through digital platforms such as learning management systems, video conferencing tools, and educational applications including Moodle, Google Classroom, Zoom, and Microsoft Teams. The rise of online education was significantly accelerated in Malaysia following the COVID-19 pandemic, which prompted the nationwide adoption of Emergency Remote Teaching (ERT) by higher education institutions (Kamaludin & Sundarasen, 2023). Online education has transformed traditional learning by enabling flexible and self-paced study regardless of time or location. However, it has also highlighted ongoing challenges in digital readiness, assessment credibility, and equitable access, particularly among students from rural or low-income backgrounds (Yong, 2024). The online education industry continues to shape the higher education landscape in Malaysia, influencing how universities develop, deliver, and evaluate academic programmes. It offers new pathways for inclusivity and innovation but requires strategic focus to address emerging risks and quality concerns. This research applies the SWOT–AHP strategic analysis method to the online education industry in the context of university students. The influencing factors have been quantified and ranked to identify the most critical priorities for improving the effectiveness and trustworthiness of digital learning in Malaysia.

1.1 Problem Statement

The rapid expansion of online and blended learning in Malaysian higher education—accelerated by the COVID-19 pandemic—has significantly widened access to tertiary education, with estimates indicating that over 70% of Malaysians have enrolled in at least one online course since 2020 (Digital Defynd, 2024). While this shift has provided greater flexibility and cost-efficiency, it has simultaneously exposed several enduring systemic vulnerabilities that threaten the credibility and sustainability of online education in the Malaysian context.

First, issues of assessment integrity remain prevalent. Even with the integration of digital-proctoring tools, recent findings from a study at Universiti Kuala Lumpur indicate that academic dishonesty continues to be a concern, and students often perceive virtual assessments as lacking fairness and rigour (Shamsudin, Ahmad, & Abu Hassim, 2024). This perception contributes to a broader erosion of trust in digital credentials among employers and stakeholders.

Second, there are disparities in digital readiness among academic staff, with significant variation in technological proficiency, pedagogical innovation, and attitudes toward digital instruction. Many educators still face challenges in designing interactive and learner-centred content for virtual delivery, leading to inconsistent student learning experiences across institutions (Muniandy & Kamsin, 2024).

Third, connectivity inequity remains a critical barrier to inclusive online learning. Despite advancements in national broadband infrastructure, students from rural areas and lower-income (B40) backgrounds frequently experience unstable internet connections, limited access to suitable devices, and prohibitive data costs. These factors continue to restrict equitable participation in digital classrooms (Ali, Wan Zainodin, & Tengku Mahamad, 2024).

Although existing literature has acknowledged these challenges, much of the discourse remains descriptive in nature. A critical gap exists in establishing a prioritised, data-driven framework that ranks these factors by their relative strategic importance. Without such a hierarchy, institutional responses risk becoming fragmented and reactive, thereby misallocating resources and perpetuating disparities within Malaysia's evolving online education ecosystem.

1.2 Research Objective

Given the persistent challenges facing the online education sector in Malaysian higher education—particularly concerning assessment integrity, lecturer digital-readiness, and connectivity inequities (Ali et al., 2024; Muniandy & Kamsin, 2024; Shamsudin et al., 2024)—there is a clear need for structured, evidence-driven prioritisation to inform strategic planning. Building upon prior scholarly work that employs hybrid SWOT and Analytic Hierarchy Process (AHP) methods in educational strategy (Ramaditya et al., 2023; Więckowski & Sałabun, 2023), this research aims to systematically prioritise strategic factors influencing the sustainability and effectiveness of online education among Malaysian university students. Specifically, this research addresses the following objectives:

i. To systematically identify and categorise the internal strengths and weaknesses, along with external opportunities and threats, affecting the online education landscape among Malaysian university students. This diagnosis is informed by recent empirical and qualitative assessments conducted within Malaysia's higher education context (Ali et al., 2024; Muniandy & Kamsin, 2024).

ii. To quantify the relative strategic importance of identified SWOT factors using the Analytic Hierarchy Process (AHP). By performing pairwise comparisons, this study converts qualitative assessments into numerical weights, following best-practice guidelines in higher education strategic analysis (Ramaditya et al., 2023).

iii. To validate the robustness of the derived AHP prioritisation through sensitivity analysis, ensuring reliability under varying conditions and expert judgement scenarios (Więckowski & Sałabun, 2023).

iv. To formulate evidence-based strategic recommendations, leveraging the ranked outcomes of the SWOT–AHP analysis, thus providing actionable insights for university policymakers. These insights will specifically focus on quality assurance, lecturer capacity building, and initiatives to mitigate digital equity issues, following the structured strategic conversion approach recommended by recent studies (Culduz et al., 2023).

Addressing these objectives will offer Malaysian universities a structured strategic roadmap, allowing targeted interventions that enhance online education quality, integrity, and equity, thus maximizing systemic impacts.

2.0 Methodology and Application

A research methodology describes the methods and procedures used to identify and examine information related to a specific research topic (Lada et al., 2024; Sreekumar, 2023). This research applies strategic tools such as SWOT analysis and Analytic Hierarchy Process (AHP) to identify and rank important factors that affect the e-commerce preferences among university students.

2.1 SWOT Analysis

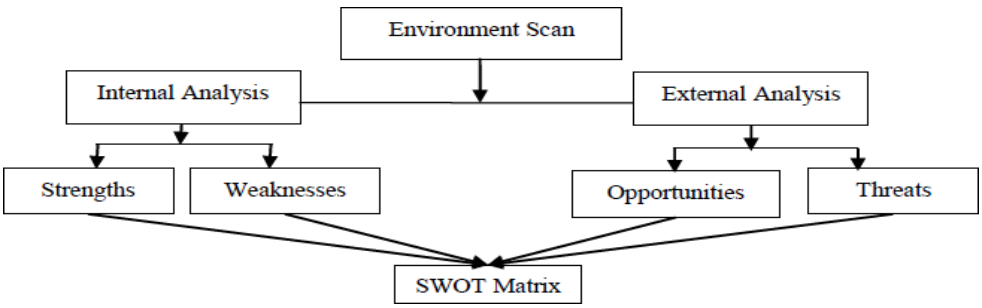

Figure 1: Framework of SWOT Analysis

SWOT analysis is a strategic planning tool used to analyse internal and external factors in order to acquire a systematic approach and support for a decision situation (Kenton, 2024). The internal and external factors are most considerable for the industry or organization's future and are referred to as strategic factors. In SWOT, these factors are grouped into four parts known as SWOT groups which include strengths, weaknesses, opportunities and threats as shown in figure 1.

Strengths and weaknesses are internal factors. They are characteristics of a business firm that offer relative advantages or disadvantages over its competition. Strengths may be any number of areas or characteristics where a business excels and has a competitive advantage over its competitors while weaknesses are the aspect or characteristics where a business is at a competitive disadvantage relative to its competitor. On the other hand, opportunities and threats are the external factors. Opportunities are elements of the external environment that are able to improve business performance growth. However, threats are elements of the external environment that could cause trouble for the business firm (Peterdy, 2024).

2.2 Analytic Hierarchy Process (AHP)

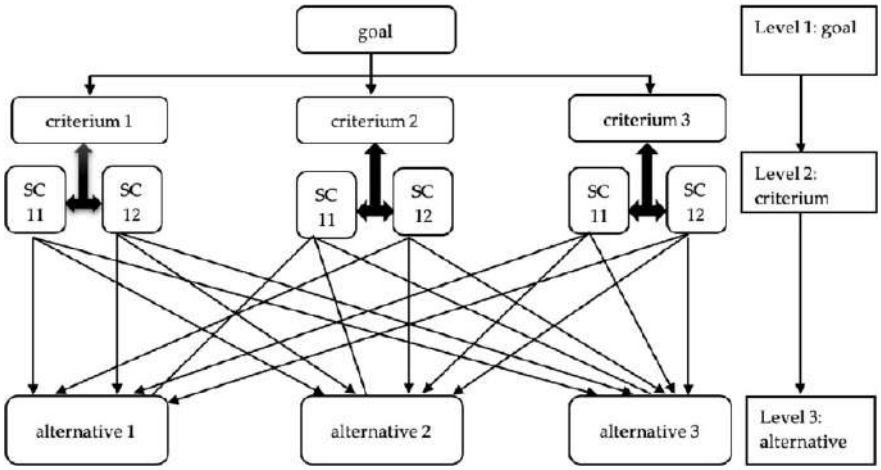

Figure 2: Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) developed by Thomas L Saaty in the 1970s (Taherdoost, 2017). It is a multi-criteria decision-making approach that breaks down the decision problem into a hierarchical structure consisting of goals, factors, sub factors and alternatives. AHP is based on three key principles. First is the structure of the model, second is the comparative evaluation of the criteria or alternatives and third is the synthesis of the priorities. In the literature, AHP has been widely applied to address various decision-making problems. The AHP organizes objectives, decision criteria and alternatives into hierarchical structure similar to a family tree. This hierarchy typically consists of at least three levels including the overall goal of the problem at top, multiple criteria defining the alternatives in the middle and the alternatives at the bottom level.

In this research, the AHP method is used to prioritize SWOT elements. After following the decomposition of the problem and construction of the hierarchy, the prioritization process begins by determining the relative importance of the criteria. In each of the levels, criteria are compared in pairs against each other with respect to their influence and in relation to the criteria at the higher level. The AHP employs a standardized comparison scale of nine levels to conduct the pairwise assessment. The AHP approach in decision-making involves four stages as mentioned below.

Stage 1: define the problem and set up the structure of the hierarchy.

The initial first level involves defining all decision components of the problem. The first top level is broad general objective. The lower levels contain the sub- objectives and attributes that influence the decision itself. The various possible alternatives exist at bottom level.

Stage 2: collection of input data.

Input data implies to the impact of each element on each sub-objective in the adjacent upper level of hierarchy. The information is placed in a matrix for pair-wise comparisons. For example, if we have seven elements on level L and two elements on level L-1, we have 7 x 7 matrix for each of the two elements on level L-1. The matrix is called as reciprocal judgement matrix. To fill this matrix, we need to make 10L (L*(L- 1)/2 5 7*6/2) comparisons. The diagonal cells of this matrix are filled with 1 and rest of the matrix is filled with reciprocal values. AHP uses a 1–9 scale of measurement in pair-wise comparisons. Nine implies to highly preferred element over the other element to which it is compared. One implies to an equally important element. In between values are signifying various degrees of relationship.

Stage 3: find the relative weights with the eigenvalue method

The relative priorities of different criteria (sub-criteria) are not easily plausible from the judgement matrix. In this stage, relative weights of a set of objects (criteria, sub-criteria and alternatives) are calculated with the matrix of pair-wise comparison B=bij which is positive and reciprocal (1–9, and 1–1/9).

Thus, the given matrix B such that

$$B = \begin{bmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ b_{n1} & \cdots & \cdots & b_{nm} \end{bmatrix}$$

Where $B_{ij} = 1/B_{ji}$ for all I, j = 1,2,3…, n

Compute a vector of relative priorities w = (w1, w2... w3). The w is normalized so that it adds up to 1 or 100. If all the judgements are consistent, then

$$b_{ik} \; b_{kj} = b_{ij} \text{ for all I, j = 1, 2, ….. , n Then,}$$

normalizing any column j of matrix B will generate the wts

$$W_i = \frac{b_{ij}}{\Sigma_{K=1} \, b_{kj}} \text{ for all I, j = 1, 2K ···, n}$$

Pair-wise judgement is often error-prone and condition in the second equation may not be

confirmed. Consequently, the final result of priorities may depend upon the column chosen for normalization. Such a problem can be solved either by logarithmic least square (LLS) or eigenvector method developed by Saaty. Latter is a simpler procedure than former and also involves averaging all possible ways of comparing alternatives (Harker & Vargas, 1987). Calculations of the wt. vector as the right eigenvector of the matrix B:

$$Bw = \lambda_{max} W$$

where λ max is the maximum eigenvalue of matrix B. So the weight vector can be enumerated as

$$Wi = \frac{\sum_{j-1}^{n} bij * wj}{\lambda_{max}}$$

Inconsistencies in judgement can be calculated by eigenvector method. Satty research depicts for λ max n for positive reciprocal matrix. For a perfectly consistent matrix then λ max = n.

Satty defined a consistency index by the formula

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

Also, consistency ratio (CR) is measured as ratio of CI and random index (RI)

$$CR = CI/RI$$

Therein RI the random index is computed as the mean of CI of randomly generated matrices of size n.

If CR < 0.1, it is acceptable, and if CR > 1, the DM has to re-evaluate the decisions in order to reduce inconsistencies.

Stage 4: develop a composite priority vector for bottom most level of the hierarchy to rate alternative decision strategies

The aim of employing AHP is to rank or prioritize different decision alternatives depending on how well each one meets the objective or goal. The final aggregate ranking for the decision alternatives is done by adding up all the weighted eigen entries corresponding to all levels (right down to the alternatives). Eigenvectors are weighted according to weight of the criteria.

2.3 SWOT-AHP Hybrid Methodology

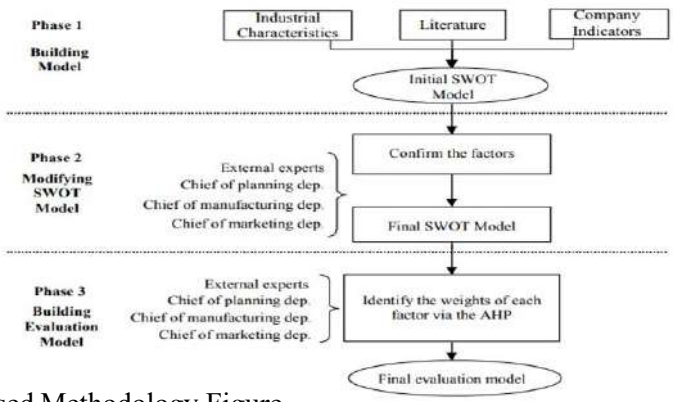

Figure 3: Phases of Proposed Methodology Figure

3: Phases of Proposed Methodology

Figure 3 show a SWOT-AHP based strategic management model. In order to create a SWOT-AHP based strategic management model, three phases model needed which is building initial task, modifying factors, and building an evaluation model. SWOT factors are subjected to pairwise comparisons concerning higher level factors, in order to generate the priority factors using eigenvalue calculations. Although SWOT analysis lacks the quantitative feature needed to generate ranking mechanism for identified factors, the integration of the Analytic Hierarchy Process (AHP) addresses this limitation. The hybrid model of SWOT-AHP systematically qualifies the relative importances of SWOT factors and evaluates their intensity, thereby providing a robust framework for strategic decision-making.

Application of AHP in the SWOT framework is supposed to quantify and evaluate the importance of the SWOT factors systematically. Three major steps are followed in this regard. First and foremost is the identification of the internal and external key factors such as strengths, weaknesses, opportunities and threats. Next is applies the pairwise comparisons to capture the weights of each SWOT group. Finally uses the AHP to derive the relative priorities of each factor within the SWOT groups. The overall weight and ranking of each factor are obtained by multiplying its local weight by the weight of its respective group, resulting in a comprehensive prioritization framework.

Table 1: Pairwise Comparison Scale

Expert opinion on pair-wise ranking of importance of two sub-criteria with reference to the main criteria in tree hierarchy	
If option A and option are equally important	1
If option A is moderately more important than option B	3
If option A is strongly more important than option B	5
If option A is very strongly more important than option B	7
If option A is extremely more important than option B	9
If option A and option B are equally important	1

Table 1 provides a clear representation of the AHP scale which often used for pairwise comparisons in decision-making. In decision-making frameworks such as AHP, a pairwise comparison scale is needed to quantify the relative importance of two criteria or sub-criteria with respect to a higher-level goal or main criterion. After identifying all the key factors for each SWOT category, they are subjected to pairwise comparisons to evaluate their relative importance within each group. For instance, comparing one strength to another strength. Furthermore, higher-level comparisons are conducted to determine the weight of each SWOT category relative to others. For example, the importance of strengths versus threats. Eigenvalue calculations are used to generates quantitative weights for all the SWOT factors and ranking them based on their strategic significance. The pairwise comparison scale is based on a set of values ranging from 1 to 9. This scale ensures consistency and allows decision-makers to mathematically evaluate subjective judgements which are then processed to calculate weights for the key factors of SWOT categories. Furthermore, these weights provide a quantitative foundation for prioritization in strategic analysis.

3.0 SWOT Matrix

Table 2: SWOT Matrix of E-commerce Industry

Strength (S)
(S1) Flexible time and location for students (Salleh & Subbarao, 2021) (S2) Lower costs for transport and living (Yong, 2024) (S3) Students are used to digital tools (Rathinam et al., 2023) (S4) LMS like Moodle are widely used in universities (Kamaludin & Sundarasen, 2023) (S5) Government supports digital learning infrastructure (MOF, 2021)
Weaknesses (W)
(W1) Online exams raise cheating concerns (Yong, 2024) (W2) Poor internet in rural areas (Salleh & Subbarao, 2021) (W3) Lecturers lack online teaching skills (Albelbisi & Yusop, 2020) (W4) Too many assignments and poor course design (Yong, 2024) (W5) Less interaction and support from peers (Salleh & Subbarao, 2021)
Opportunities (O)
(O1) Better course design using mixed methods (Asmawi & Jaladin, 2018) (O2) Analytics can detect struggling students (Rathinam et al., 2023) (O3) AI tools for online learning can personalise feedback (Yong, 2024) (O4) More digital training to help lecturers improve (Albelbisi & Yusop, 2020) (O5) Microcredentials within formal degrees (Kamaludin & Sundarasen, 2023)
Threats (T)
(O1) Cybersecurity risks with online platforms (Yong, 2024) (O2) Employers doubt online degree quality (Kamaludin & Sundarasen, 2023) (O3) Students multitask and lose focus online (Salleh & Subbarao, 2021) (O4) Heavy use of digital platform causes risk to national data (MOF, 2021) (O5) Digital gaps hurt poor students' learning (Yong, 2024)

SWOT matrix provides a comprehensive understanding of the online education industry's internal strengths and weaknesses as well as external opportunities and threats. According to Table 2, there are five factors for each of the key elements for the SWOT categories.

The online education industry offers several strengths that benefit university students. One of the key advantages is the flexibility of time and location, which allows students to attend classes and complete coursework from anywhere at their convenience (Salleh & Subbarao, 2021). This is especially helpful for students balancing studies with part-time jobs or family commitments. In addition, online education helps reduce costs related to transportation and accommodation, making it more financially accessible for students from lower-income households (Yong, 2024). Most university students today are digital natives, making it easier for them to adapt to online platforms and learning tools (Rathinam et al., 2023). Furthermore, learning management systems (LMS) such as Moodle and Google Classroom are already widely used in Malaysian universities, allowing for consistent and structured content delivery (Kamaludin & Sundarasen, 2023). Government initiatives such as JENDELA and MyDIGITAL have also improved internet infrastructure and supported digital learning growth across the country (MOF, 2021).

Despite these strengths, the online education industry also presents several weaknesses that affect students' learning experiences. Firstly, concerns about academic integrity remain significant, as online exams can be more vulnerable to cheating compared to in-person assessments (Yong, 2024). Moreover, many students, particularly those in rural areas, face difficulties accessing stable internet and digital devices, limiting their ability to participate effectively (Salleh & Subbarao, 2021). Another major concern is the lack of digital teaching skills among lecturers, which can lead to poor content delivery and reduced student engagement (Albelbisi & Yusop, 2020). Students have also reported excessive workloads and poorly designed assessments that contribute to stress and burnout (Yong, 2024). Lastly, the lack of peer interaction and direct support from lecturers can make students feel isolated and less motivated to learn (Salleh & Subbarao, 2021).

The online education industry also has several opportunities for further improvement and growth. Better course design using interactive and blended approaches can enhance learning outcomes and engagement (Asmawi & Jaladin, 2018). The use of learning analytics allows institutions to track student progress and identify those who may be struggling, enabling early interventions (Rathinam et al., 2023). Artificial Intelligence (AI) tools such as automated feedback and adaptive learning systems can offer a more personalised learning experience (Yong, 2024). There is also an opportunity for universities to invest more in structured training for lecturers to improve their online teaching effectiveness (Albelbisi & Yusop, 2020). Lastly, the expansion of microcredential programmes within formal degree structures provides flexibility and allows students to build skills that are relevant to the job market (Kamaludin & Sundarasen, 2023).

However, online education faces a number of external threats that could impact its effectiveness for university students. Cybersecurity remains a key concern, with risks such as data breaches and identity theft that can undermine trust in online systems (Yong, 2024). Employers may also continue to question the quality and rigour of fully online degrees, which could affect graduate employability (Kamaludin & Sundarasen, 2023). Students often multitask or become distracted during online classes, leading to low engagement and shallow learning (Salleh & Subbarao, 2021). The heavy reliance on third-party platforms such as Zoom and Google also raises issues related to data ownership and national digital sovereignty (MOF, 2021). Lastly, digital inequality remains a critical threat, as students from disadvantaged backgrounds struggle with limited access to devices and connectivity, widening the education gap (Yong, 2024).

Table 3: Importance of Degree of SWOT Factors (SWOT Standardized Matrix)

SWOT Number	SWOT Groups	Weight	Rank	(+)	(-)
1.	Weaknesses (W)	46.6%	1	15.5%	15.5%
2.	Strength (S)	35.5%	2	11.1%	11.1%
3.	Opportunities (O)	12.8%	3	3.0%	3.0%
4.	Threats (T)	5.1%	4	1.0%	1.0%

The SWOT Standardised Matrix (Table 3) reveals that Strengths carry the heaviest weight at 46.6

per cent, closely followed by Weaknesses at 35.5 per cent. Opportunities account for 12.8 per cent, while Threats contribute the remaining 5.1 per cent. These figures show that positive internal capabilities now outweigh vulnerabilities and external factors in determining the strategic direction of online education among university students.method course design) that can be captured once core strengths and weaknesses are addressed. Threats receive the lowest weight (5.1 %), suggesting that external risks are considered important but relative to internal issues less pressing for immediate strategy.

Table 4: Importance of Degree of Strengths

Categories	Strength (S)	Weight	Rank	(+)	(-)
1.	Flexible time and location (S1)	24.8%	3	7.7%	7.7%
2.	Lower transport and living cost (S2)	32.2%	1	10.0%	10.0%
3.	Student used to digital tools (S3)	25.6%	2	12.8%	12.8%
4.	LMS used widely in universities (S4)	10.8%	4	1.9%	1.9%
5.	Government supports digital learning infrastructure (S5)	6.7%	5	1.2%	1.2%

Table 4 indicates that lower transport and living costs (32.2 %) are regarded as the most valuable strength. Students' familiarity with digital tools (25.6 %) and flexible time and location (24.8 %) rank second and third respectively, emphasising convenience as a pivotal driver of online learning. The widespread use of LMS platforms (10.8 %) and ongoing government support for digital infrastructure (6.7 %), although weighed lower, still play supportive roles in sustaining the system.

Table 5: Importance of Degree of Weaknesses

Categories	Weaknesses (W)	Weight	Rank	(+)	(-)
1.	Online exams raise cheating concerns (W1)	49.2%	1	11.8%	11.8%
2.	Poor internet in rural areas (W2)	20.7%	2	8.1%	8.1%
3.	Lecturers lack online teaching skills (W3)	11.7%	4	3.4%	3.4%
4.	Too many assignments and poor course design (W4)	12.8%	3	4.1%	4.1%
5.	Less interaction and support from peers (W5)	5.6%	5	1.5%	1.5%

As shown in Table 5, concerns over cheating in online examinations (49.2 %) stand out as the most critical weakness. Poor internet connectivity in rural areas (20.7 %) follows, highlighting persistent digital divides. Excessive workload and weak course design (12.8 %) and lecturers' limited online-teaching skills (11.7 %) occupy third and fourth positions, while reduced peer interaction (5.6 %) remains the least-weighted weakness.

Table 6: Importance of Degree of Opportunities

Categories	Opportunities (O)	Weight	Rank	(+)	(-)
1.	Better course design using mixed methods (O1)	45.2%	1	22.4%	22.4%
2.	Analytics can detect struggling students (O2)	17.0%	3	6.0%	6.0%
3.	AI tools can personalize feedback (O3)	18.2%	2	4.3%	4.3%
4.	More training to help lecturers improve (O4)	1.6%	4	3.5%	3.5%
5.	Microcredentials within formal degrees (O5)	9.0%	5	6.8%	6.8%

Table 6 shows that improving course design through mixed methods (45.2 %) is the foremost opportunity. AI tools that personalise feedback (18.2 %) and analytics that detect struggling students (17.0 %) rank next, signalling growing interest in data-driven support mechanisms. Expanded lecturer training (10.6 %) and micro-credential integration (9.0 %) round off the opportunity set.

Table 7: Importance of Degree of Threats

Categories	Threats (T)	Weight	Rank	(+)	(-)
1.	Cybersecurity risks with online platforms (T1)	49.8%	1	27.0%	27.0%
2.	Employers doubt online degree quality (T2)	25.4%	2	8.5%	8.5%
3.	Students multitask and lose focus online (T3)	9.0%	4	2.2%	2.2%
4.	Heavy use of Zoom and Google tools (T4)	6.4%	5	2.0%	2.0%
5.	Digital gaps hurt poor students' learning (T5)	9.4%	3	3.7%	3.7%

In Table 7, cyber-security risks associated with online platforms (46.5 %) emerge as the dominant threat. Employer scepticism toward the quality of online degrees (29.0 %) is the second-largest concern. The remaining threats, students' tendency to multitask and lose focus (9.4 %), heavy reliance on Zoom and Google tools (7.8 %), and digital gaps affecting disadvantaged learners (7.3 %) are weighted considerably lower, yet still warrant attention.

Table 8: Overall Priority Scores of SWOT Factors

SWOT Group	Group Priority	SWOT Factors	Factor Priority Within the Group	Overall Priority of Factor	Rank
Strength	46.6%	Flexible time and location (S1)	24.8.9%	11.56%	4
		Lower transport and living cost (S2)	**32.2%**	**15.01%**	**2**
		Student used to digital tools (S3)	25.6%	11.93%	3
		LMS used widely in universities (S4)	10.8%	5.03%	7
		Government supports digital learning infrastructure (S5)	6.7%	3.12%	10
		Online exams raise cheating concerns (W1)	**49.2%**	**17.47%**	**1**
Weaknesses	35.5%	Poor internet in rural areas (W2)	20.7%	7.35%	5

		Lecturers lack online teaching skills (W3)	11.7%	4.15%	9
		Too many assignments and poor course design (W4)	12.8%	4.54%	8
		Less interaction and support from peers (W5)	5.6%	1.99%	14
Opportunities	12.8%	**Better course design using mixed methods (O1)**	**45.2%**	**5.7%**	**6**
		Analytics can detect struggling students (O2)	17.0%	2.18%	13
		AI tools can personalise feedback (O3)	18.2%	2.33%	12
		More training to help lecturers improve (O4)	10.6%	1.36%	16
		Microcredentials within formal degrees (O5)	9.0%	1.15%	17
Threats	5.1%	**Cybersecurity risks with online platforms (T1)**	**46.5%**	**2.37%**	**11**
		Employers doubt online degree quality (T2)	29.0%	1.48%	15

		Students multitask and lose focus online (T3)	9.4%	0.48%	18
		Heavy use of Zoom and Google tools (T4)	7.8%	0.40%	19
		Digital gaps hurt poor students' learning (T5)	7.3%	0.38%	20

Table 8 illustrates the ranking of the SWOT factors and pinpoints the principal elements shaping the online-education industry among university students. According to the revised results, strengths now emerge as the most influential group, commanding a group priority of 46.6 per cent. This emphasises the strategic importance of advantages such as lower transport and living costs, students' familiarity with digital tools and the widespread use of LMS platforms. Collectively, these strengths underpin learning by enabling flexibility, cost efficiency and reliable course delivery.

Weaknesses occupy the second position with a priority of 35.5 per cent. Although no longer the dominant category, they still highlight pressing vulnerabilities—chief among them academic-integrity concerns in online examinations and uneven internet connectivity in rural areas. Addressing these shortcomings remains essential to safeguard educational credibility and ensure equitable access.

Opportunities account for 12.8 per cent, signalling meaningful but secondary growth potential. Key opportunities include improving course design through mixed or blended methods, deploying AI-driven personalised feedback and expanding micro-credential offerings. By capitalising on these areas, universities can enrich learner engagement and support lifelong upskilling.

Threats carry the smallest share at 5.1 per cent, yet they continue to pose non-trivial risks. Cyber-security vulnerabilities top this list, followed by employer scepticism toward fully online qualifications. Digital inequity and dependence on third-party platforms complete the threat landscape, underscoring the need for robust risk-mitigation and trust-building measures.

Overall, the findings chart a clear roadmap: leverage major strengths, remedy critical weaknesses, pursue high-value opportunities and contain emerging threats. The analysis required 46 pairwise comparisons (40 within the four groups plus six at the group level). The overall Consistency Ratio is 4.2 per cent, well below the 10-per-cent threshold, confirming reliable judgements. The principal eigenvalue for the four-group comparison is 4.114, and the eigenvector solution stabilized after five iterations ($\delta = 2.2 \times 10^{-8}$), attesting to the robustness of the results. This structured SWOT–AHP approach thus offers a sound, evidence-based framework for strategic decision-making aimed at strengthening online education in Malaysian universities.

4.0 Limitation

This research focuses solely on a single sector, which is also a broad and evolving domain, namely online education. Furthermore, the focus of this study is on university students, which may not fully represent the perspectives of other important user segments such as working adults, school-aged learners, or educators

themselves, whose needs and challenges may differ significantly. In conducting the analysis, this research employed strategic tools such as SWOT analysis and the Analytic Hierarchy Process (AHP) to identify and rank key factors across the SWOT categories — strengths, weaknesses, opportunities, and threats. The ranking of these factors was carried out based on simulated expert judgement and supported by secondary sources, which were then systematically evaluated using the AHP method. Although this approach provides a structured framework for prioritising strategic issues, the reliance on expert assumptions and secondary data may limit the scope and diversity of viewpoints considered. Nonetheless, this combination of methodologies ensures a comprehensive and analytical evaluation of the strategic priorities within the online education sector in Malaysia and yields consistency ratios below five per cent, indicating reliable judgements.

5.0 Conclusion

In a nutshell, the strategic analysis of the online-education industry using the SWOT–AHP approach offers a robust framework for identifying the key factors that influence its effectiveness, particularly for university students. The results indicate that strengths carry the greatest weight in shaping strategic direction (46.6 %), followed by weaknesses (35.5 %), opportunities (12.8
%), and threats (5.1 %).

Strong internal advantages—lower living and transport costs, student familiarity with digital tools, flexible schedules, and the widespread use of LMS platforms provide a solid foundation for online learning. Nevertheless, notable weaknesses remain: online-exam integrity issues, rural connectivity gaps, heavy workloads, and uneven lecturer readiness continue to affect student engagement and satisfaction.

Although opportunities rank third, they still offer meaningful paths for advancement. These include blended-course redesign, AI-driven personalised feedback, learning analytics, and micro-credential integration, all of which can enhance learning personalisation and foster lifelong upskilling. Threats hold the lowest overall weight, yet factors such as cyber-security risks, employer scepticism about online degrees, and digital inequity still require vigilant management to sustain trust in online qualifications.

Taken together, the findings guide higher-education institutions and policymakers toward a more resilient, student-centred online-learning ecosystem. By leveraging dominant strengths, remedying critical weaknesses, harnessing high-value opportunities, and containing emergent threats, universities can improve educational quality, bolster student confidence, and position Malaysian higher education for sustained digital innovation and growth.

References

Albelbisi, N. A., & Yusop, F. D. (2020). SWOT analysis on MOOC implementation in Malaysia: A review. In Open and Distance Learning Initiatives for Sustainable Development (pp. 115–134). IGI Global.

Asmawi, A., & Jaladin, R. A. M. (2018). Improving course design through blended learning: A case study in Malaysian higher education. Malaysian Online Journal of Educational Technology, 6(2), 1–15.

Culduz, M., Altun, M., & Dereli, T. (2023). A SWOT–AHP approach for determining the strategic priorities of distance education at higher-education institutions. Education and Information Technologies, 28(3), 3199–3223. https://doi.org/10.1007/s10639-022-11465-2

Kamaludin, A., & Sundarasen, S. (2023). Online learning in Malaysian higher education: Strengths, weaknesses, opportunities, and threats. Journal of Education and e-Learning Research, 10(1), 23–31.

Lada, S., Chekima, B., Ansar, R., Lim, M. F., Bouteraa, M., Abdul Adis, A.-A., Abd Karim, M. R., & Yong, K. (2024). Strategic alternatives for Muslim-friendly homestay in Sabah Malaysia: A SWOT/TOWS analysis. Journal of Islamic Marketing, 15(6), 1534–1559. https://doi.org/10.1108/JIMA-07-2022-0218

Ministry of Finance Malaysia. (2021). MyDIGITAL and JENDELA initiatives. Government of Malaysia.

Muniandy, B., & Kamsin, N. (2024). Readiness and challenges in implementing digital learning among Malaysian educators. International Journal of Academic Research in Business and Social Sciences, 14(1), 55–67. https://doi.org/10.6007/IJARBSS/v14-i1/39147

Ramaditya, M., Hariyati, Y., & Winarno, A. (2023). Application of SWOT and AHP in the analysis of e-learning implementation in higher education. International Journal of Educational Technology in Higher Education, 20(1), Article 31. https://doi.org/10.1186/s41239-023-00394-8

Rathinam, N. S., Mahmud, R., & Mamat, M. (2023). Trends, issues, and challenges in e-learning in the Malaysian education system: A review of literature. Frontiers in Education, 8, 1062219. https://doi.org/10.3389/feduc.2023.1062219

Salleh, S., & Subbarao, S. K. (2021). SWOT analysis of students' perceptions of online learning during COVID-19 in a Malaysian private university. Journal of Education and Learning, 15(2), 128–138.

Shamsudin, R., Ahmad, N., & Abu Hassim, M. N. (2024). Exploring the impact of online assessment tools and digital proctoring on academic integrity in higher education: Case of Universiti Kuala Lumpur. Higher Education Studies, 14(2), 88–102. https://doi.org/10.5539/hes.v14n2p88

Więckowski, J., & Sałabun, W. (2023). Sensitivity analysis in multi-criteria decision-making problems: A review of methods and applications. Procedia Computer Science, 222, 463–472. https://doi.org/10.1016/j.procs.2023.09.176

Yong, M. H. (2024). The impact of online learning among Malaysian university students: A post-pandemic reflection. International Journal of Educational Management, 38(1), 45–61.

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STRATEGIC PLANNING FOR FOOD INDUSTRY AN APPLICATION ON NESTLE: INTEGRATING SWOT/TOWS AND AHP METHODS

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ABSTRACT

This research employs both AHP and SWOT/TOWS techniques to perform a strategic assessment of the food industry (Lee & Carter, 2012; Khan & Hackney, 2015; Zhang, 2019). The idea is to provide the broadest perspective of the organization and the environment to recognize significant strategic priorities that will increase sustainability and competitive advantage of the industry. SWOT analysis is considered basic and provides an overview of the state of the industry based on various aspects. To move beyond simple identification, the TOWS matrix is applied to translate the SWOT findings into concrete strategic options by matching internal strengths and weaknesses with external opportunities and threats. This framework helps in formulating actionable strategies aligned with different scenarios, thus enhancing decision-making effectiveness. For a critical evaluation of the priorities based on real data, the study utilizes the AHP technique. AHP decomposes the evaluation into a logical hierarchical structure that allows for a comprehensive comparison of the factors relative to each other. This combination of qualitative and quantitative research offers insights on the issues and prospects impacting stakeholders of the food industry. Main strategic areas discussed include supply chain management for improvement, product development and innovation, dealing with regulatory frameworks, and meeting consumer preferences. In summary, this study stresses the significance of strategic management in remediating the challenges inherent in the food industry. Thus, using the SWOT, TOWS, and AHP methodologies, the participants obtain the information necessary to make decisions and improve the performance of the entire industry. Apart from benefitting the identification of key issues, this approach also helps in the development of issue-specific strategies for growth and competitive advantage in a changing market context.

KEYWORDS: Strategic Planning, Food Industry, SWOT/TOWS, AHP, Nestle.

1.0 INTRODUCTION

The food industry plays a pivotal role in the global economy since it influences food production, food processing, food distribution and food consumption (Lee & Carter, 2012). This is a diversified sector that comprises of agricultural production, food processing, wholesale and retail trade, and catering which is essential to human life- therefore there is necessity of developing new products and services that would satisfy the emerging tastes, health considerations and technological improvements in the market.

The purpose of this paper is to provide a more in-depth examination of the food industry in order to assist major stakeholders in the industry including governments, producers, retailers, and consumers to make relevant choices that will enhance the competitiveness and sustainability of the industry in future. Such quantitative methods implemented in this broad evaluation procedure are SWOT, TOWS, and Analytic hierarchy Process (AHP). Such methodologies assist stakeholders in attaining objective-based management by ranking business operations in critical internal facilitators of operational performance and external forces, such as market opportunities and regulatory risks, that could define industry performance (Khan & Hackney, 2015).

Specifically, the analysis uses the SWOT-AHP model of strategic evaluation and involves the TOWS matrix as the balance between analysis and action. Whereas SWOT reveals internal weaknesses and strengths and external threats and opportunities, TOWS puts the results of the analysis into strategic choices by logically combining internal and external variables. This assists in the development of adaptive, market defensive, aggressive or corrective policies (depending on the interaction of these factors) to enable a more initiative reaction to market behaviour.

This study focuses on using the SWOT/TOWS-AHP model and conducting an extensive analysis of the food industry. The study provides both quantitative and qualitative approaches in an attempt to present a balanced view of this industry, and the way it can evolve in future. The results obtained in this study are very insightful and will assist in developing processes and methods that can be instrumental in attempting to open up and utilize economic opportunities, improve the quality and safety of the foods delivered in the marketplace, and ensure that all producers and sellers fulfill established legal requirements to allow growth to be sustainable along the entire food chain (Zhang, 2019).

In general, it should be stressed that strategic analysis is an essential aid to solutions to food industry problems. SWOT, TOWS and AHP could be regarded as the methodologies that complement each other and assist stakeholders in realizing the dynamics in the industry, developing the effective initiatives to minimise the threat and to take advantage of the
opportunities, which leads to the sustainable development and competitive advantage in the global food market.

2.0 LITERATURE REVIEW

Food industry has been changing a lot owing to increased consumer demands, technology and changes in regulations. Strategic planning has been found to play a critical role in enabling food companies to cope with these changes and still be able to be competitive. Kurttila et al. (2000) also suggest that Qualitative tools, such as the SWOT, when incorporated into quantitative approaches to decision-making, such as the Analytic Hierarchy Process (AHP) enhances the credibility of the strategic evaluations. The hybrid scheme enables a decision-maker to arrange and rank internal and external factors more objectively. Kangas et al. (2003) also point out that the use of AHP in SWOT brings about strategic transparency especially in environments that are complex like in the food industry.

Nestle being the largest food and drink company in the world presents an interesting study case in the application of these strategic frameworks. Financial strength, diverse products and broad distribution channels have enabled the firm to attain a global market leadership. Nevertheless, in spite of the above strengths, Nestlé has been criticized strategically. During the tenure of the former CEO

Mark Schneider, Nestlé placed substantial emphasis on the improvement of operating margins, which was allegedly achieved at the cost of innovation and brand building. Reuters (2024) further reports that the company lagged behind its peers, such as PepsiCo and Unilever, in volume growth because it decreased its investments in product innovation and marketing. In 2024, when Laurent Freixe took over as CEO, he began a new organic growth drive that involved simplifying the business operations, revitalizing core brands and embarking on more research and development (Reuters, 2024).

Along with financial strategy, Nestlé has built a lot of investment in sustainability and digital transformation as well. According to Voytovych and Tereshchuk (2021), the use of AI, big data, and IoT in its marketing and production has facilitated operational efficiency and customer interaction in Nestlé. Sustainability measures have been taken by the company, as well as developing zero-water factories or reducing water withdrawal by 41% per tonne of product since 2005 (Nestlte, 2023). Such initiatives not only help lessen the environmental burden, but it also helps build a strong brand among the environmentally-aware consumers. In spite of these strategic initiatives, Nestlé is not spared of the ethics, safety and reputation related challenges. The Indian Maggi noodles crisis (2015) when the products were detected to have high amount of lead in them, really hurt the consumer confidence. Also, the company has been accused of child labor in cocoa supply chains, deforestation, and illegal aggressive marketing of infant formula (Schrempf-Stirling & Palazzo, 2016). These image problems explain why managing weaknesses and threats should be done in a systematic way- hence the applicability of models such as TOWS and AHP in generating strategic responses.

Last but not least, the literature on competitive strategy also justifies a mixed mode of approach to companies such as Nestlé. The combination of cost leadership and differentiation is discussed by Salavou (2015) as allowing firms to adjust to the competitive environments and maintaining innovation. Pertusa-Ortega et al. (2009) also confirm this when they say that strategic agility, customer focus, and process innovation are the requirements in a dynamic industry like the food and beverage industry. Thus, Nestlé will have to keep juggling between operational efficiency and long-term innovation and ethical brand keeping. To conclude the combination of SWOT, TOWS and AHP is quite applicable in strategic analysis of Nestle. It facilitates a systematic decision-making process which takes into consideration the internal strength and the external market forces. Considering the financial and global capabilities of Nestlé, as well as its weak aspects related to innovation and reputation, this hybrid model would provide a valid structure to prioritize strategic initiatives and stay ahead of the competition in the changing and challenging industry.

3.0 METHODOLOGY

3.1 Research Design

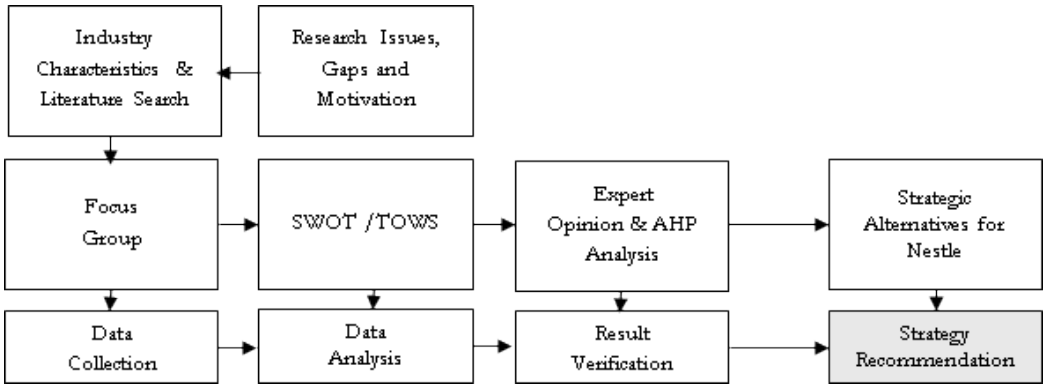
The research design of the present study takes the form of three major stages: (1) identification of the objectives of the research, (2) data collection and analysis, (3) assessment of the findings using strategic planning tools. The steps are initiated with defining the main objective of the analysis - to evaluate the strategic positioning of Nestledge in the food industry with the help of an integrated model of SWOT, TOWS and Analytic Hierarchy Process (AHP). On the basis of this purpose, the following research objectives are derived, such as to identify key internal and external strategic factors, and prioritise these on the basis of their strategic significance.

The second phase involves the gathering of relevant secondary information; this includes company reports, peer-reviewed journals and market intelligence. This information is further utilized to create a SWOT matrix in which the strengths, weaknesses, opportunities, and threats affecting Nestlé are categorized. After this the TOWS matrix is applied to come up with strategic alternatives by pairing internal and external factors. In order to offer a more formal and measurable analysis, the Analytic hierarchical Process (AHP) is used. AHP allows pair-wise comparisons of the elements of SWOT and the TOWS strategies and gives weighted scores, which indicate their relative importance in strategic decisions.

The evaluation and interpretation of the results are done in the last stage through the consistency ratios and a general strategic framework is prepared with the reference to the prioritised strategies. The nature of this study as a document analysis and expert-informed weighting did not

need any physical location or recruitment of participants. Nonetheless, all the data sources were purposely chosen to ascertain relevance, credibility, and study objective concordance. This design is systematic in the sense that it combines qualitative and quantitative wisdom in strategic planning with food industry. Figure 3 shows the flow of the study:

Figure 3.0: Flow of the study



3.2 Analysis of SWOT

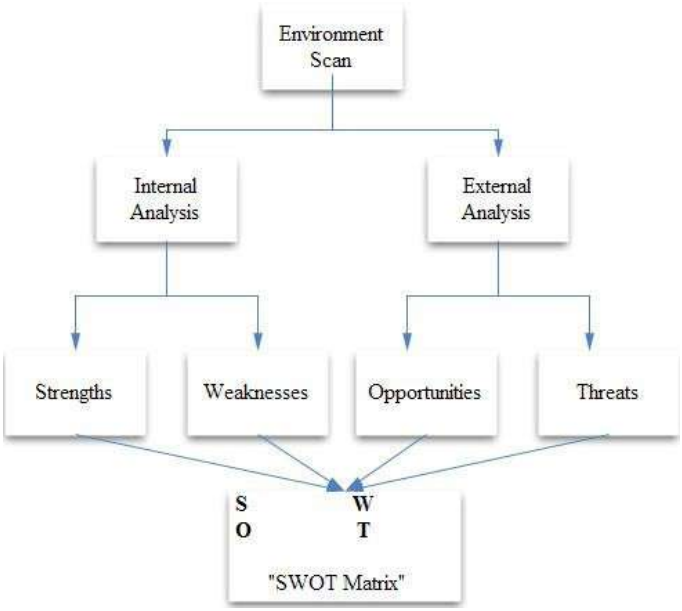


Figure 3.1: SWOT analysis framework (Kahraman, 2008)

SWOT analysis can be regarded as one of the most influential techniques that is commonly used across different industries, including the food industry, to perform the assessment of firm's strengths, weaknesses, opportunities, and threats (Kurttila et al. , 2000; Kangas et al. , 2003; Yüksel & Dağdeviren, 2007). In essence, it categorizes these factors into four distinct groups: known as SWOT analysis that stands for strength, weakness, opportunity, and threat and provides a framework for decision-making process.

In the context of the food industry, strengths include factors within a firm's control that provide it with competitive advantage, including; supply chain management, reputation, and unique food technologies. On the other hand, weaknesses refer to internal shortcomings including inefficient production systems, lack of product diversification or inability to meet certain regulations. Threats on the other hand are external factors like new entrants, threats in new markets, and shifting customer preferences and demands for healthier and organic food products, which the industry can leverage on for its development. While threats include environmental factors that may be external such as economic fluctuations, change in customer preferences, and regulatory policies which may be a challenge.

The primary reasons for using SWOT analysis as part of the strategic planning for the food industry are to match the internal strengths with the external opportunities in the operating environment and to minimize the threats that stem from weaknesses. It makes it easier for the various stakeholders to design a set of strategies that seeks to build on the existing strengths, capitalize on the existing opportunities, manage the existing threats and overcome the existing weaknesses. In this way, companies are able to adapt and even create new strategic models in the face of a challenging economic environment and global competition.

For instance, Figure 3.1 borrowed from Kahraman et al. (2001) shows how SWOT analysis fits into an environmental survey thus showing its pragmatic usefulness especially when making strategic choices and managing operations in the food industry. This system does not only make decision making easy but also allows for forward planning in order to actively manage uncertainties and capitalize on opportunities which are paramount to the sustainability of the food business.\

3.3 SWOT-AHP Hybrid Methodology

In this study, the AHP structure results from the SWOT matrix and is separated in three parts:
(a) goal to be achieved by the decision, (b) the SWOT groups and (c) the factors included within each SWOT group (sub-criteria). The hierarchical representation of the SWOT structure is shown in Figure 2.

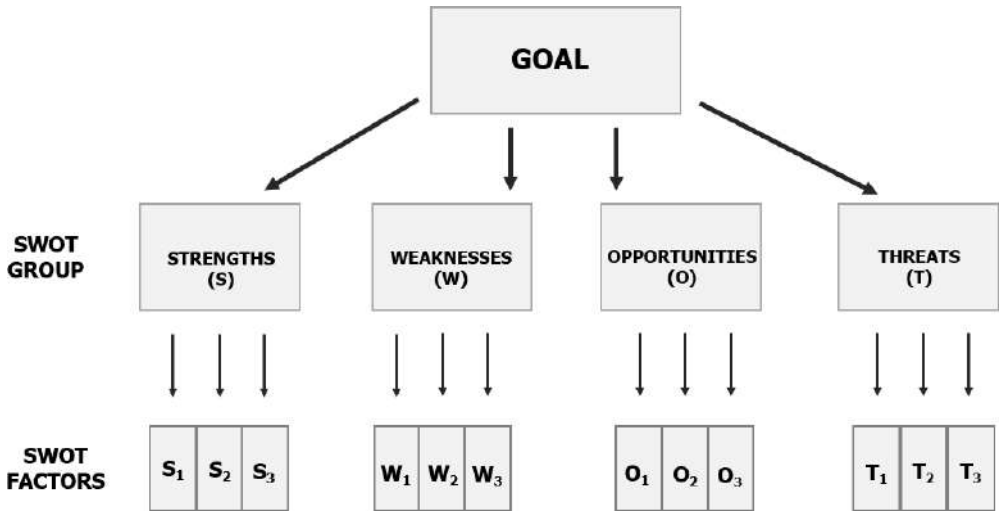


Figure 3.2: Hierarchical Structure of the SWOT Matrix

Nestlé S.A. is a Swiss company that operates in the food and beverage industry and has a diverse range of products. Its main office is located in Vevey, Switzerland. Founded in 1867, this corporation has the title of being the largest food company globally, based on its revenues and other indicators like market capitalization. Nestlé offers a diverse array of products in its portfolio, encompassing several categories such as infant nutrition, packaged water, breakfast cereals, coffee, tea, sweets, dairy products, ice cream, frozen food, pet food, and snacks. Nestlé has a presence in 189 countries around the world, demonstrating its wide-reaching global presence.

We utilise Nestle as a benchmark corporation in food industry to assess the SWOT analysis employing AHP methods. The comparison scale is used to conduct pairwise comparisons and ascertain the relative significance between each pair of SWOT variables. Following the digitization of the SWOT framework using the Analytic Hierarchy Process (AHP), the aggregated matrix was used to determine the vector weights or priority for the studied groups and components.

In order to develop a strategic management model based on SWOT/TOWS-AHP, we have devised a three-phase model consisting of the following steps: establishing the starting tasks, adjusting the components, and constructing an evaluation model (refer to Figure 1). Firstly, a SWOT analysis is conducted, and a matrix is constructed. The SWOT matrix incorporates and outlines the pertinent elements and internal conditions.

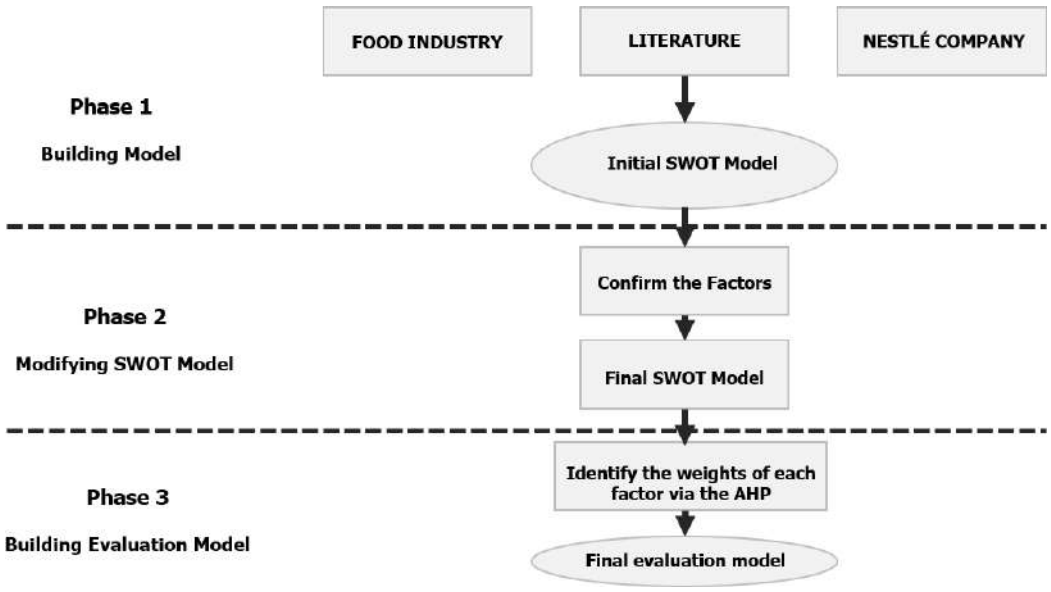


Figure 3.3: Phase of Proposed Methodology

Table 3.0: Pairwise Comparison Scale

Expert opinion on pair-wise ranking of importance of two sub-criteria with reference to the main criteria in tree hierarchy	
If option A and option are equally important	1
If option A is moderately more important than option B	3
If option A is strongly more important than option B	5
If option A is very strongly more important than option B	7
If option A is extremely more important than option B	9
If option A and option B are equally important	1

The AHP scale that is commonly utilized in making pair-wise comparisons is well represented in Table 3. In decision-making models, like AHP, a pair-wise comparison scale, is required to measure the relative significance of two criteria or sub-criteria concerning a higher-level goal or master criterion. Once all the important factors have been determined in each of the SWOT categories, a process of pair-wise comparison is conducted on them to determine which ones are more important than others in each group. An example is the comparison of one strength with a strength. In addition, comparisons of a higher level are undertaken to establish the weight of each SWOT category against others. As an illustration, the significance of strengths over threats. The eigenvalue computations are applied to produces the quantitative weights of all the SWOT factors and ranks the factors according to their strategic importance. The pairwise comparison scale is founded on a series of values outlasting 1-9. Consistency is guaranteed by this scale and it enables decision-makers to mathematically assess subjective judgements that are further processed to determine weights of the main factors of SWOT categories. Moreover, the weights allow a quantitative basis to priorities in strategic analysis.

3.4 Analysis of TOWS

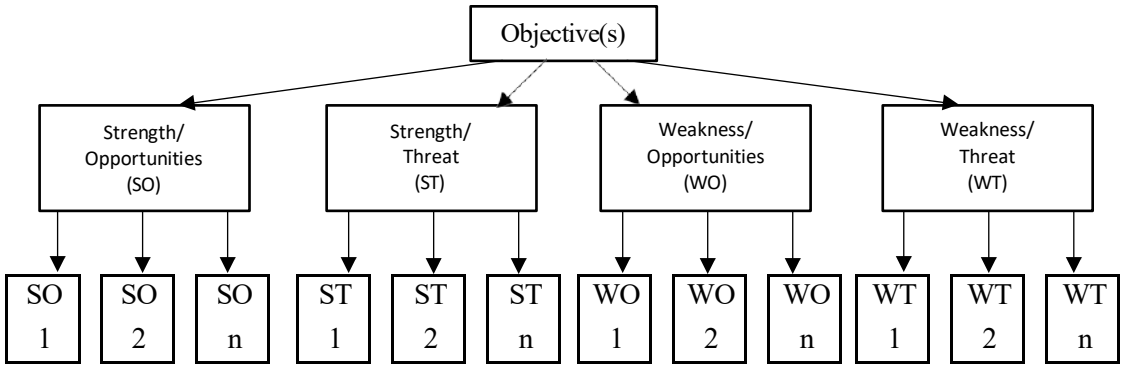


Figure 3.4: Hierarchical structure of the TOWS matrix
Source: Gallego-Ayala & Juizo (2011)

TOWS matrix is based on the SWOT framework and assists companies in matching their strengths and weaknesses with possible external opportunities and threats and generate particular strategies. TOWS is an extension of SWOT in that it assists managers in choosing how to employ what the company excels at to take advantage of new opportunities (SO strategies), how to guard against threats by employing those strengths (ST strategies), how to manage weaknesses by taking advantage of new opportunities (WO strategies) and how to respond to both weaknesses and threats (WT strategies) (Weihrich, 1982). Because of this orientation, TOWS proves useful in industries like food, as there the companies must constantly be able to react fast to sudden changes in the market as well as health and rules changes.

TOWS analysis helps business in the food industry to organize their response to what they can do (internally) and to what is going on (externally). As an illustration, a firm that has achieved high levels of supply chain efficiency can take advantage of this by initiating operations in locations where demand of ecologically friendly and superior food products are on the rise. In the case of companies with outdated technology, becoming a member of partnerships or investing in innovation can allow them to grasp incentives or subsidies offered by the government to encourage digital transformation (WO strategy). As an illustration, when a person begins to purchase more healthy food, or the regulations regarding food safety become more severe, it can be effective to count on the good quality control of the company, as well as on its recognized brand name (ST strategy).

Consequently, the TOWS matrix enables individuals to formulate concise strategies out of the concepts of the SWOT analysis to use in decision-making. Dyson (2004) has observed that TOWS assists organizations to link the internal capacities they have with the external world that builds flexibility and enhances resilience. Fair practices, healthiness and sustainability have become essential in the food business because an increasing number of customers would like to know what they are consuming. TOWS assists stakeholders to manage their problems strategically and act to acquire competitive advantage over their competitors and facilitate sustainable growth in the international market.

3.5 Analytic Hierarchy Process (AHP)

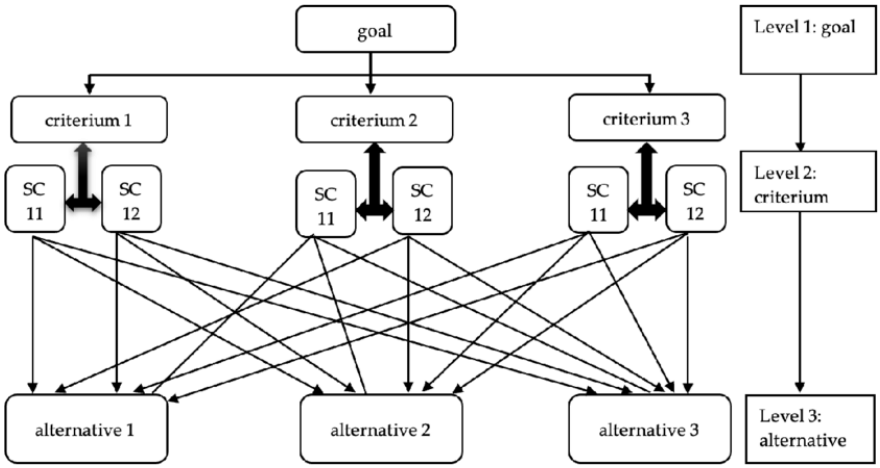


Figure 3.5: Analytic Hierarchy Process (AHP)

The AHP is an indispensable tool in decision making especially where the decision maker is faced with a multiple criteria decision problem. In other words, it breaks complex choices into a list of objectives, criteria and alternatives that are arranged in a hierarchical manner (Sharma, 2008). In the context of food industry, AHP is used for numerous strategic reasons including supplier evaluation, new product positioning and supply chain management.

AHP uses the concept of pairwise comparisons whereby decision makers are able to rate the levels of importance of each criteria in the developed hierarchy. This method involves the assessment of alternatives to the lowest level of the hierarchy and makes it easier to select the most appropriate among the available options. Its advantage is that it provides a systematic approach to analyzing subjective factors alongside objective parameters (Tuzmen & Sipahi, 2011).

For the practical use of the food industry, AHP can be used to indicate critical factors such as cost drivers, product quality, sustainable practices, and company innovation capacities. In the pairwise comparison method, the stakeholders use numerical values developed on a scale of preference originally developed by Saaty known as Saaty's comparison matrix to measure the relative importance of each criterion (Saaty, 2006). These comparisons are critical in judging relevance of various factors holistically to ensure that priorities for decisions are well arrived at systematically (Sharma, 2008).

Because of its hierarchical structure, AHP is highly suitable for addressing multifaceted issues in the food sector, such as evaluating trade-offs between costs and quality in supplier management or addressing systemic interactions between environmental sustainability and consumers' preferences in introducing new products. Through the systematic assimilation of all relevant aspects, AHP improves decision making precision and enables informed choices

consistent with the strategic plan and market requirements in the complex food industry environment.

Table 3.1. Pairwise comprasion scale

Importance	Explanation
1	The objective is equally influenced by two criteria.
3	An individual's judgment and experience are marginally more favorable than another's
5	One is greatly favored over the other by experience and judgment.
7	The criterion is highly favored, and its dominance is evident in practice.
9	The utmost conceivable order of importance is established for each. 2,4,6,8 Employed to symbolize the compromise between the aforementioned priorities

Source: Yüksel (2007); Saaty(1996)

The Analytic Hierarchy Process (AHP) is a decision-making methodology built on three fundamental principles: the mapping of priorities, the comparison of criteria and/or alternatives, and the nesting of the model. AHP has been widely used to solve different decision-making problems and is seen as a strong approach for problem solving (Lee, 2011). The first process in employing AHP is to develop a hierarchical structure of the decision making problem by categorizing the objectives, decision attributes and alternatives in the form of a family tree (Dağdeviren, 2009).

AHP can be particularly applied in the food industry to solve strategic problems like the choice of suppliers, improvement of production lines, and creating new products. The hierarchical framework typically consists of at least three levels: the top level describes the goal (e.g., supply chain efficiency), the middle level consists of the factors that affect the decision (e.g., costs, quality, sustainability), and the lowest level lists the options (e.g., different suppliers or production methods).

The application of AHP in the food industry involves developing this hierarchical model, and then making pairwise comparisons to identify the relative weights of criteria. These criteria at each level are compared pair wise in terms of their impact and relevance with the criteria at the higher levels. These comparisons are made systematically using a nine-level comparison scale adopted from Saaty (1980) so that efficiency of the comparisons can be quantified (Albayrak & Erensal, 2004).

By using AHP, the decision makers in the food industry are in a position to systematically rank the parts of the strategy decision. For example, when choosing a supplier, they may assign a specific numerical value to the criteria like cost, reliability, and sustainability to determine their significance. Such a structure ensures consideration of all aspects, which makes the decision more coherent and less prejudiced.

AHP's ability to integrate both qualitative and quantitative criteria makes it particularly suitable for the food industry, where decisions often involve complex trade-offs. By employing AHP, stakeholders can enhance their strategic planning and operational efficiency, ultimately contributing to improved performance and competitiveness in the market.

For the pairwise comparison matrix A to be perfectly consistent, it must have a rank of 1, and the maximum eigenvalue (λmax) must equal the number of criteria nnn. When this condition is met, the weights can be derived by normalizing the rows or columns of A (Albayrak & Erensal, 2004;

Borajee & Murat, 2011; Wang & Elhag, 2007). The quality and reliability of the AHP's results are highly dependent on the consistency of the pairwise comparisons. The consistency of the matrix A is verified by examining the relationship between its elements. Specifically, $A = W \times W^{-1}$, where W represents the vector of weights (Dağdeviren, 2009).

To quantify the level of consistency, Saaty (1980) proposed the Consistency Index (CI), which is calculated using the formula:

$$C1 = \frac{\square max. - n}{n - 1}$$

This index helps measure how consistent the pairwise comparisons are. To further validate the consistency, the Consistency Ratio (CR) is computed by dividing the CI by the Random Index (RI). The RI is an average CI obtained from randomly generated matrices of the same size. The formula for the CR is:

$$CR = \frac{CI}{RI}$$

A CR value of 0.1 or less is generally deemed acceptable, indicating that the inconsistencies are within a tolerable range, and the weight derivation is reliable (Saaty, 2006). This thorough approach ensures that the pairwise comparisons in the AHP are consistent, enhancing the robustness and credibility of the decision-making process. Such rigor is particularly important in complex and multifaceted industries like the food sector, where decisions must balance multiple criteria and stakeholders' interests (Vargas, 1990; Forman & Gass, 2001).

Table 3.2: Random of index

n	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

3.6 SWOT/TOWS-AHP Model

In the complex environment where the food industry operates, combining SWOT analysis with the Analytic Hierarchy Process (AHP) is particularly useful for informed decision-making and for determining strategic priorities among multiple competing factors (Gallego, 2011). This hybrid approach begins with a traditional SWOT analysis to identify internal strengths and weaknesses as well as external opportunities and threats specific to the food sector (Kurttila et al., 2008). These elements are then organized hierarchically based on overarching objectives—such as improving market competitiveness, enhancing food safety, or advancing environmental sustainability.

The next step involves pairwise comparisons using the AHP method, whereby each SWOT factor is systematically compared with others in terms of its relative importance and influence. This allows for numerical weighting through eigenvalue calculations, producing a structured and quantifiable prioritization of strategic factors (Kangas et al., 2003; Kajanus, 2004). AHP brings objectivity into the otherwise qualitative SWOT framework by offering clear indicators of which strategic elements deserve more attention or resources.

To further strengthen this model, the TOWS matrix is integrated into the analysis as a practical tool to formulate specific strategies based on the ranked SWOT elements. Unlike SWOT, which is primarily diagnostic, TOWS focuses on strategic synthesis—matching internal strengths to external opportunities (SO strategies), using strengths to counter threats (ST), mitigating weaknesses through opportunities (WO), and minimizing both weaknesses and threats (WT) (Weihrich, 1982). This matrix provides a logical framework for translating the weighted SWOT factors into concrete strategic actions tailored to the dynamic challenges of the food industry.

The inclusion of TOWS within the SWOT-AHP framework enhances the model's strategic applicability by bridging analysis with actionable planning. It not only assists stakeholders in prioritizing their objectives based on quantifiable data but also helps them develop coherent strategies that align with both internal capabilities and external market conditions. The model has been effectively applied in various sectors such as forestry policy planning, tourism strategy development, and resource optimization (Wikramasinghe, 2010; Lee, 2011). In the context of the food industry, this integrated approach enables businesses to better adapt to shifting consumer trends, regulatory demands, and competitive pressures while pursuing sustainable growth.

4.0 APPLICATION AND RESULTS

4.1 SWOT/TOWS-AHP

Table 4.1: SWOT Matrix

STRENGTHS (S)	WEAKNESSES (W)
S1: Financial Strength (Smith,2023) **S2**: Research and Development (R&D) (Johnson, 2022) **S3**: Global Presence (Brown, 2021) **S4**: Quality of the product (Taylor, 2022) **S5**: Strategic Acquisitions and Partnerships (Anderson, 2022)	**W1**: Negative Publicity (Wilson, 2021) **W2**: High Operational Costs (Davis, 2023) **W3**: Dependency on Certain Products (Lee, 2023) **W4**: Product Recalls and Safety Issues (Garcia, 2022)
OPPORTUNITIES (O)	**THREATS (T)**
O1: Expansion in Emerging Markets (Martinez, 2023) **O2**: Health and Wellness Trends (Harris, 2022) **O3**: Sustainability Initiatives (Walker, 2022) **O4**: Digital Transformation (Nelson, 2023)	**T1**: Intense Competition (Mitchell, 2022) **T2**: Regulatory Challenges (Parker, 2023) **T3**: Economic Uncertainty (Evans, 2022) **T4**: Changing Consumer Preferences (Roberts, 2023)

Table 4.2: TOWS Matrix

S-O Strategies	W-O Strategies
1. **SO1**: Use financial strength to invest in expansion into emerging markets. (S1, O1) 2. **SO2**: Leverage strong R&D to develop health-oriented products aligned with wellness trends. (S2, O2) 3. **SO3**: Use global presence to drive sustainability initiatives in multiple regions. (S3, O3) 4. **SO4**: Improve product quality through digital transformation and technology upgrades. (S4, O4)	1. **WO1**: Rebuild brand image through sustainability campaigns to counteract negative publicity. (W1, O3) 2. **WO2**: Reduce operational costs by adopting digital transformation and automation. (W2, O4) 3. **WO3**: Diversify product offerings to align with health and wellness trends. (W3, O2) 4. **WO4**: Improve product safety standards in response to market expansion and health trends. (W4, O2)

S-T Strategies	W-T Strategies
1. **ST1**: Use financial strength to weather economic uncertainty and market fluctuations. (S1, T3) 2. **ST2**: Strengthen R&D to stay ahead of intense competition and evolving regulations. (S2, T1, T2) 3. **ST3**: Use global presence to hedge against changing consumer preferences in specific markets. (S3, T4) 4. **ST4**: Maintain high product quality to stand out in a highly competitive environment. (S4, T1)	1. **WT1**: Address negative publicity through proactive communication and compliance to reduce regulatory risk. (W1, T2) 2. **WT2**: Cut high operational costs to increase flexibility amid economic uncertainty. (W2, T3) 3. **WT3**: Decrease product dependency to adapt to shifting consumer preferences. (W3, T4) 4. **WT4**: Implement strict quality control systems to avoid recalls and strengthen public trust. (W4, T1, T2)

The TOWS matrix is analysed using the Analytic Hierarchy Process (AHP). First, a comparison of the TOWS groups is made in pairs according to the comparison scale of 1 to 9. This study utilized the TOWS Matrix as a strategic planning tool to help come up with, list and rank the most important strategies the company must pursue in a very competitive and dynamic business environment. As compared to the conventional SWOT analysis where internal and external factors are merely identified, the TOWS matrix goes an extra mile further to pair these factors in order to develop strategic alternatives. The integration allows making the process more action-oriented, especially when used in conjunction with Analytic Hierarchy Process (AHP) in making decisions.

The TOWS analysis started with the investigation of internal strengths and weaknesses of the company and external opportunities and threats. Secondary data was used to rate each component and strategic combinations were produced in four major categories; SO (Strengths Weaknesses-Opportunities), WO (Weaknesses-Opportunities), ST (Strengths-Threats) and WT (Weaknesses-Threats).

Within the SO strategies, the company will utilize its financial capability (Smith, 2023) and international reach (Brown, 2021) to enter into emerging markets (SO1), where consumer-purchasing power and demand of modern products are increasing (Martinez, 2023). Besides, its strong research and development capabilities (Johnson, 2022) can help it create health-focused products (SO2), which is also a trend in the global wellness (Harris, 2022). The international presence of the company also allows it to employ sustainability initiatives
(SO3) that are appealing to environmentally conscious consumers, and its technological capacity works to improve the quality of its products via digital upgrades (Nelson, 2023).

Regarding WO strategies, the company focuses on internal weaknesses converting them into strategic actions. Indicatively, it neutralizes bad publicity (Wilson, 2021) with sustainability campaigns (WO1), which swiftly normalizes its standing with the people and the regulators. The company faces the challenge of high operational costs (Davis, 2023) and implements the digital transformation of workflow to optimize it and earn more money (WO2). As well, the business diversifies its products (WO3) to ensure that it is less dependent on a specific product (Lee, 2023) and to meet the needs of the expanding segment of health-conscious consumers (Harris, 2022). There is also priority on improved product safety standards (WO4) to conform to the growing needs in the expanding markets.

The ST strategies are based on using the strengths to cushion against the external threats. The financial foundation of the company (Smith, 2023) would enable it to survive the economic turbulence (Evans, 2022) and adjust to the changes in the market (ST1). It accelerates product innovation cycles and beefs up R&D to address high competition rates and shifting regulatory demands (Mitchell, 2022; Parker, 2023). The presence in the global market (Brown, 2021) allows it to diversify market risks and deal with the changing preference of consumers (Roberts, 2023) (ST3). In the meantime, the company ensures a high level of products quality (Taylor, 2022) and thus it is prominent in a saturated market (ST4).

Lastly, the WT strategies provide counter-measures against vulnerability of the business. As an example, the company manages negative publicity and possible regulatory risk (Wilson, 2021; Parker, 2023) by being communicatively active and legally compliant (WT1). Cost-cutting programs (WT2) are beneficial to reduce the effects of an economic recession (Evans, 2022), and the decreased product dependency (WT3) is connected to the necessity to respond rapidly to shifts in customer behavior (Roberts, 2023). Moreover, severe quality control measures (WT4) are established to prevent the recall of the product and maintain brand image (Garcia, 2022).

A combination of AHP and TOWS matrix allows the systematic prioritization of these strategies. Each strategy is individually rated, in quantitative terms, with respect to its relevance, impact and feasibility using a pairwise comparison model (Saaty, 1980). This systematic process is needed to make sure that the management concentrates on the actions with high priority, which have the best ROI and fit the strategy. Finally, the TOWS-AHP technique helps the firm to make resource allocations within the dynamic business environments in the most effective manner (Kurttila et al., 2000; Kangas et al., 2003; Gallego & Rodríguez, 2011).

Table 4.3: Pairwise Comparison of TOWS Factors

TOWS Group	SO	WT	ST	WT	Importance Degrees of TOWS Groups
SO	1.00	3.00	6.00	9.00	0.58
WO	0.33	1.00	3.00	6.00	0.25
ST	0.17	0.33	1.00	5.00	0.12
WT	0.11	0.17	0.20	1.00	0.04
CR=0.06					

The TOWS matrix analysis of the strategic priorities of the company gives a systematic understanding of the contribution of various combinations of strategies to the overall strategic planning. The pairwise comparison analysis shows that the SO (Strengths-Opportunities) strategies have the greatest degree of importance of 0.58 indicating that these strategies are imperative in stimulating the long-term growth of the company. Such heavy weighting corresponds to the strategic positioning to utilize internal capabilities, including financial muscle, R&D capability, global market presence, brand strength, and strategic alliances, to fully exploit external opportunities, including emerging markets, health and sustainability macrotrends, and digitalization (Smith, 2023; Johnson, 2022; Brown, 2021; Taylor, 2022;

Anderson, 2022; Martinez, 2023; Harris, 2022; Walker, 2022; Nelson Such strengths-opportunities synergies are viewed as the key to the sustainable competitive advantage and subsequent growth. Closely behind is the WO (Weaknesses-Opportunities) strategy group with a degree of importance of 0.25. This weighting means that although internal weaknesses present respectable challenges, including high operational costs, products recalls, and reliance on a few products, they can be addressed by pursuing the external opportunities actively (Wilson, 2021; Davis, 2023; Lee, 2023;

Garcia, 2022). As an example, automation and digital technologies can be considered to align with operational inefficiencies reduction, and the health-focused consumer trend can be considered to expand the product range. The WO strategies embody the corporate ability to turn its weaknesses into competitive strengths in the case where it matches the progressive external trends.

Ranked third are the ST (Strengths-Threats) strategies with an importance value of 0.12, indicating that they are moderately relevant in the strategy formulation of the company. These plans focus on leveraging the company core strengths to cushion against outside threats posed by regulatory changes, economic turmoil, and the ever-changing consumer tastes (Mitchell, 2022; Parker, 2023; Evans, 2022; Roberts, 2023). The reduced weighting is an indication that although the company is not ignorant of these threats, it is fairly confident that it can curb their effect using its own strength. The strategy has strategic resilience, although its calculated emphasis is on growth rather than on a defensive position.

Finally, the WT (Weaknesses-Threats) strategies have the least level of importance of 0.04, which means that they have little strategic impact. The given category that presupposes defensive measures aimed to decrease the number of internal vulnerabilities and prevent the external threats at the same time can be seen as the least important in the given situation. The company considers the market fluctuations and regulatory risk as the threats, though they are not so urgent as in other strategic directions. This implies that these combinations are not urgent combinations that the company is currently focusing on perhaps because the company believes that its house is in order and that its external positioning is also firmly in place.

The Consistency Ratio (CR = 0.06) affirmatively indicates that the pair-wise comparisons involved in this TOWS-based AHP study are consistent and acceptable, and thereby the importance degrees obtained are valid. Finally, the analysis permits a logical base to be used when placing bets on strategic resources - concentrating on building and exploiting internal resources to pursue growth options, overcome internal constraints via innovation, and sustain flexibility with regards to market conditions.

Table 4.4 Comparison Matrix of SO Group

SO	SO1	S02	SO3	SO4	Importance Degrees
SO1	1.00	3.00	6.00	8.00	0.59
S02	0.33	1.00	2.00	5.00	0.22
SO3	0.17	0.50	1.00	3.00	0.12
SO4	0.12	0.20	0.33	1.00	0.05
CR=0.02					

The presented data allow specifying the essential S-O strategies of the company and determining the degree of their relative importance in terms of strategic decision-making based on an Analytical Hierarchy Process (AHP). According to the determined importance degrees, the financial strength (SO1) is the most important strategic factor, as it has the importance degree of 0.59. This is indicative of its bases in maintaining operational steadiness,
supporting growth that is capital-intensive, and making the company more nimble in seizing the emerging chances (Smith, 2023). Capital generation and management is a pillar of strategic mobility and resilience of the company.

Research and Development (R&D) (SO2) is next in the priority list with a degree of importance of 0.22. This highlights the central importance of the innovation as the factor of market competitiveness preservation (Johnson, 2022). Although it is not as overriding as the financial might, the sustained investment into the R&D is needed to power the product innovation, meet the shifting

needs of consumers, and maintain the technological progress.

Global presence (SO3) has a moderate strategic value, and the degree of importance is 0.12. The solid global presence helps the company to spread the risk and to claim a broader market share. Nevertheless, it also requires focusing on the local regulations, cultures, and economic conditions (Brown, 2021). The company should weigh the advantages of global presence against the challenge of operating globally.

Lastly, the product quality and strategic partnerships (SO4) has the least level of importance of 0.05. Although these are sources of customer satisfaction and growth opportunities, they are considered as supporting and not main sources of strategic direction. The fact that they are comparatively less weighty implies that though they are significant, they are not the main concern of the contemporary strategic docket of the company.

Consistency Ratio (CR = 0.02) assures that the process of weighting was very consistent and trustworthy, and there is no doubt that these factors should be prioritized. This strategic analysis helps the corporation to make smart deployment of its strategic resources - capitalizing on the strongest strengths to create the most valuable impact and making sure that the less significant aspects are still handled effectively. The focus on financial might and research and development permits the company to build a strong strategic backbone, at the same time retaining its ability to be flexible and evolve when facing a changing market environment.

Table 4.5: Comparison Matrix of WO Group

WO	WO1	W02	WO3	WO4	Importance Degrees
WO1	1.00	2.00	7.00	6.00	0.52
WO2	0.50	1.00	4.00	6.00	0.32
WO3	0.14	0.25	1.00	2.00	0.09
WO4	0.17	0.17	0.50	1.00	0.06
CR=0.03					

The table above lists the critical W-O strategies of the company and compares their importance as a strategy using the Analytical Hierarchy Process (AHP). Against each weakness, there is an importance degree which is the relative effect of the weakness to the strategic decision-making.

The most serious weakness is negative publicity (WO1) with a degree of importance of 0.52. It shows the vital importance of a good reputation and how it may greatly affect consumer confidence, brand equality, and market performance when damaged (Wilson, 2021). In the contemporary open and networked marketplace, the control over the perception of the masses and the elimination of the negative publicity is an essential part of the sustenance of the competitiveness and the client base in the long term.

Close behind with an importance degree of 0.32 are high operational costs (WO2). These factors of operational inefficiencies and increased costs have a substantial impact on the bottom line of the company, making it less profitable and quasi unable to invest in its strategic growth (Davis, 2023). The optimization of processes and costs, as well as the effective allocation of resources, are the key factors that should address this issue, and therefore lead to better financial health and competitiveness.

The dependency on some products (WO3) is assigned with the lower yet significant level of importance of 0.09. Product concentration is also a strategic weakness although it is not as urgent as

the other factors already mentioned. Dependence on a limited product range predisposes the firm to market dynamics, changes in consumer preferences, and innovation by the competitors. Diversifying the offerings of the company, therefore, may cushion against the abrupt declines and enhance resilience (Lee, 2023).

Finally, product recalls and safety issues (WO4) are of the least significance with a degree of 0.06. Although it carries relatively less weight, this aspect is also quite dangerous, particularly with regard to possible legal risks, regulatory measures, and reputational damage. The quality control and risk management ought to be proactive in the understanding and avoiding the further development of these issues into significant threats (Garcia, 2022).

The consistency Ratio (CR) value of 0.03 shows a very high consistency degree of the judgment process, which adds to the credibility of these importance degrees. The result of this systematic assessment will provide the company with a complete picture of its weaknesses in order to enable the leadership to dedicate their strategic resources towards reducing the impact of the most dangerous weaknesses. The company may position itself in a better place to be able to grow sustainably in the competitive business environment by focusing on management of its public image and efficiency of its operations, as well as dealing with the problem of product dependency and safety.

Table 4.6: Comparison Matrix of ST Group

ST	ST1	ST2	ST3	ST4	Importance Degrees
ST1	1.00	4.00	9.00	9.00	0.65
ST2	0.25	1.00	3.00	6.00	0.21
ST3	0.11	0.33	1.00	3.00	0.08
ST4	0.11	0.17	0.33	1.00	0.04
CR=0.05					

The listed S-T strategies offer the company very useful growth, innovation, and competitive positioning avenues. These S-T strategies have undergone Analytical Hierarchy Process (AHP) in which a degree of importance has been modified to depict the relative impact (strategic) of the same.

Expansion in emerging markets (ST1) is the most important opportunity, with the degree of importance of 0.65. This heavy weighting reflects the enormous opportunity in emerging economies wherein increasing consumer spending power and economic expansion provides additional sources of revenue and targets (Martinez, 2023). Investing into these areas will enable the company to diversify out of the crowded markets, minimize the risk and improve its long term competitiveness.

Next, the degree of importance of personal health and wellness trends (ST2) is 0.21. That indicates the rise in demand among consumers towards healthier lifestyle choices, such as healthy food options and wellness-oriented products (Harris, 2022). The company could capitalize on this trend and create and promote new health-focused products that are in line with consumer values, allowing better brand differentiation and customer loyalty.

Sustainability initiatives (ST3), having the degree of importance of 0.08, are a moderate strategic opportunity. Actions like carbon-reduction emissions, enhanced waste management, and environmentally friendly production processes not only build better brands but also fulfill the increasing stakeholder requirements, as well as regulatory ones (Walker, 2022). Although it is not the most urgent opportunity, sustainability is a critical portion of long-term strategy and social responsibility.

The least significant degree of importance is 0.04, which belongs to digital transformation (ST4). It may be noted that although technology has the potential to transform the company by making operations more effective, allowing it to innovate, and making customer experiences more memorable, it is a lower priority in the current strategic focus of the company (Nelson, 2023). This could imply that the initial digital investments have been done or that there are more imminent opportunities that are more critical in the contemporary business setting.

Consistency Ratio (CR) of 0.05 shows that there is a high degree of reliability in the process of assessment and the judgments made are sound. With a resource and strategic planning concentration on its high-priority opportunities, especially geographic expansion opportunity, and health-focused innovation, the company will be able to maximize growth potential, market positioning, and responsiveness to emerging global trends.

Table 4.7: Comparison Matrix of WT Group

WT	WT1	WT2	WT3	WT4	Importance Degrees
WT1	1.00	2.00	4.00	9.00	0.50
WT2	0.50	1.00	3.00	5.00	0.29
WT3	0.25	0.33	1.00	6.00	0.15
WT4	0.11	0.20	0.17	1.00	0.04
CR=0.06					

The W-T strategy analysis helps to turn up a number of possible risks that can either derail business operations or impede strategic developments. These W-T strategies will be assessed based on the Analytical hierarchical Process (AHP), whereby the degree of importance will determine the influence of each strategy to the decision-making and long-term planning.

Intense competition (WT1) is the most serious threat with the degree of importance of 0.50. This indicates the significant amount of pressure that firms have to deal with when they are operating within a highly competitive industry, as competitors can eat into the market share, decrease pricing power, and lower customer loyalty (Mitchell, 2022). The company should counter this threat by engaging in constant innovation, building a strong value offering and be nimble footed in adapting to market changes and competitor actions.

Regulatory challenges (WT2) follows with a degree of importance of 0.29, indicating its high impact on the business continuity, particularly among different jurisdictions that have dynamic or strict regulations (Parker, 2023). It is critical to ensure proactive compliance with the law and create dynamic regulatory approaches that will ultimately prevent imposition of fines or operational interference or reputational losses.

The degree of importance of economic uncertainty (WT3) is 0.15 indicating that it has a moderate influence on the strategic planning. Unstable economic factors like inflation, recession, or exchange rate can reduce consumer spending trends and cost of operations (Evans, 2022). What companies ought to do in reaction is to ensure that their financial plans are flexible and create resilience by way of cost effectiveness and revenue diversification.

Fluctuations in consumer preferences (WT4) are the least influential threat, according to the AHP outcomes, and their level of importance is 0.04. This factor is also relevant in the long-term, even though it is secondary in the present strategic environment. changing patterns of customer needs and behavior Shifting customer needs and behavior patterns demand a continuous market research and rapid product development, as well as focused marketing to maintain relevance (Roberts, 2023).

Consistency Ratio (CR) of 0.06 indicates a high degree of consistency of judgment which is reliable when prioritizing these threats. To ensure greater defensibility and market resilience in an environment of external volatility, the company should proactively manage the most immediate threats, especially competition in the industry and regulatory compliance.

Table 4.8: Overall Priority Scores of TOWS Factors

TOWS Group	Group Priority	TOWS Factors	Factor Priority within the Group	Overall Priority of Factor
SO	0.58	**SO1**: Use financial strength to invest in expansion into emerging markets. (S1, O1)	0.59	0.3422
		SO2: Leverage strong R&D to develop health-oriented products aligned with wellness trends. (S2, O2)	0.22	0.1276
		SO3: Use global presence to drive sustainability initiatives in multiple regions. (S3, O3)	0.12	0.0696
		SO4: Improve product quality through digital transformation and technology upgrades. (S4, O4)	0.05	0.029
WO	0.25	**WO1**: Rebuild brand image through sustainability campaigns to counteract negative publicity. (W1, O3)	0.52	0.13
		WO2: Reduce operational costs by adopting digital transformation and automation. (W2, O4)	0.32	0.08
		WO3: Diversify product offerings to align with health and wellness trends. (W3, O2)	0.09	0.0225
		WO4: Improve product safety standards in response to market expansion and health trends. (W4, O2)	0.06	0.015

ST	0.12	**ST1**: Use financial strength to weather economic uncertainty and market fluctuations. (S1, T3)	0.65	0.078
		ST2: Strengthen R&D to stay ahead of intense competition and evolving regulations. (S2, T1, T2)	0.21	0.0252
		ST3: Use global presence to hedge against changing consumer preferences in specific markets. (S3, T4)	0.08	0.0096
		ST4: Maintain high product quality to stand out in a highly competitive environment. (S4, T1)	0.04	0.0048
WT	0.04	**WT1**: Address negative publicity through proactive communication and compliance to reduce regulatory risk. (W1, T2)	0.50	0.02
		WT2: Cut high operational costs to increase flexibility amid economic uncertainty. (W2, T3)	0.29	0.0116
		WT3: Decrease product dependency to adapt to shifting consumer preferences. (W3, T4)	0.15	0.006

		WT4: Implement strict quality control systems to avoid recalls and strengthen public trust. (W4, T1, T2)	0.04	0.0016

The data is presented in a format that groups strategic factors into four priority TOWS groups of SO (Strength-Opportunity), WO (Weakness-Opportunity), ST (Strength-Threat), and WT (Weakness-Threat) with both group and individual priority scores that can be used to help make strategic decisions. This systematic analysis shows which are the strategies that the firm must focus on to achieve sustainable competitive advantage and growth.

The SO strategies have the highest group priority of 0.58, which depicts that the company has the capability of taking a proactive role in utilizing its internal strengths in exploiting the exterior opportunities. SO1: Invest in expansion to emerging markets using financial strength comes out as the most critical strategy in this group having an overall priority score of 0.3422 which is the highest among all the factors. The crucial nature of financial resources in expanding to new markets and increasing operations is highlighted (Smith, 2023). The second SO strategy is SO2: Using solid R&D to create health-focused products to tap into the wellness trend with a score of 0.1276, which drives innovation to identify changing customer demands (Johnson, 2022). Such strategies as SO3: Driving sustainability initiatives through global presence (0.0696) and SO4: Improving product quality via digital transformation (0.029) reflect the wider attempts to integrate sustainability and technology improvement into the functioning.

Then there are WO strategies, whose group priority is 0.25 that aims at turning the weaknesses into opportunities. The most important strategy in this category is WO1: Rebuilding brand image through sustainability campaigns to counteract negative publicity with a priority of 0.13, emphasizing the fact that reputation is crucial and needs to be managed and ESG-aligned (Wilson, 2021). WO2: The cost saving on operations through automation and digital tools has a score of 0.08, which reflects the cost efficiency as a major priority. The rest of the lower-ranking strategies such as WO3: Product diversification in line with health trends (0.0225) and WO4: Increasing the safety standards of its products (0.015) are also valid, especially as the company enters the markets of health-conscious customers.

ST strategies proceed, and the group priority is 0.12, or the attempt to leverage the strengths to limit the threats. The strongest in this case is ST1: Leveraging financial power in times of economic doubt, with a score of 0.078, which supports the idea of financial might in volatile market situations (Evans, 2022). ST2: Enhancement of R&D to keep ahead of competition and regulations comes next with 0.0252, which demonstrates the strategic importance of innovation in the environment of external challenges. ST3 and ST4, involving global presence and product quality as a measure against threats such as changing preferences and competition, are lower, at 0.0096 and 0.0048 respectively, though they too will assist in long-run defensive positioning.

Lastly, the group priority of WT strategies is the lowest (0.04), which is rather reactive in its nature (minimizing weaknesses and external threats). WT1: The priority of proactive communication and compliance with regulations as a way of addressing any negative publicity is the greatest here, with 0.02, showing the importance of brand protection and legal compliance. WT2: Reducing high operations cost in an uncertain economy has a score of 0.0116 which highlights flexibility of costs. WT3 (0.006) and WT4 (0.0016) are niche strategies like enhancement of less reliance on individual products as well as better quality controls.

A Consistency Ratio (CR) of 0.06 is an indication of a high level of logical consistency of the prioritization process that adds to the credibility of these strategic recommendations. To summarize, with the help of the strategy of using the strengths to realize the opportunities, particularly in the part of financial expansion and innovation, and responding effectively to the core weaknesses and threats with

a set of efficient measures, the company is going to be in a position of sustainable growth and competitive survival in a rapidly changing global market.

5.0 LIMITATION

The study is limited to one firm in a large and diversified industry- Nestlé in the world food industry. Even though Nestlé is an excellent benchmark because of its size and international scope, the results are not necessarily representative of the strategic environment or challenges of smaller food companies or those active in other market contexts. Moreover, structured strategic tools; SWOT, TOWS and Analytic Hierarchy Process (AHP) are used in the analysis in order to identify, match and rank internal and external factors. Its ranking methodology is based on the expertise and secondary data (reports of companies, scholarly articles, and news analyses). Though the method offers a more systematic and structured approach, the reliance on secondary data and subjective comparisons could reduce the variety of the considered perspectives and real-time information. Irrespective of these limitations, the combined approach predetermines a well-rounded and analytically rigorous assessment of the strategic footprint of Nestlé in the context of the global food sector.

6.0 CONCLUSION

Based on the conducted TOWS-AHP analysis of Nestle in the food industry, there are a number of strategic implications that could be drawn on the position and movement of the company in a dynamic global market. SO strategies were found to be the most critical of all the four TOWS strategy groups with a group priority of 0.58. It is interesting to note that the SO1: Using financial strength to invest in expansion into emerging markets (overall priority: 0.3422) was the most influential strategy. This provides an indication of the financial strength of Nestlé and its ability to generate growth by geographic diversification (Smith, 2023; Martinez, 2023). SO2: Using robust R&D to develop health-focused products (0.1276) is also vital since it follows the shifting global trends towards health and wellness (Johnson, 2022; Harris, 2022). Other actions like increasing sustainability by being globally present (SO3: 0.0696) or advancing product quality with the help of digitalization (SO4: 0.029) contribute to the competitive advantage and brand strength of Nestlé as well.

On the weakness -- opportunity (WO) side, the group priority being 0.25, the first issue is negative publicity. The rebuilding of brand image via sustainability campaigns (Strategy WO1) has a high priority (0.13), as it is crucial to focus on reputation management on a regular basis (Wilson, 2021; Walker, 2022). Another option available to achieve enhanced internal efficiency and market adaptability includes operational cost reduction (WO2: 0.08) and product diversification (WO3: 0.0225) (Davis, 2023; Lee, 2023).

ST strategies, group priority 0.12, are focused on the defensive operations based on internal strengths. The highest of them, ST1: Having financial strength to withstand economic turbulence (0.078) reminds us once again of the importance of liquidity and maneuverability in uncertain markets (Evans, 2022). ST2: Long-term resilience is also supported by ST2: Enhancing R&D to counter competition and regulation (0.0252).

Lastly, WT strategies have the lowest group priority (0.04) which implies they are reactive. WT1: Managing the negative publicity with the help of proactive communication (0.02) and WT2: Mitigating costs in the face of economic risk (0.0116) are secondary yet critical measures to protect the brand and operational adaptiveness of Nestlé.

In general, the Consistency Ratio (CR = 0.06) ensures that the evaluation is reliable, which supports the idea that these priorities have been identified in a logical and systematic way. The strategic position of Nestlé should be maintained with a focus on further consolidation of the leading financial performance, enhanced innovative research and development, and capturing the growth in the new markets along with the enhancement of internal efficiency and management of reputational risks. With a proper balance between opportunity exploitation and risk reduction, Nestlé stands a

good chance to continue dominating the global food market well into the future, facing the emerging challenges with swagger and innovation.

7.0 FUTURE RESEARCH

The competitive and dynamic global food industry is ever changing based on the pressure of the ever-changing consumer demands, technology and regulation pressures. Then, upcoming studies on strategic planning in this sector and especially those focusing on organizations such as nestlé ought to explore further such subjects as supply chain resilience, sustainability plans, and ethical sourcing. These aspects will likely become even more crucial when environmental issues and social responsibility become more prominent in consumer society.

There is also the need, given the digital transformation that is redefining consumer interaction, to investigate in future research how ai, blockchain and data analytics can be strategically used to achieve transparency, traceability and personalization in food products and services. Other strategic assessment models that could be used by the researchers to supplement the SWOT/TOWS-AHP frame work to better address long term strategic fit include the IE matrix (internal-external matrix), space matrix (strategic position and action assessment) or QSPM (quantitative strategic planning matrix).

In addition, the use of primary data collection techniques namely interviews, surveys, and focus group discussions with executives, consumers, and supply chain partners would help to supplement the findings due to the provision of real-time and multi-stakeholder thinking. This would make strategic recommendations more practicably relevant and would lead to more flexible planning in a turbulent international market. Finally, the potential of upcoming health trends, plant-based food development, and practices of a circular economy should also be investigated in future research as they are likely to determine the future state of the food industry and the position of Nestlé in it.

References

Dyson, R. G. (2004). Strategic development and SWOT analysis at the University of Warwick. European Journal of Operational Research, 152(3), 631–640. https://doi.org/10.1016/S0377-2217(03)00062-6

Helms, M. M., & Nixon, J. (2010). Exploring SWOT analysis: Where are we now? Journal of Strategy and Management, 3(3), 215–251. https://doi.org/10.1108/17554251011064837

Kajanus, M., Kangas, J., & Kurttila, M. (2004). The use of value focused thinking and the A'WOT hybrid method in tourism management. Tourism Management, 25(4), 499–506. https://doi.org/10.1016/S0261-5177(03)00120-1

Kurttila, M., Pesonen, M., Kangas, J., & Kajanus, M. (2000). Utilizing the analytic hierarchy process (AHP) in SWOT analysis: A hybrid method and its application to a forest-certification case. Forest Policy and Economics, 1(1), 41–52. https://doi.org/10.1016/S1389-9341(99)00004-0

Lee, J. W. (2011). Decision-making models for the selection of IT outsourcing service providers: A comparison of approaches. Journal of Business Research, 64(3),274280. https://doi.org/10.1016/j.jbusres.2009.08.009

Pertusa-Ortega, E. M., Molina-Azorín, J. F., & Claver-Cortés, E. (2009). Competitive strategy, structure and firm performance: A comparison of the resource-based view and the contingency approach.

Management Decision, 47(8), 12851303. https://doi.org/10.1108/00251740910984578

Saaty, T. L. (1980). The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation. New York: McGraw-Hill.

Saaty, T. L. (2006). Fundamentals of Decision Making and Priority Theory with the Analytic Hierarchy Process. Pittsburgh, PA: RWS Publications.

Salavou, H. (2015). Competitive strategies and their shift to the future. European Business Review, 27(1), 80–99. https://doi.org/10.1108/EBR-04-2013-0070

Schrempf-Stirling, J., & Palazzo, G. (2016). Upstream corporate social responsibility: The evolution from contract responsibility to full producer responsibility. Business & Society, 55(4), 491–527. https://doi.org/10.1177/0007650315575104

Voytovych, I., & Tereshchuk, H. (2021). Digital marketing transformation of multinational companies: A case of Nestlé. Management Theory and Studies for Rural Business and Infrastructure Development, 43(2), 247–256. https://doi.org/10.15544/mts.2021.24

Weihrich, H. (1982). The TOWS matrix: A tool for situational analysis. Long Range Planning, 15(2), 54–66. https://doi.org/10.1016/0024-6301(82)90120-0

Wikramasinghe, H. (2010). Strategic tourism revival marketing plan for Sri Lanka: An application of AHP method in SWOT analysis. Tourism Management, 31(6), 861–870. https://doi.org/10.1016/j.tourman.2009.09.010

Yüksel, I. (2012). Developing a multi-criteria decision-making model for PESTEL analysis. International Journal of Business and Management, 7(24), 52–66. https://doi.org/10.5539/ijbm.v7n24p52

Yüksel, I., & Dağdeviren, M. (2007). Using the analytic network process (ANP) in a SWOT analysis: A case study for a textile firm. Information Sciences, 177(16), 3364–3382. https://doi.org/10.1016/j.ins.2007.01.001

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STRATEGIC ANALYSIS OF INFRASTRUCTURE AND URBAN PLANNING IN KOTA KINABALU: A COMPREHENSIVE SWOT/TOWS-AHP APPROACH

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ABSTRACT

This study examines the infrastructure and urban planning landscape of Kota Kinabalu, Sabah, using an integrated SWOT-TOWS-AHP approach to identify strategic priorities for sustainable urban development. Secondary data from government reports, academic literature, and industry publications were analyzed to evaluate the city's strengths, weaknesses, opportunities, and threats. The SWOT analysis revealed key strengths such as strategic location, modern infrastructure projects, tourism potential, and natural attractions, while major weaknesses included traffic congestion, urban sprawl, inadequate drainage systems, and limited affordable housing. Based on these findings, the TOWS matrix was used to formulate strategic alternatives. The Analytic Hierarchy Process (AHP) was then applied to prioritize the proposed strategies through pairwise comparisons. The results indicated that promoting eco-tourism zones integrated with sustainable urban infrastructure was the highest-ranked strategy (38.0%), followed by the implementation of smart city technologies (19.0%) and the development of affordable housing and public transportation initiatives (11.1%). The findings provide a structured framework for policymakers and urban planners to support sustainable, resilient, and inclusive urban growth in Kota Kinabalu.

Keywords: Tourism industry, Ecotourism, SWOT analysis, TOWS matrix, Analytic Hierarchy Process (AHP), Sabah

1.0 Introduction

1.1 Background of the Study

The infrastructure and urban planning sector plays a pivotal role in shaping Kota Kinabalu's growth, directly impacting its economic prosperity, environmental sustainability, and residents' quality of life (Besar et al., 2020). While the city's transportation systems have developed rapidly, further improvements are essential to meet the evolving needs of a growing population (Besar et al., 2020). As Kota Kinabalu continues to expand, strategic planning becomes crucial to promote sustainable mobility, particularly through transit-oriented development (Yap et al., 2021).

Kota Kinabalu's urban landscape has transformed significantly in recent years. Urban development strategies and integrated development plans now play a central role in guiding investment decisions and fostering synergy between different urban zones (Wanda et al., 2019). Strategic planning is essential for coordinating key aspects of urban development, such as land use, housing, transportation, and environmental management, to ensure integrated and sustainable urban growth (Wanda et al., 2019). It is not simply an administrative process but a vital tool for managing the complex challenges of urbanization, including land optimization, affordable housing provision, and efficient service delivery (Yaakup & Healey, 1994).

Moreover, strategic planning allows for the proactive shaping of the urban environment, helping the city build resilience against future uncertainties and promoting long-term sustainability through a balanced approach to economic, social, and environmental goals (Ragheb et al., 2022). To

design effective urban policies, Kota Kinabalu's authorities must deepen their understanding of urban dynamics within the broader context of socioeconomic development (Bidandi & Williams, 2017).

The importance of strategic planning lies in its ability to provide a structured framework for informed decision-making, optimal resource allocation, and outcome-driven initiatives (Chang et al., 2018). It equips decision-makers to anticipate challenges, set clear goals, and develop actionable strategies aligned with the city's long-term vision (Khadour et al., 2023). By adopting a holistic approach, strategic planning integrates diverse elements such as economic development, social equity, and environmental protection, ensuring that development initiatives support the community's well-being.

In addition, strategic planning fosters collaboration among stakeholders, including government bodies, private sector actors, and local communities, encouraging shared priorities and joint action. Integrated planning—both vertically across government levels and horizontally across sectors such as land use, housing, transportation, green spaces, and public infrastructure—is essential for building healthy and sustainable cities (Lowe et al., 2022). Ultimately, applying strategic planning principles ensures that Kota Kinabalu's infrastructure projects are not only economically sound but also environmentally sustainable and socially inclusive, thereby enhancing the overall livability of the city.

1.2 Problem Statement

Kota Kinabalu faces multiple challenges, including rapid urbanization, rising population density, environmental degradation, and insufficient infrastructure. These issues collectively threaten the city's long-term sustainability and livability. Without strategic intervention, the current pattern of urban development could lead to increased traffic congestion, air and water pollution, loss of green spaces, and growing social inequality. Asmawi et al. (2022) emphasize that population growth, unchecked urbanization, urban sprawl, and agricultural land conversion contribute to the development of cities that are both unsustainable and unresilient.

Addressing these challenges requires a comprehensive and integrated approach that acknowledges the interconnectivity of urban systems and promotes synergistic solutions. Urban planning decision-making is inherently complex, requiring tools that can manage trade-offs, balance competing objectives, and ensure transparency and accountability. Decision-makers must consider not only economic growth but also environmental protection and social equity—factors that often involve conflicting priorities and stakeholder interests.

To overcome the limitations of traditional planning approaches—often criticized for being overly subjective or intuition-based—there is a pressing need for a holistic, data-driven decision-making framework. The SWOT-TOWS-AHP methodology offers a structured, analytical approach for evaluating strategic options in urban development. This integrated framework enables planners to assess internal and external factors, formulate strategies, and prioritize actions based on stakeholder preferences and real-world constraints.

The SWOT analysis identifies the strengths and weaknesses within Kota Kinabalu's infrastructure and urban planning sector, as well as the external opportunities and threats influencing its development. Building on this, the TOWS matrix helps generate actionable strategies: using strengths to exploit opportunities, addressing weaknesses by leveraging opportunities, using strengths to counter threats, and minimizing weaknesses to avoid threats (Bottero et al., 2021). Following this, the Analytic Hierarchy Process (AHP) enables stakeholders to rank and prioritize the strategic alternatives systematically. It does so through a step-by-step process that involves defining the problem, structuring it into a hierarchy, collecting expert judgments, converting them into numerical values, calculating priorities, and analyzing sensitivity to changes (Saaty & Paola, 2017).

The integration of SWOT, TOWS, and AHP provides a robust decision-making framework that enhances the transparency, objectivity, and effectiveness of strategic planning in urban infrastructure development. According to Samah et al. (2006), such an approach ensures that decisions are not only data-driven but also aligned with long-term urban sustainability goals. This method is particularly beneficial in complex urban environments like Kota Kinabalu, where relying solely on traditional or intuition-based planning can lead to biased decisions and suboptimal outcomes. By using the AHP Priority Calculator as part of this methodology, decision-makers can make well-informed, stakeholder-aligned choices that enhance the city's overall quality of life.

1.3 Research Objectives

The primary objective of this research is to conduct a comprehensive assessment of the infrastructure and urban planning landscape in Kota Kinabalu, Sabah, using the integrated SWOT-TOWS-AHP methodology. This approach aims to identify strategic priorities and develop actionable recommendations to support sustainable urban development. To achieve this overarching goal, the research is guided by three specific objectives, each contributing distinct insights to inform the formulation of effective strategies:

I. Identify and evaluate key internal and external factors that influence the infrastructure and urban planning sector in Kota Kinabalu. This includes analyzing the sector's strengths, weaknesses, opportunities, and threats (SWOT) to understand the broader context and challenges facing the city.

II. Develop strategic alternatives using the TOWS matrix, which builds upon the SWOT analysis. The TOWS framework helps generate actionable strategies by matching internal strengths with external opportunities, addressing weaknesses, countering threats, and aligning proposed actions with the city's unique context. These strategies are tailored to tackle pressing urban issues such as infrastructure deficits, environmental degradation, social inequality, and climate change vulnerability (Ragheb et al., 2022).

III. Prioritize the identified factors and strategies using the Analytic Hierarchy Process (AHP). AHP involves a structured process of pairwise comparisons and hierarchical weighting, enabling the evaluation of each factor and strategy's relative importance. This method integrates expert judgments and stakeholder preferences, ensuring that the final priorities reflect the collective goals and values of the community. The resulting rankings provide a transparent and rational basis for strategic decision-making in the urban planning context.

By addressing these objectives, the study seeks to offer a robust, evidence-based foundation for guiding Kota Kinabalu's urban development towards a more sustainable and resilient future.

1.4 Scope and Limitation

The scope of this research is centered on assessing the infrastructure and urban planning landscape of Kota Kinabalu, Sabah, to provide context-specific insights and recommendations. The study focuses on evaluating the current state of infrastructure and urban development, identifying key challenges and opportunities, and formulating strategies to support sustainable and resilient urban growth.

While the research aims to offer meaningful contributions, it is important to recognize certain limitations that may influence the scope and generalizability of its findings. One key limitation is the availability and accessibility of data. Comprehensive, up-to-date information on various aspects of infrastructure and urban planning in Kota Kinabalu may be limited or difficult to obtain. Additionally, there may be restricted access to experts in the field of urban planning and infrastructure development within the local context, which could affect the depth of the analysis. Another constraint is the limited timeframe available for the study. Conducting a more extensive and detailed assessment, such as broader data collection or stakeholder interviews, would require additional time and resources beyond the current research schedule. Despite these limitations, the study strives to provide valuable insights

that can inform future planning and decision-making efforts in Kota Kinabalu's urban development landscape.

2.0 Methodology

2.1 Research Design

This research adopts a mixed-methods approach, integrating quantitative analysis through the Analytic Hierarchy Process (AHP) with qualitative insights derived from secondary data sources. This approach leverages both numerical and non-numerical data to capture diverse perspectives and reinforce the reliability of findings (Ginanjar & Prajanti, 2021).

The quantitative component focuses on prioritizing the factors and strategies identified through the SWOT and TOWS analyses. The AHP method will be applied to derive weights and rankings through pairwise comparisons and expert evaluations (Sulistio et al., 2018). AHP offers a structured way to break down complex decisions into manageable elements, enabling a more transparent and rigorous decision-making process (Lada et al., 2024; Putra et al., 2021).

The qualitative component involves an in-depth review of secondary sources, including industry reports, government documents, and academic literature. This component aims to provide contextual understanding, validate findings, and highlight best practices in sustainable infrastructure and urban planning. The use of secondary data enhances the research by offering background insights, verifying key issues, and informing strategy development (Idris et al., 2015).

By combining these two methodologies, the mixed-methods approach supports triangulation, allowing the comparison and integration of findings from both quantitative and qualitative data. This strengthens the validity and reliability of the research and leads to more robust and actionable recommendations for sustainable urban development in Kota Kinabalu (Ariffin et al., 2015). Such an approach is especially effective in addressing infrastructure planning challenges in suburban areas, where it can help prioritize investments based on identified needs (Ismiyanti et al., 2019).

2.2 Data Collection

This research will utilize secondary data collected from a wide range of credible sources, including government publications, industry reports, academic journals, and online databases. These sources will offer a comprehensive overview of the current state of urban planning and infrastructure development in Kota Kinabalu. The data will encompass key elements of the city's urban environment, such as population demographics, economic indicators, land use patterns, transportation systems, infrastructure capacity, and environmental conditions.

The collected information will be analyzed to identify trends, challenges, and opportunities relevant to infrastructure and urban planning in Kota Kinabalu. This analysis will serve as a foundation for the SWOT and TOWS frameworks, supporting the formulation of well-informed and context-specific strategies. In addition, the research will gather insights into stakeholder perceptions, existing policy frameworks, and best practices in sustainable urban development to guide the development of strategic alternatives.

To ensure accuracy and contextual relevance, official documents, such as local development plans, regulatory frameworks, and policy guidelines, will be reviewed alongside academic studies and reports on urban growth in Malaysia (Samsurijan et al., 2022). This approach will provide a well-rounded understanding of the factors shaping urban development in Kota Kinabalu and help generate practical, evidence-based recommendations.

2.3 SWOT/TOWS Analysis

2.3.1 SWOT Analysis

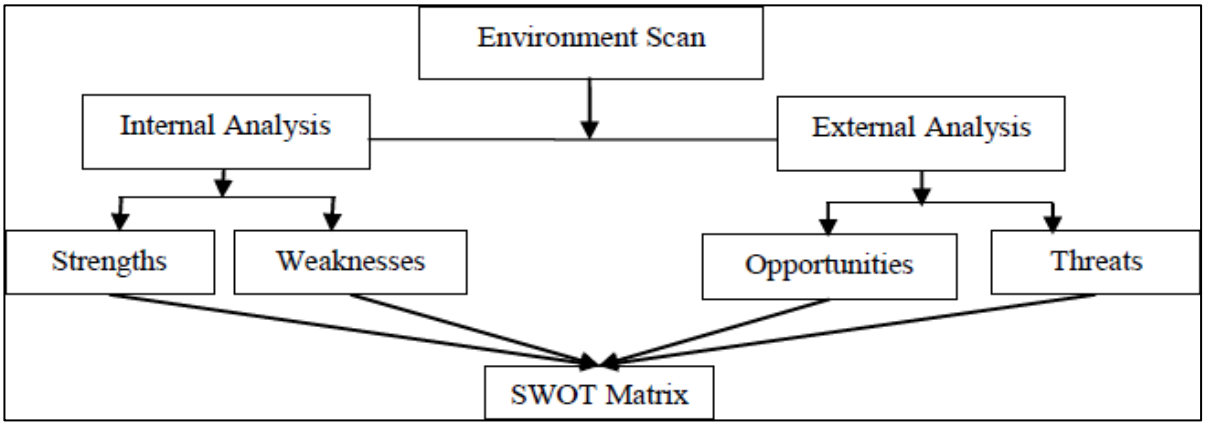


Figure 1: Framework of SWOT

SWOT analysis serves as a strategic tool that helps organizations systematically assess both internal and external elements that impact decision-making (Kenton, 2024). These elements, referred to as strategic factors, play a significant role in shaping the future of an organization or industry. In the SWOT framework, these factors are divided into four categories: Strengths, Weaknesses, Opportunities, and Threats, as shown in Figure 1.

Strengths and weaknesses are internal aspects of a business. They highlight the organization's unique capabilities or shortcomings in comparison to its competitors. Strengths indicate areas where the company excels and maintains a competitive benefit. In contrast, weaknesses identify internal limitations or areas where the business is less effective than others.

In contrast, opportunities and threats come from external sources. Opportunities are favorable external situations that a business can leverage to achieve growth or improve performance. Threats, however, are external factors that may pose risks or hinder the business's success (Peterdy, 2024).

2.4 Analytic Hierarchy Process (AHP)

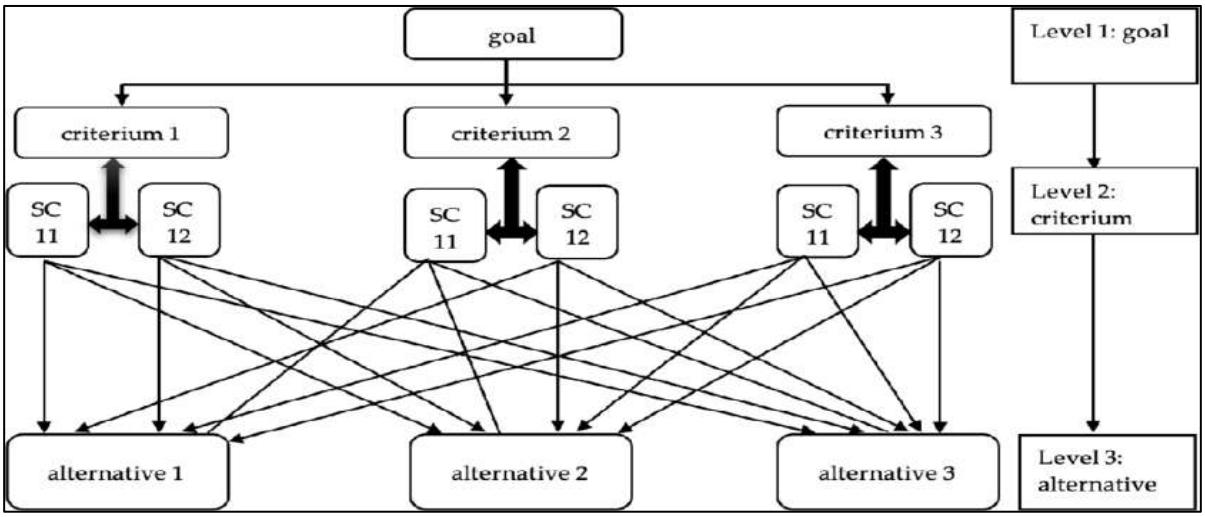


Figure 2: Framework of AHP

The Analytic Hierarchy Process (AHP), developed by Thomas L. Saaty in the 1970s (Taherdoost, 2017), is a widely used multi-criteria decision-making method. It breaks down complex decisions into a hierarchical structure that includes the overall goal, decision criteria, sub-criteria, and available alternatives. AHP is built upon three fundamental principles: (1) structuring the decision model, (2) making comparative evaluations of the elements, and (3) synthesizing the priorities.

AHP has been extensively applied in research and practice to solve various decision-making challenges. The method organizes objectives, criteria, and alternatives into a hierarchy, much like a family tree. Typically, this hierarchy has at least three levels: the primary goal at the top, the criteria in the middle, and the alternatives at the bottom.

In this study, AHP is used to rank elements of a SWOT analysis. Once the problem is broken down and the hierarchy is structured, the prioritization begins by comparing the importance of each criterion. At every level, elements are assessed in pairs relative to their impact, with respect to the criteria at the higher level. AHP uses a standard nine-point scale for pairwise comparisons.

The AHP Process Consists of Four Key Stages:

Stage 1: Define the Problem and Build the Hierarchy
The first step is to clearly define the problem and organize its components into a hierarchical model. The top level of the hierarchy represents the overall goal. The intermediate levels include the sub-goals or criteria influencing the decision, while the bottom level lists the alternative options.

Stage 2: Collect Input Data
At this stage, pairwise comparisons are made to assess the impact of each element on its corresponding criterion in the upper level of the hierarchy. These comparisons are recorded in reciprocal judgment matrices. For instance, if there are seven elements at a certain level and two at the level above, two 7×7 matrices are created. Each matrix requires $\frac{n(n-1)}{2}$ comparisons (e.g., 21 comparisons for 7 elements). The diagonal elements are always 1, and the other values are reciprocals of each other. AHP uses a scale from 1 to 9 to express preferences:

I. 9 = extremely more important
II. 1 = equally important
III. Values between 2–8 express varying degrees of preference.

Stage 3: find the relative weights with the eigenvalue method

The relative priorities of different criteria (sub-criteria) are not easily plausible from the judgement matrix. In this stage, relative weights of a set of objects (criteria, sub-criteria and alternatives) are calculated with the matrix of pair-wise comparison B=bij which is positive and reciprocal (1–9, and 1–1/9).

Thus, the given matrix B such that

$$B = \begin{bmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ b_{n1} & \cdots & \cdots & b_{nm} \end{bmatrix}$$

where $B_{ij} = 1/B_{ji}$ for all I, j = 1, 2, 3..., n

Compute a vector of relative priorities w = (w1, w2... w3). The w is normalized so that it adds up to 1 or 100. If all the judgments are consistent, then

$$b_{ik} * b_{kj} = b_{ij} \text{ for all I, j = 1, 2 ···, n}$$

Then, normalizing any column j of matrix B will generate the wts

$$W_i = \frac{b_{ij}}{\sum_{K=1} b_{kj}} \text{ for all I, j = 1, 2K ···, n}$$

Pair-wise judgement is often error-prone, and the condition in the second equation may not be confirmed. Consequently, the result of priorities may depend upon the column chosen for normalization. Such a problem can be solved either by the logarithmic least square (LLS) or eigenvector method developed by Saaty. Latter is a simpler procedure than former and also involves averaging all possible ways of comparing alternatives (Harker & Vargas, 1987). Calculations of the wt. vector as the right eigenvector of the matrix B:

$$Bw = \lambda max$$

Where λ max is the maximum eigenvalue of matrix B. So, the weight vector can be enumerated as

$$Wi = \frac{\sum_{J-1}^{N} bij*wj}{\lambda_{max}}$$

Inconsistencies in judgment can be calculated by eigenvector method. Satty research depicts λ max n for a positive reciprocal matrix. For a perfectly consistent matrix, then λ max = n.

Satty defined a consistency index by the formula

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

Also, consistency ratio (CR) is measured as the ratio of CI and random index (RI)

$$CR = CI/RI$$

Therein RI the random index is computed as the mean of the CI of randomly generated matrices of size n. If CR < 0.1, it is acceptable, and if CR > 1, the DM must re-evaluate the decisions to reduce inconsistencies.

Stage 4: Develop a composite priority vector for the bottom-most level of the hierarchy to rate alternative decision strategies.

The final step is to determine the overall priority of each alternative by synthesizing the results from all levels of the hierarchy. This involves combining the weighted priorities from each level down to the alternatives. The alternatives are then ranked based on how well they meet the overall objective, using the aggregated eigenvector values weighted according to the importance of the criteria.

2.5 SWOT-AHP Hybrid Methodology

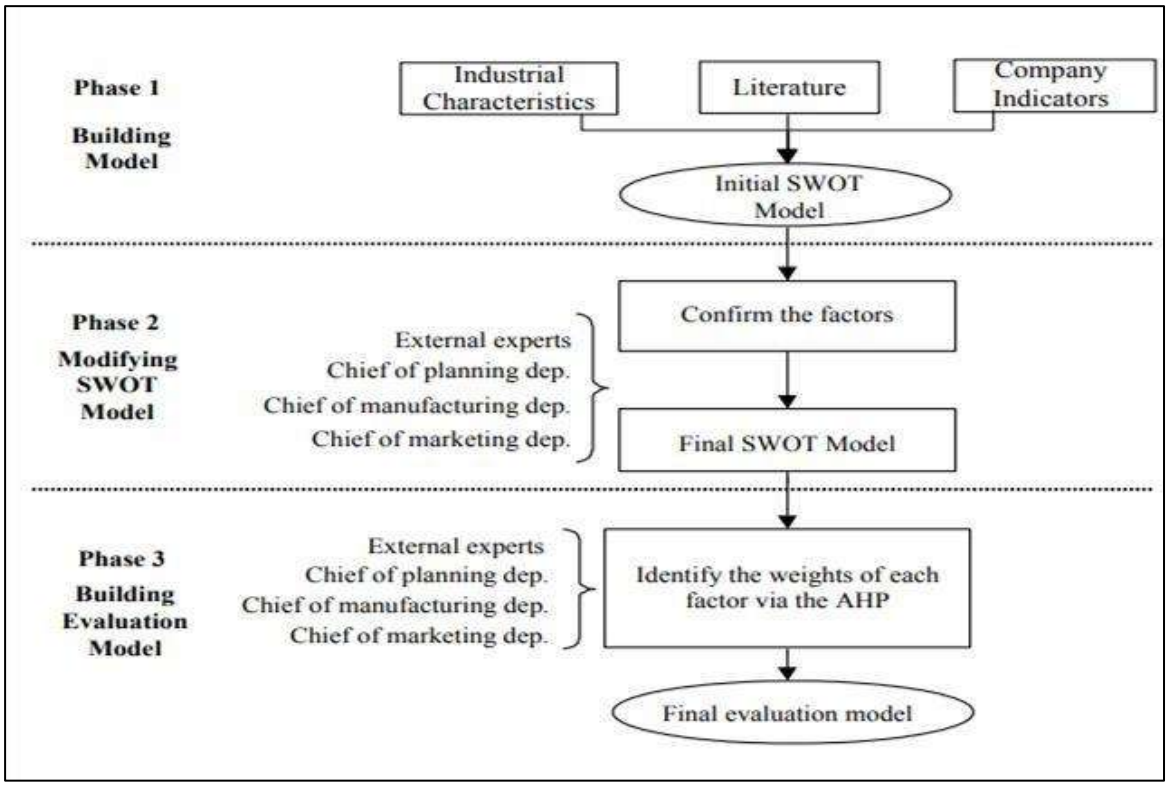


Figure 3: Phases of Proposed Methodology

Figure 3 show a SWOT-AHP based strategic management model. In order to create a SWOT-AHP based strategic management model, three phases model needed which is building initial task, modifying factors, and building an evaluation model. SWOT factors are subjected to pairwise comparisons concerning higher level factors, in order to generate the priority factors using eigenvalue calculations. Although SWOT analysis lacks the quantitative feature needed to generate ranking mechanism for identified factors, the integration of the Analytic Hierarchy Process (AHP) addresses this limitation. The hybrid model of SWOT-AHP systematically qualifies the relative importances of SWOT factors and evaluates their intensity, thereby providing a robust framework for strategic decision-making.

Application of AHP in the SWOT framework is supposed to quantify and evaluate the importance of the SWOT factors systematically. Three major steps are followed in this regard. First and foremost is the identification of the internal and external key factors such as strengths, weaknesses, opportunities and threats. Next is applies the pairwise comparisons to capture the weights of each SWOT group. Finally uses the AHP to derive the relative priorities of each factor within the SWOT groups. The overall weight and ranking of each factor are obtained by multiplying its local weight by the weight of its respective group, resulting in a comprehensive prioritization framework.

Expert opinion on pair-wise ranking of importance of two sub-criteria with reference to the main criteria in tree hierarchy	
If option A and option are equally important	1
If option A is moderately more important than option B	3
If option A is strongly more important than option B	5
If option A is very strongly more important than option B	7
If option A is extremely more important than option B	9
If option A and option B are equally important	1

Table 1: Pairwise Comparison Scale

Table 1 provides a clear representation of the AHP scale which often used for pairwise comparisons in decision-making. In decision-making frameworks such as AHP, a pairwise comparison scale is needed to quantify the relative importance of two criteria or sub-criteria with respect to a higher-level goal or main criterion. After identifying all the key factors for each SWOT category, they are subjected to pairwise comparisons to evaluate their relative importance within each group. For instance, comparing one strength to another strength. Furthermore, higher-level comparisons are conducted to determine the weight of each SWOT category relative to others. For example, the importance of strengths versus threats. Eigenvalue calculations are used to generates quantitative weights for all the SWOT factors and ranking them based on their strategic significance. The pairwise comparison scale is based on a set of values ranging from 1 to 9. This scale ensures consistency and allows decision-makers to mathematically evaluate subjective judgements which are then processed to calculate weights for the key factors of SWOT categories. Furthermore, these weights provide a quantitative foundation for prioritization in strategic analysis.

3.0 Results and Discussion

3.1 SWOT Analysis

Strengths (S)	**Weaknesses (W)**
S1. Strategic location (Besar et al., 2020). S2. Modern infrastructure projects (BIMP EAGA, 2025). S3. Growing tourism sector (Ladin et al., 2020). S4. Natural attractions (BIMP-EAGA, 2025).	W1. Traffic congestion (Besar et al., 2020). W2. Urban sprawl (Besar et al., 2020). W3. Inadequate drainage (Norhisyam et al., 2019). W4. Lack of affordable housing (Henry, 2012)
Opportunities (O)	**Threats (T)**
O1. Smart city initiatives (BIMP EAGA, 2025). O2. Public-private partnerships (PPPs) (BERNAMA, 2024). O3. Eco-tourism & sustainable urbanism (Ladin et al., 2020). O4.Digital infrastructure expansion (Teo, 2025). O5.Climate-resilient urban design (V Jainih & N S H Harith, 2020).	T1. Natural disasters (V Jainih & N S H Harith, 2020). T2. Overdependence on tourism (Chan et al., 2022). T3. Environmental degradation (Ang et al., 2025). T4. Budget constraints (BERNAMA, 2024). T5. Population growth (Besar et al., 2020).

Table 2: SWOT Analysis

A SWOT analysis provides a structured framework for evaluating the strategic position of Kota Kinabalu in relation to its infrastructure and urban planning (M., 2015). This approach examines internal factors—strengths and weaknesses—as well as external influences—opportunities and threats—that shape the city's developmental trajectory (Rebuya & Gasga, 2022).

One of Kota Kinabalu's key strengths lies in its strategic location, which enhances regional trade and connectivity (Besar et al., 2020). The city's ongoing modern infrastructure projects further support economic growth and aim to improve the quality of life for its residents (BIMP-EAGA, 2025). Additionally, the growing tourism sector contributes significantly to local revenue by attracting both domestic and international visitors (Ladin et al., 2020). The presence of educational institutions and government agencies strengthens administrative capacity and fosters innovation. Moreover, Kota Kinabalu's natural attractions, including its coastal landscapes and rich biodiversity, make it a highly appealing location for both residents and tourists (BIMP-EAGA, 2025).

Despite these strengths, Kota Kinabalu faces several weaknesses that hinder its sustainable development. Traffic congestion is a persistent problem, negatively impacting urban mobility and contributing to air pollution (Besar et al., 2020). Urban sprawl, driven by unregulated, low-density expansion, places excessive pressure on existing infrastructure and harms the environment (Besar et al., 2020). Inadequate drainage systems exacerbate flooding during periods of heavy rainfall, disrupting daily activities and damaging property (Norhisyam et al., 2019). Furthermore, a shortage of affordable housing limits access to adequate living conditions for lower-income populations, widening socio-economic disparities (Henry, 2012).

On the other hand, Kota Kinabalu can seize several opportunities to improve its infrastructure and urban planning. The advancement of smart city initiatives holds promise for enhancing urban services through digital technology (BIMP EAGA, 2025). Public-private partnerships (PPPs) offer a mechanism to harness private investment and expertise for infrastructure development (BERNAMA, 2024). Emphasizing eco-tourism and sustainable urbanism can attract environmentally conscious visitors and encourage responsible development practices (Ladin et al., 2020). The expansion of digital infrastructure will also improve internet access, connectivity, and overall economic activity (Teo, 2025). Additionally, adopting climate-resilient urban design can help mitigate the impacts of extreme weather and climate-related hazards, enhancing the city's long-term sustainability.

Nevertheless, Kota Kinabalu must contend with several threats that could undermine its progress. Natural disasters, such as floods and earthquakes, pose ongoing risks to both infrastructure and public safety and must be considered in urban planning efforts (V Jainih & N S H Harith, 2020). The city’s over-reliance on tourism makes it vulnerable to external economic shocks and global disruptions (Chan et al., 2022). Environmental degradation, including deforestation and pollution, threatens the health of ecosystems and residents alike (Ang et al., 2025). In addition, budgetary limitations can restrict the scale and speed of infrastructure development (BERNAMA, 2024). Rapid population growth is placing increasing strain on public services and urban facilities, calling for strategic investment in transportation and housing systems (Besar et al., 2020).

3.2 TOWS Analysis

	Strengths (S)	**Weaknesses (W)**
Opportunities (O)	**S-O Strategies** **[SO1]** Promote eco-tourism zones integrated with sustainable urban infrastructure (Varanasi et al., 2024). (S3, O3) **[SO2]** Implement smart city technology (AI, IoT) for traffic and flood management systems (Kushwaha, 2024). (S2, S4, O1, O5)	**W-O Strategies** **[WO1]** Launch affordable housing & public transport projects via federal and state collaboration (Enekwachi-Akpa, 2024). (W1, W3, W4, O2) **[WO2]** Use GIS and smart planning tools to manage urban sprawl and improve drainage infrastructure (Martin et al., 2020). (W2, W3, O1)

	S-T Strategies	W-T Strategies
Threats (T)	**[ST1]** Develop climate-resilient coastal infrastructure (Yahia et al., 2024). (S2, S4, T1, T3) **[ST2]** Diversify economy by enhancing digital infrastructure and reducing reliance on tourism (Rhena & Kraugusteeliana, 2024). (S1, S2, T2, T4)	**[WT1]** Secure international grants for climate adaptation in infrastructure (Füssel et al., 2012). (W3, T1, T4) **[WT2]** Reform zoning laws and improve planning institutions to mitigate risks from overdevelopment and natural hazards (Garrido & Saunders, 2019). (W2, T5, T3)

Table 3: TOWS Analysis

The TOWS Matrix builds upon the traditional SWOT analysis by systematically aligning a city's internal factors—its strengths and weaknesses—with external influences, such as opportunities and threats. This framework helps generate targeted strategies that not only capitalize on a city's existing advantages but also address its vulnerabilities and prepare for external risks. It is particularly useful for urban development planning, where strategic direction is essential to sustainability and resilience (Syamsuri, Latif, & Osman, 2019).

S-O strategies aim to leverage internal strengths to capitalize on external opportunities. For Kota Kinabalu, this could involve promoting eco-tourism zones supported by sustainable urban infrastructure, such as green-certified buildings and walkable urban areas (Varanasi et al., 2024). These initiatives enhance environmental preservation while attracting environmentally conscious tourists. The city can also implement smart city technologies—including artificial intelligence (AI) and the Internet of Things (IoT)—to manage traffic flow and mitigate flood risks, thereby improving urban efficiency and quality of life (Kushwaha, 2024).

W-O strategies address internal weaknesses by taking advantage of external opportunities. For instance, issues like traffic congestion and inadequate housing can be alleviated through public-private partnerships that fund affordable housing projects and upgraded public transportation systems (Enekwachi-Akpa, 2024). Additionally, the adoption of geographic information systems (GIS) and data-driven planning tools can help control urban sprawl and improve drainage infrastructure, leading to more equitable and efficient urban development (Martin et al., 2020).

S-T strategies use existing strengths to mitigate the impact of external threats. Kota Kinabalu's strategic location and economic diversity can be harnessed to build climate-resilient infrastructure, such as coastal flood defenses and elevated transport corridors, reducing vulnerability to natural disasters (Yahia et al., 2024). Expanding the city's digital infrastructure and encouraging innovation in the tech sector also helps diversify the economy, reducing dependency on the tourism industry, which is susceptible to global economic shifts (Rhena & Kraugusteeliana, 2024).

W-T strategies are the most defensive, aiming to reduce both internal weaknesses and external threats. Kota Kinabalu could pursue international funding, such as grants from UN-Habitat or ASEAN initiatives, to overcome local budget limitations for critical infrastructure projects (Füssel et al., 2012). At the same time, reforming zoning policies and improving institutional planning are necessary to control unplanned development, prevent environmental degradation, and ensure long-term urban resilience (Garrido & Saunders, 2019).

3.3 AHP Implementation

3.3.1 AHP Pairwise Comparison Matrix

	1 (SO1)	2 (SO2)	3 (WO1)	4 (WO2)	5 (ST1)	6 (ST2)	7 (WT1)	8 (WT2)
1 (SO1)	1.00	3.00	5.00	7.00	3.00	5.00	6.00	7.00
2 (SO2)	0.33	1.00	2.00	4.00	2.00	3.00	4.00	5.00
3 (WO1)	0.20	0.50	1.00	2.00	1.00	2.00	3.00	4.00
4 (WO2)	0.14	0.25	0.50	1.00	1.00	2.00	2.00	3.00
5 (ST1)	0.33	0.50	1.00	1.00	1.00	2.00	3.00	4.00
6 (ST2)	0.20	0.33	0.50	0.50	0.50	1.00	2.00	3.00
7 (WT1)	0.17	0.25	0.33	0.50	0.33	0.50	1.00	1.00
8 (WT2)	0.14	0.20	0.25	0.33	0.25	0.33	1.00	1.00

Table 4: AHP Pairwise Comparison Matrix

Principal eigen value = 8.282
Eigenvector solution: 4 iterations, delta = 8.6E-8 Number of
Comparisons = 28
Consistency Ratio (CR) = 2.9%

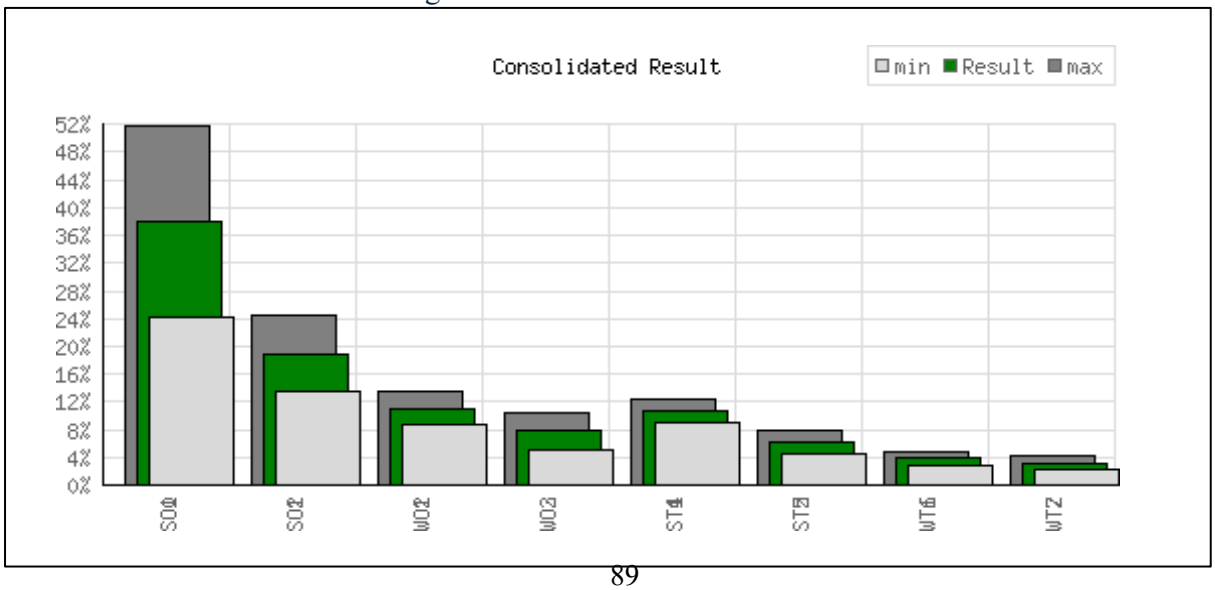
To prioritize the strategic options derived from the TOWS analysis, the Analytic Hierarchy Process (AHP) was applied using a pairwise comparison matrix. This method allows for the systematic comparison of each strategy based on its relative importance toward achieving sustainable urban development in Kota Kinabalu. The AHP Priority Calculator was used to facilitate this process, generating the necessary comparisons and priorities efficiently.

A total of 28 pairwise comparisons were made among eight strategies—two from each quadrant of the TOWS matrix (SO, WO, ST, WT). These comparisons reflect stakeholders' judgments on the relative priority of each strategy based on Saaty's (1980) scale of relative importance.

To assess the consistency of these judgments, a Consistency Ratio (CR) was calculated. The resulting CR of 2.9% indicates a high level of consistency, as it falls well below the acceptable threshold of 10% recommended by Saaty (1980). This demonstrates that the pairwise evaluations are coherent and reliable for decision-making. The use of AHP, supported by a strong consistency ratio, reinforces the objectivity and robustness of the strategic prioritization process. This structured approach ensures that planning decisions are based on clear, well-justified stakeholder input.

3.4 Prioritized TOWS Factors (AHP Result)

Figure 3: AHP Consolidated Result



Cat	Strategy Code	Priority (%)	Rank	(+)	(-)
1	SO1	38.0%	1	13.8%	13.8%
2	SO2	19.0%	2	5.4%	5.4%
3	WO1	11.1%	3	2.3%	2.3%
4	WO2	7.8%	5	2.7%	2.7%
5	ST1	10.7%	4	1.7%	1.7%
6	ST2	6.3%	6	1.7%	1.7%
7	WT1	3.9%	7	1.0%	1.0%
8	WT2	3.2%	8	1.0%	1.0%

Table 5: AHP Prioritized Table

SO1 – Promote eco-tourism zones integrated with sustainable urban infrastructure ranks as the highest priority with a weight of 38.0%**.** This indicates that Kota Kinabalu's greatest potential lies in leveraging its natural strengths, such as its scenic coastal and forest areas, while aligning with sustainability goals. Focusing on eco-tourism not only preserves the environment but also stimulates economic growth and job creation, making it a highly strategic move for urban planning.

SO2 – Implement smart city technologies (AI, IoT) for urban systems holds the second highest priority at 19.0%. This reflects the importance of digital transformation in addressing urban challenges like traffic congestion, energy efficiency, and public safety. As Kota Kinabalu grows, incorporating technology into its infrastructure will be critical to improving service delivery and city management.

WO1 – Launch affordable housing and public transport initiatives is the third-ranked strategy, with a weight of 11.1%. This suggests that addressing basic urban weaknesses,

such as housing shortages and inadequate transport connectivity, remains an important objective. Improving affordability and access will enhance social equity and urban livability.

ST1 – Develop climate-resilient infrastructure (e.g., coastal defences) ranks fourth at 10.7%. Given Kota Kinabalu's coastal location and vulnerability to climate change, this strategy emphasises the need to mitigate future environmental risks. Coastal defences and resilient infrastructure will help protect the city against sea level rise and extreme weather events.

WO2 – Use GIS and smart tools to manage urban sprawl and drainage systems is the fifth priority at 7.8%. While still important, this strategy serves more as a supporting action. It highlights the growing role of data and mapping tools in tackling urban sprawl, flood risks, and poor drainage—challenges that affect city functionality and health.

ST2 – Diversifying the economy via digital infrastructure follows next with 6.3%. While diversifying the economy is vital, this strategy appears to be a longer-term vision rather than an immediate action. Digital infrastructure is a key enabler of innovation and resilience, but it requires foundational systems and policy support first.

WT1 – Secure international funding for climate adaptation holds a low priority at 3.9%. Though securing funding can unlock large-scale projects, it's viewed as uncertain or less controllable compared to internally driven initiatives. Thus, it ranks lower as a standalone strategic focus.

WT2 – Reform zoning laws and improve institutional capacity is the lowest-ranked strategy with 3.2%. Institutional reforms, while necessary, tend to be complex and slow to implement. This result suggests that immediate urban planning efforts should be directed toward more actionable and impactful areas, while reforms can proceed in parallel over the long term.

3.5 Strategic Implications

The results of this research offer valuable strategic insights for both policymakers and businesses in Kota Kinabalu. By prioritizing the top-ranked strategies using the integrated SWOT-TOWS-AHP framework, decision-makers can more effectively address urban challenges and guide the city towards sustainable development.

The highest-priority strategy—promoting nature-based solutions to drive economic growth—highlights the importance of eco-tourism and sustainable infrastructure development. Policymakers are encouraged to establish eco-tourism zones and incentivize environmentally friendly business practices. This approach not only preserves the environment but also supports job creation and economic diversification. Businesses in tourism, hospitality, and construction can align their investments with these objectives by adopting green building standards and low-impact development strategies.

The second priority emphasizes the need to accelerate smart city initiatives. Policymakers should invest in technologies such as artificial intelligence (AI), the Internet of Things (IoT), and big data to improve traffic flow, utility management, and public safety. This presents strong collaboration opportunities for technology firms and infrastructure companies to lead pilot projects and develop digital solutions tailored to the city's needs.

Improving social equity through affordable housing and better public transportation ranks as the third priority. Addressing these gaps can reduce urban inequality and enhance quality of life, especially for low- and middle-income populations. Governments should support inclusive housing schemes and reliable transit systems, while developers and transport operators can respond by providing more accessible and affordable services. There is also potential for innovative approaches such as transit-oriented development and mixed-income housing projects.

Climate-resilient infrastructure is also a critical focus area, particularly given Kota Kinabalu's coastal location and vulnerability to environmental hazards. Policymakers must integrate climate risk assessments into infrastructure planning, while engineering and construction firms should innovate in the design and implementation of flood mitigation systems, coastal protection, and resilient road networks.

Another key strategy involves leveraging Geographic Information Systems (GIS) and smart planning tools to manage urban sprawl and improve drainage systems. Although not ranked at the top, this approach supports long-term resilience and efficiency in land use planning. Municipal agencies should adopt data-driven zoning processes, and tech companies can offer customized solutions to aid local decision-making.

The diversification of the digital economy, while lower in priority, still holds strategic value. Building digital infrastructure, increasing broadband access, and enhancing digital literacy can help future-proof Kota Kinabalu's economy. Policymakers should lay the groundwork for this transformation, while businesses in the digital and creative sectors can prepare to expand into these emerging areas.

Although securing international climate funding was ranked lower, it remains an important opportunity. Policymakers should actively pursue such funding by strengthening local institutions and building compelling proposals. However, reliance on external support should be balanced with internal capacity-building and self-sufficiency.

Finally, institutional reform and zoning law modernization, though ranked lowest, are essential to support all other strategies. These reforms should proceed incrementally, starting with improved transparency, streamlined processes, and staff training. Over time, such changes will enhance the overall effectiveness and accountability of urban planning systems.

In summary, the findings from this research offer a clear and actionable roadmap for sustainable urban development in Kota Kinabalu. Policymakers can use these strategic priorities to guide resource allocation and policy formulation, while businesses can align their operations and innovations with the city's evolving infrastructure and environmental goals. Together, these efforts will contribute to a more resilient, inclusive, and livable city.

4.0 Conclusion and Recommendation

4.1 Summary and Findings

This study evaluated the current state of infrastructure and urban planning in Kota Kinabalu using a combined SWOT-TOWS-AHP framework. The approach provided a structured way to assess internal and external factors, generate strategic alternatives, and prioritize actions based on expert input.

The analysis found that Kota Kinabalu has several strengths, including its strategic coastal location and potential in eco-tourism. However, the city also faces significant challenges such as limited infrastructure capacity, environmental degradation, rapid urbanization, and growing social inequality. Opportunities were identified in the form of smart city development, green economy initiatives, and digital innovation, while key threats included climate risks, institutional limitations, and weak policy enforcement.

Using the TOWS matrix, a variety of strategies were proposed to address these issues. The AHP method was then applied to prioritize these strategies based on expert feedback. The top-ranked strategies included:

I. Promoting nature-based economic development,

II. Implementing smart city infrastructure,

III. Improving social equity through better housing and transport, and

IV. Strengthening climate-resilient infrastructure systems.

These strategies provide a practical guide for urban planners and decision-makers to improve Kota Kinabalu's sustainability and resilience.

4.2 Recommendations

In the short term, it is recommended that Kota Kinabalu prioritizes the promotion of eco-tourism and green infrastructure. Pilot projects in eco-tourism zones can be initiated, alongside incentives for green building development, to encourage environmentally responsible investment and showcase the city’s commitment to sustainability. Additionally, launching smart city pilot initiatives, such as intelligent traffic monitoring systems and smart utility management, can enhance urban efficiency and foster greater public trust in technology-driven governance.

Improving public transport accessibility should also be a key focus. This includes expanding bus routes, enhancing pedestrian access, and making transportation more affordable, particularly for underserved communities. Such efforts will not only reduce traffic congestion but also contribute to greater social equity. To ensure that development strategies are well-aligned with the needs of various stakeholders, structured engagement sessions should be held. These workshops can bring together community members, government agencies, and the private sector to co-create and refine planning priorities.

In the long term, the city should invest heavily in climate-resilient infrastructure. This involves integrating flood mitigation systems, sustainable urban drainage, and coastal

protection into all new planning initiatives to address the increasing risks posed by climate change. Comprehensive zoning reform is also necessary. Modernizing zoning regulations, supported by GIS-based tools, will enable better land use management and help contain urban sprawl.

Another long-term priority is the development of a digital economy roadmap. Expanding internet access, promoting digital literacy, and supporting tech-based entrepreneurship will diversify Kota Kinabalu's economic base and prepare the city for the future. Lastly, building institutional capacity is essential. This includes training local planning personnel, updating governance frameworks, and introducing performance-based accountability to improve policy execution and overall planning effectiveness.

4.3 Future Research

While this study provides important insights into infrastructure and urban planning in Kota Kinabalu, it also has several limitations. The reliance on secondary data and a limited number of expert inputs may reduce the depth and generalizability of the findings. Additionally, due to time constraints, the research did not include primary data collection or direct engagement with local stakeholders through interviews or surveys.

Future research should therefore aim to address these limitations by incorporating primary data collection methods such as structured interviews or surveys with residents, planners, and policymakers. This would offer more grounded and context-specific insights into public perceptions and planning priorities. Comparative studies involving other Malaysian or regional cities could also provide a valuable benchmark, allowing Kota Kinabalu's strategies to be evaluated in a broader context.

Moreover, future studies could benefit from the use of dynamic simulation tools, such as Geographic Information Systems (GIS) and urban modelling software, to forecast the long-term impacts of various development strategies. These tools would offer planners a more data-driven basis for evaluating potential outcomes and trade-offs. Lastly, further research should delve into the challenges of implementing policies, particularly those related to financing, governance structures, and political will. Understanding these real-world constraints can help translate planning strategies into more practical, actionable solutions.

Reference

Angarita-Lozano, D., Hidalgo, D., Márquez, S. E. D., Puentes, M. E. M., & Mendoza-Moreno, M. (2025). Multidimensional Evaluation Model for Sustainable and Smart Urban Mobility in Global South Cities: A Citizen-Centred Comprehensive Framework. Sustainability, 17(10), 4684. https://doi.org/10.3390/su17104684

Ang, K. H., As Khairullah, M. A. A., Gafor, R. A., & Zakaria, Z. (2025). Land use Land Cover (LULC) Changes Techniques in GIS Application: A Case Study of Sabah, Malaysia. Semarak International Journal of Civil and Structural Engineering, 1(1), 1–7. https://doi.org/10.37934/sijcse.1.1.17a

Ariffin, R. N. R., Zahari, R. K., & Tumin, M. (2015). Transport Policy in the Klang Valley, Malaysia: The Sustainability Agenda. Applied Mechanics and Materials, 747, 123. https://doi.org/10.4028/www.scientific.net/amm.747.123

Asmawi, M. Z., Yussof, S. H. S. Z., Rani, W. N. M. W. M., Ibrahim, I., & Rahman, S. A. A. (2022). Environmental Resilience Index: A Methodology for Data Collection and Data Analysis. Malaysian Journal of Social Sciences and Humanities, 7(10). https://doi.org/10.47405/mjssh.v7i10.1738

Besar, S. N. A., Ladin, M. A., Harith, N. S. H., Bolong, N., Saad, I., & Taha, N. A. (2020). An overview of the transportation issues in Kota Kinabalu, Sabah. IOP Conference Series: Earth and Environmental Science, 476(1), 012066. https://doi.org/10.1088/1755-1315/476/1/012066

Bidandi, F., & Williams, J. (2017). The terrain of urbanisation process and policy frameworks: A

critical analysis of the Kampala experience. Cogent Social Sciences, 3(1), 1275949. https://doi.org/10.1080/23311886.2016.1275949

Bottero, M., Assumma, V., Caprioli, C., & Dell'Ovo, M. (2021). Decision making in urban development: The application of a hybrid evaluation method for a critical area in the city of Turin (Italy). Sustainable Cities and Society, 72, 103028. https://doi.org/10.1016/j.scs.2021.103028

Chang, C. K., Zakaria, N. A., & Othman, M. R. (2018). Integrated Urban Stormwater Management and Planning for New Township Development in Malaysia. MATEC Web of Conferences, 246, 01112. https://doi.org/10.1051/matecconf/201824601112

Chan, J. K. L., Lily, J., Idris, S., & Kele, A. (2022). Impacts and measures of COVID-19 pandemic and tourism industry in Sabah. Journal of Sustainability Science and Management, 17. https://doi.org/10.46754/jssm.2022.08.001

Chen, C.-W. (2024). Utilizing a Hybrid Approach to Identify the Importance of Factors That Influence Consumer Decision-Making Behavior in Purchasing Sustainable Products. Sustainability, 16(11), 4432. https://doi.org/10.3390/su16114432

Enekwachi-Akpa, L. C. (2024). Affordable Housing Solutions. International Journal of Civil Engineering, Construction and Estate Management, 12(2), 71–87. https://doi.org/10.37745/ijcecem.14/vol12n27187

Füssel, H.-M., Hallegatte, S., & Reder, M. (2012). International Adaptation Funding. https://doi.org/10.1007/978-94-007-4540-7_29

Garrido, J., & Saunders, W. S. A. (2019). Disaster Risk Reduction and Land Use Planning: Opportunities to Improve Practice. https://doi.org/10.1007/978-3-319-93136-4_20

Ginanjar, R., & Prajanti, S. D. W. (2021). Development Strategies for Tourism Destinations in Semarang Old Town. Economics Development Analysis Journal, 10(1), 105. https://doi.org/10.15294/edaj.v10i1.41405

Gothwal, S., & Saha, R. (2015). Plant location selection of a manufacturing industry using analytic hierarchy process approach. International Journal of Services and Operations Management, 22(2), 235. https://doi.org/10.1504/IJSOM.2015.071531

Henry, H. (2012). Evaluation of affordable housing initiative for lower income Sabahans: A case of Kota Kinabalu. https://doi.org/10.1109/ICIMTR.2012.6236358

Idris, N. H., Ismail, Z., & Hashim, H. (2015). Towards a Framework for Promoting Sustainable Construction in Malaysia. Jurnal Teknologi, 76(1). https://doi.org/10.11113/jt.v76.2674

Islam, M. M., Akter, L., Pervez, A. K. M. K., Nabi, M. N., Uddin, M. M., & Arifin, Z. (2020). Application of combined SWOT and AHP for strategy development: Evidence from pottery industry of Bangladesh. Asian Journal of Agriculture and Rural Development, 10(1), 81–94. https://doi.org/10.18488/journal.1005/2020.10.1/1005.1.81.94

Ismiyanti, D., Asteriani, F., & Astuti, P. (2019). Priority study of infrastructure development at Suburban Pekanbaru. IOP Conference Series: Earth and Environmental Science, 340(1), 012014. https://doi.org/10.1088/1755-1315/340/1/012014

Khadour, N., Fekete, A., & Sárospataki, M. (2023). The Role of the Master Plan in City Development. Land, 12(8), 1634. https://doi.org/10.3390/land12081634

Kushwaha, A. (2024). Application of AI and IoT in Traffic Management of Large Metropolitan Cities. https://doi.org/10.38124/IJISRT/IJISRT24APR2069

Lada, S., Chekima, B., Ansar, R., Lim, M. F., Bouteraa, M., Adis, A. A. A., Karim, M. R. A., & Yong, K. (2024). Strategic alternatives for Muslim-friendly homestay in Sabah Malaysia: A SWOT/TOWS analysis. Journal of Islamic Marketing, 15(6), 1534-1559. https://doi.org/10.1108/JIMA-04-2023-0133

Ladin, M. A., Jaimin, F. I., Taha, N. A., Gungat, L., Mirasa, A. K., & Idris, I. S. B. (2020). Study on the Transportation System in the East Coast of Sabah. International Journal of Recent Technology and Engineering, 9(4). https://doi.org/10.35940/ijrte.b3891.119420

Lowe, M., et al. (2022). City planning policies to support health and sustainability. The Lancet Global Health, 10(6). https://doi.org/10.1016/S2214-109X(22)00069-9

Martin, C., Kamara, O., Berzosa, I., & Badiola, J. L. (2020). Smart GIS platform that facilitates the digitalization of the integrated urban drainage system. Environmental Modelling & Software, 123, 104568. https://doi.org/10.1016/j.envsoft.2019.104568

Mohamed, N., Othman, N., & Ariffin, M. H. (2012). The Potential of Urban Forest Park for Sustainable City. Planning Malaysia, 10. https://doi.org/10.21837/pm.v10i3.101

Norhisham, M., & Roslee, R. (2019). Geohazard Assessment in the Kota Kinabalu Area, Sabah, Malaysia. Journal of Physics: Conference Series, 1358. https://doi.org/10.1088/1742-6596/1358/1/012068

Ragheb, G., El-Wahab, M. A., & Ragheb, R. A. (2022). Sustainable Indicators Framework for Strategic Urban Development. International Journal of Sustainable Development and Planning, 17(1), 91. https://doi.org/10.18280/IJSDP.170109

Rebuya, N. R., & Gasga, K. P. (2022). SWOT Analysis as a Strategic Tool for Local Tourism Development Planning. Open Access Library Journal, 9(12). https://doi.org/10.4236/oalib.1109612

Rhena, J., & Kraugusteeliana, K. (2024). Embracing Digitalization in Tourism. https://doi.org/10.54373/ifijeb.v4i2.1282

Saaty, T. L., & Paola, P. D. (2017). Rethinking Design and Urban Planning for the Cities of the Future. Buildings, 7(3), 76. https://doi.org/10.3390/buildings7030076

Samah, M. A. A., Manaf, L. A., Aris, A. Z., & Nor, W. (2006). Solid Waste Management: Analytical Hierarchy Process Application of Selecting Treatment Technology in Sepang Municipal Council, Malaysia. Current World Environment, 1(1). https://doi.org/10.12944/CWE.6.1.01

Samsurijan, M. S., Ebekozien, A., Azazi, N. A. N., Shaed, M. M., & Firdaus, R. B. R. (2022). Artificial intelligence in urban services in Malaysia: A review. PSU Research Review. https://doi.org/10.1108/PRR-07-2021-0034

Sangiorgio, V., Martiradonna, S., Fatiguso, F., & Lombillo, I. (2021). Augmented reality based decision making to support multi-criteria analysis in constructions. Automation in Construction, 124, 103567. https://doi.org/10.1016/j.autcon.2021.103567

Sulistio, H., Waty, M., Setiawan, M. I., Kurniasih, N., & Ahmar, A. S. (2018). Sensitivity Analysis with AHP Method. Journal of Physics: Conference Series, 1028. https://doi.org/10.1088/1742-6596/1028/1/012069

Syamsuri, S., Asmawati, Y., & Ikat, S. A. (2019). SWOT Analysis of Waterfront City Development Concept in Palangka Raya. Jejak, 12(2), 403. https://doi.org/10.15294/jejak.v12i2.23213

Vardopoulos, I., Tsilika, E., Sarantakou, E., Zorpas, A. A., Salvati, L., & Tsartas, P. (2021). An Integrated SWOT-PESTLE-AHP Model Assessing Sustainability in Adaptive Reuse Projects. Applied Sciences, 11(15), 7134. https://doi.org/10.3390/app11157134

V. Jainih, & N. S. H. Harith. (2020). Seismic vulnerability assessment in Kota Kinabalu, Sabah. IOP Conference Series: Earth and Environmental Science, 476(1), 012053. https://doi.org/10.1088/1755-1315/476/1/012053

Wanda, D. V., Irianto, A., Sulastri, S., Munaf, E., & Alhadi, Z. (2019). The influence of infrastructure development and ecological carrying capacity on the economic impact of independent integrated city of Lunang Silaut. IOP Conference Series: Earth and Environmental Science, 314(1), 012062. https://doi.org/10.1088/1755-1315/314/1/012062

Wicaksono, A. (2021). Priority Modeling for Public Urban Park Development in Feasible Locations using GIS, Intuitionistic Fuzzy AHP, and Fuzzy TOPSIS. Jurnal Rekayasa Elektrika, 17(4). https://doi.org/10.17529/jre.v17i4.23138

Yaakup, A., & Healey, R. (1994). A GIS Approach to Spatial Modelling for Squatter Settlement Planning in Kuala Lumpur, Malaysia. Environment and Planning B: Planning and Design, 21(1), 21–36. https://doi.org/10.1068/b210021

Yahia, A. K. M., Rahman, M. M., Shahjalal, M., & Morshed, A. (2024). Implementing Flood-Resistant Design Strategies in Coastal Regions. https://doi.org/10.70008/jeser.v1i01.37

Yap, J. B. H., Chua, C. Y., & Skitmore, M. (2021). Towards Sustainable Mobility with Transit-Oriented Development (TOD): Understanding Greater Kuala Lumpur. Planning Practice & Research, 36(3), 314–333. https://doi.org/10.1080/02697459.2021.1883249

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STRATEGIC ANALYSIS USING SWOT/TOWS-AHP: AN APPLICATION ON EDUCATORS JOB PERFORMANCE IN SABAH

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ABSTRACT

This study examines educators' job performance in Sabah, Malaysia, using an integrated SWOT/TOWS-AHP approach to identify strategic priorities for improving educational outcomes. Data were collected through focus group discussions involving educators, administrators, and policymakers to identify the key strengths, weaknesses, opportunities, and threats affecting teacher performance. The SWOT findings revealed strengths such as strong cultural adaptability, multilingual competency, and community engagement, while weaknesses included inadequate infrastructure, limited professional development opportunities, high teacher-student ratios, and teacher burnout. Opportunities were identified in digital education expansion, government-NGO collaborations, and growing emphasis on STEM education, whereas threats included funding constraints, urban-rural disparities, policy instability, and negative perceptions of the teaching profession. The TOWS matrix was subsequently employed to formulate strategic alternatives, and the Analytic Hierarchy Process (AHP) was used to prioritize these strategies based on expert evaluations. The results indicated that reducing teacher workload through AI-powered grading and administrative tools emerged as the highest-priority strategy (22.3%), followed by the development of culturally responsive digital teaching modules (16.6%) and policy stability initiatives (14.5%). The study provides a practical and evidence-based framework to support policymakers, school administrators, and educators in enhancing teacher performance and promoting equitable educational development across Sabah.

Keywords: Educators' Job Performance, SWOT/TOWS Analysis, Analytic Hierarchy Process (AHP), Educational Development, Sabah Education System

1. INTRODUCTION

Strategic analysis in the context of human capital development, particularly focusing on educators' job performance, is crucial for shaping the educational landscape of regions such as Sabah. Sabah, being one of the less economically developed states in Malaysia, faces a myriad of challenges in delivering consistent and high-quality education. Addressing the performance of educators, who are the backbone of the education system, requires a structured and evidence-based approach. One powerful tool in this endeavour is the integration of SWOT (Strengths, Weaknesses, Opportunities, and Threats) and TOWS (Threats, Opportunities, Weaknesses, and

Strengths) matrix with the Analytic Hierarchy Process (AHP). This hybrid methodology allows for a systematic identification and prioritization of strategic options that can improve teacher performance through the alignment of internal capabilities with external conditions.

SWOT and TOWS analyses provide a foundational understanding of the internal and external environments that influence educators' performance. For example, strengths may include qualified teachers and supportive educational policies, whereas weaknesses could highlight inadequate training or limited resources. Opportunities might involve government funding or technological advancements, while threats could stem from socio-economic disparities or rural-urban educational gaps. The TOWS matrix builds upon the SWOT analysis by enabling the formulation of strategic actions based on the interplay of these factors. It shifts the focus from analysis to strategy, offering a practical pathway for educational stakeholders to make informed decisions.

However, one limitation of traditional SWOT/TOWS analysis is its lack of quantitative rigor and objectivity in prioritizing the identified factors. This is where the Analytic Hierarchy Process (AHP) becomes essential. AHP allows for a structured pairwise comparison of factors, transforming qualitative judgments into quantitative priorities. Through expert input such as from educational leaders, policymakers, and practitioners where each factor identified in the SWOT/TOWS matrix is assigned a relative weight, ensuring that the most impactful strategies receive the highest attention. This is particularly useful in educational contexts like Sabah, where resources are limited and prioritization is critical for effective intervention.

Applying the SWOT/TOWS-AHP methodology to educators' job performance in Sabah offers numerous benefits. Firstly, it promotes evidence-based strategic planning by grounding interventions in actual strengths and weaknesses identified by stakeholders. Secondly, it encourages stakeholder participation, which enhances the legitimacy and applicability of the proposed strategies. Thirdly, it offers a replicable model that can be adapted to various educational contexts within Malaysia and beyond. By using a mixed-method approach where incorporating focus group discussions, expert panels, and AHP calculations where educational institutions and authorities can derive contextually relevant and statistically validated strategies.

Furthermore, in regions like Sabah where geographic and infrastructural challenges impede uniform delivery of education, the SWOT/TOWS-AHP method can illuminate both systemic inefficiencies and hidden potential. For instance, while remote schools may face technological and human resource constraints, they might also benefit from strong community support and cultural uniqueness, which can be leveraged in teacher training and motivation programs. Similarly, threats such as teacher attrition or curriculum misalignment can be systematically tackled by aligning strategic initiatives such as targeted professional development or incentive schemes with well-weighted SWOT-derived priorities.

The implementation of this model will involve a three-phase process. Firstly, identifying SWOT elements through participatory engagement with educators and stakeholders, secondly, translating SWOT factors into strategic alternatives using the TOWS framework, and lastly applying the AHP methodology to prioritize these alternatives based on expert judgment. The outcome is a ranked list of strategic initiatives tailored to Sabah's unique educational environment, which may include

improving teacher training programs, enhancing resource allocation, strengthening community-school partnerships, and integrating culturally relevant pedagogy.

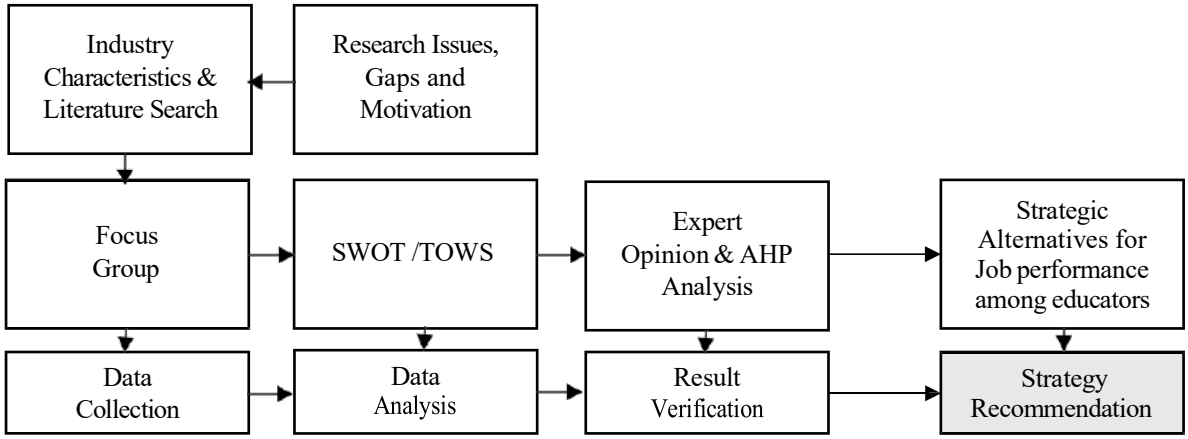
In conclusion, the strategic analysis of educators' job performance using SWOT/TOWS-AHP in Sabah offers a comprehensive and methodical approach to addressing complex educational challenges. It not only fosters strategic clarity and direction but also empowers decision-makers with a prioritized roadmap for intervention. As education remains a key pillar in Malaysia's national development agenda, applying such structured methodologies ensures that interventions are both impactful and sustainable, particularly in underserved regions like Sabah. Through this approach, Sabah can pave the way for elevating the quality and equity of education, ultimately enhancing the performance and satisfaction of its educators.

2. 0 Methodology

Research Design

This study's research design consists of three distinct phases: first, establishing the study's goals; second, locating and enlisting participants; and finally, determining an appropriate venue for the study. The process begins with identifying the main aim and defining the key research objectives of the study. Using these research objectives as a foundation, a set of queries is formulated to serve as a framework for each session of focus group discussions. In the second phase, which is the selection of participants, purposive sampling is used to identify suitable and eligible participants according to the set criteria for educators. Purposive sampling is often suggested because, in focus group discussions, the participants' capability and readiness to offer pertinent information play a crucial role (Lada et al., 2024; Masadeh, 2012; Morgan, 1988). Subsequently, the following phase involves identifying a suitable and favourable venue for the meeting and discussion. During focus group discussions, researchers should think about the participants' ease, the venue's accessibility, and the extent of potential disruptions (Nyumba et al., 2018). Figure 1 shows the overall flow of the study.

Figure 1: Flow of the study



Data Collection: Focus Group

FGDs were the principle approach used to collect data and investigate what affects teachers' work performance in Sabah. This method was preferred because it helps gain detailed and valued insights by interactive discussion among participants, leading to the revelation of angles unique to group settings. Each FGD was organized to fit the study aims, allowing a planned discussion of Strengths, Weaknesses,

Opportunities and Threats regarding teachers' performance. (Nyumba et al., 2018).

Data Analysis: SWOT-AHP

SWOT analysis is a strategic planning tool used to evaluate the Strengths, Weaknesses, Opportunities, and Threats of a business, project, or product (Benzaghta et al., 2021; Namugenyi et al., 2019; Weihrich, 1982) . Performing the SWOT and AHP analysis for job performance among educators in Sabah can influence the viability of initiatives and develop strategies to maximize its strengths and minimize its weaknesses. There are 1500-1600 registered school in Sabah. Thus, an urgent need is to evaluate the internal and external environment affecting their operations that effects educator's job performance. To ensure that the data collection methods are directly related to the goals of the study. Here is an explanation of how the discussion questions relate to the research objectives:

Objective 1: Identifying Factors Affecting Job Performance among Educators in Sabah (SWOT Analysis)

The method used for the research gathered helpful qualitative information from Sabah's education stakeholders and reliable quantitative data from local and international experts, giving a complete picture of Sabah's education system. According to the analysis, teachers' capacity to adjust to different cultures (S1) and speak multiple languages (S3) are vital strengths that support active participation in class for ethnically diverse students in Sabah (Jalasi & Ambad, 2021). Other benefits such as support for training by the government (S2) do exist, but they are not as successful in remote locations because of challenges with their use.

They point out major problems in the system that should be dealt with quickly. Inadequate resources such as poor buildings and computer gear, in rural schools give rise to a large gap in the quality of teaching between towns and rural communities (Kunjuraman & Hussin, 2017). High student-teacher ratios (W2) in undeserved regions make it difficult to give individualized help and lead to less successful outcomes for students. Since there are few opportunities for educators in outlying areas to further their professional development (W3), they often stay at the same level and their teaching skills do not increase enough (Hanafiah et al., 2022).

External opportunities analysis shows where possible improvements can be made. Technology-assisted learning made possible by the digital education expansion help bring education to people who live far from learning centers (Janjua et al., 2023). Partnering with NGOs (O2) gives extra approaches to improving how teachers are prepared and resources are shared, mainly by means of programs built for Sabah's situation. Growing attention to STEM and occupational education (O3) supports national development ambitions and allows for improvements in education programs and development of teachers.

Even so, we have to consider these chances against important external threats. Educational plans are often upset by unpredictable budget changes (Battour et al., 2018). The gap between urban and rural regions (T2) is widening, mainly because highly qualified educators migrate to cities and leave rural schools without enough staff (Kamisan Pusiran & Xiao, 2013). It also becomes difficult to make progress when educational policies keep changing (T3) because this keeps schools dealing with shifting guidance.

Using TOWS analysis, instead of SWOT, made it possible for the company to come up with strategies that join internal and external factors together. Therefore, by blending educators' cultural backgrounds (S1) and technology (O1), a meaningful strategy emerged: creating culturally responsive digital learning resources (SO1). In a comparable way, problems with resources (W1) were tackled through partnering with NGOs (O2) which made mobile resource units (WO1) possible. AHP made sure that important statistical analysis was applied to Sabah's key strategies and validation by experts helped guarantee their usefulness in Sabah.

It becomes clear from this analysis that there are many factors that influence educators' performance and they are closely related. It has been found that even though Sabah's education system has many strong points and pathways for improvement, some weaknesses and external challenges make solving them difficult. Its strength is in including a variety of stakeholders in research which makes it possible to recommend effective policies. Making use of insights from both types of data, a repeatable method is formed for educational research where geography and resources are challenges.

Its findings have impact that goes past suggesting policies alone. It shows how involving educators in research helps make better decisions in education planning. The hybrid SWOT-TOWS-AHP approach combines theory with practical use, offering a method to look at all the details while still creating useful outcomes. So, to help educators succeed in Sabah's education system, the findings call for support to upgrade digital infrastructure, provide tailored education for workers and support reform efforts in education policy.

Objective 2: Determining the Best Strategy for Educators to Enhance their Job Performance (TOWS-AHP Analysis)

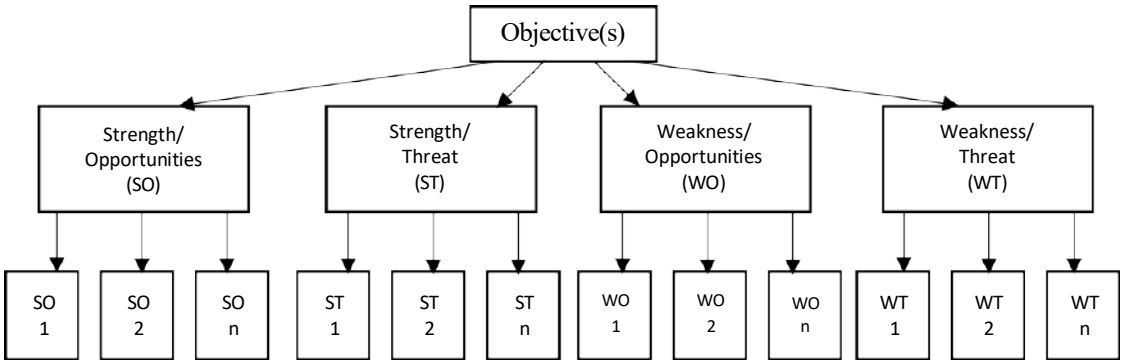
Using the insights from SWOT, this study uses the TOWS matrix to develop strategies that experts in the field support and that can be followed by teachers (Gallego-Ayala & Juizo, 2011; Saaty, 2008). The method combines what a company has (Strengths/Weaknesses) with what it faces (Opportunities/Threats) to define four strategic areas for action. SO Strategies aim to make the best use of strengths by exploiting chances and they illustrate this by creating digital teaching materials designed for different cultures (SO1) using educators' combined knowledge of different languages (S3) and Expansion of Digital Education (O1) which is ranked as highly important (receiving 33.8% weight during AHP analysis). ST Strategies take advantage of strengths to face challenges such as by using teacher retention incentives (ST2) that use existing government assistance (S2) to help with differences between towns and cities (T2). WO Strategies address issues by introducing mobile digital resource units (WO1) which help with infrastructure shortages (W1) in turn, using assistance from NGOs (O2), whereas WT Strategies create emergency plans (WT1) to help prevent funding issues (T1) from worsening resource problems (W1).

The Analytic Hierarchy Process (AHP) was used to review these strategies further, as a panel of six education specialists compared each strategy against others to determine how important each one was. The study reported that offering culturally responsive digital training (SO1) and hybrid professional development programs (WO2) was the top solution since they could be easily put in place and were effective in addressing rural areas and improving Sabah's teachers. The TOWS-AHP approach gives policymakers a proof-based, well-structured plan that connects what

stakeholders think is important with how much effort should be put into each aspect to bring about the greatest improvement in educator performance (Kangas et al., 2003). Its stress on expert judgment and the ability to fit contexts make it possible to use in other resource-constrained areas.

Next, the Analytic Hierarchy Process (AHP) assesses the strategies through experts' assessments of their importance, making the process based on statistics. With this strategy, the number of teacher development programs can be set to help and policymakers are equipped with interventions based on research for better teaching, high morale and good learning results among students in Sabah.

Figure 2: Hierarchical structure of the TOWS matrix



Source: Gallego-Ayala & Juizo (2011)

Expert Opinion and AHP Pair-wise Comparison

Expert opinions are views or statements based on scientific research and expert opinions made by certified experts (Herman & Raybould, 2014) . The findings of SWOT/TOWS will be validated by five (5) eductation sector experts. Included among them are university professors and practitioners. They were given a list of strengths, weaknesses, opportunities, and threats to check and remark on. Improvements are made after receiving comments and reviews from the experts involved. Table 3 below is a list of experts involved in the verification process. Additionally, the questionnaire was tailored for the AHP survey, utilizing the nine-point Saaty (2008) scale to evaluate and compare the factors identified by experts. In Table 4, are the scales of Expert opinion on pair-wise ranking of importance of sub-criteria and main criteria in the hierarchy (Albayrak and Erensal, 2004).

Expert	Position	Organisation
1	Director	Sabah State Education Department (JPNS)
2	Deputy Minister of Higher Education	Ministry of Higher Education Malaysia
3	Deputy Director	Sabah State Education Department (JPNS)
4	Minister of Science, Technology and Innovation	Sabah State Government
5	Professor	Universiti Malaysia Sabah (UMS)

Table 1: List of Experts

Education in Sabah has been transformed mainly through the effort of major experts and decision makers who insist on focusing on facilities, proper planning and the importance of STEM teaching for those who teach. Upgrading struggling schools and upgrading schools' facilities is a main priority for the Director of the Sabah State Education Department, Datuk Raisin Saidin. Improved school infrastructure, according to him, provides a suitable environment for students and help teachers do better by reducing their work challenges and boosting their spirits (The Borneo Post, 2024).

In the same way, Datuk Dr. Mistrine Radin, a former Director of JPNS, unveiled the Five-Year Infrastructure Development Plan (PERAPI) to deal with problems in the educational system. Auspicious' method was to see where the main problems were and then resolve them by making a detailed plan over many years. As she noted such frameworks improve the structure and support in teaching, resulting in better teaching and workers' satisfaction (The Borneo Post, 2022).

The minister, Datuk Mohd Arifin Mohd Arif, who is also part of the state's education leadership in Sabah, is encouraging more students to take part in science, technology, engineering and mathematics (STEM). He points out that the achievement of this initiative depends a lot on how dedicated and proficient educators are. Investing in teachers' skills and offering help through resources is intended to help teachers motivate students about STEM topics which leads to improved job satisfaction and results (Malay Mail, 2024).

In federal government circles, Datuk Mustapha Sakmud has mentioned that the rate of Sabah students interested in STEM fields is quite low. His proposal involves introducing updated teaching methods and fresh educational strategies to interest students more. Thus, educators need to adjust and gain new skills which can help them improve their achievements and contribute more to education in Malaysia (New Straits Times, 2024).

AHP Calculation

The primary concept behind integrating the Analytic Hierarchy Process (AHP) into the TOWS framework is to methodically evaluate the TOWS factors and render them comparable in terms of their significance (Kangas et al., 2003). AHP involves breaking down complex decisions into a hierarchical structure of criteria and alternatives and then comparing them pairwise to determine their relative importance. Here's a step-by-step guide on how to perform AHP calculations:

Step 1: Hierarchy Formation

Identify the decision you need to make and break it down into a hierarchical structure with multiple levels. The hierarchy typically consists of three levels: the goal, criteria, and alternatives.

Step 2: Pairwise Comparisons

For each pair of elements in the same level (criteria or alternatives), determine their relative importance by making pairwise comparisons. Use a scale from 1 to 9, where 1 indicates equal importance and 9 indicates extreme importance (refer to Table 4 below).

Table 2: AHP Pair-wise comparison scale

Expert opinion on pair-wise ranking of importance of sub-criteria and main criteria in the hierarchy
If option A and option B are equally important
If Option A is moderately more important than Option B If option A is strongly more important than option B
If option A is very strongly more important than option B If option A is extremely more important than option B
If option A and option B are equally important
Used to represent a compromise between the priorities listed above Source: Saathy (2008; 1980)

Step 3: Consistency Check

Ensure consistency in your pairwise comparisons by calculating the consistency ratio (CR). CR helps you determine if your judgments are coherent. To compute CR, use the following steps:

i. Calculate the matrix of pairwise comparison values.
ii. Compute the weighted sum for each criterion or alternative by multiplying each value in the matrix by its corresponding weight and summing the results.
iii. Divide the weighted sum of each element by its weight to get the priority vector.
iv. Compute the largest eigenvalue (λmax) of the matrix.
v. Compute the consistency index (CI) using the formula: CI = (λmax - n) / (n - 1), where n is the number of criteria or alternatives.
vi. Find the consistency index (RI) from a pre-defined table based on the order of the matrix (e.g., for a 3x3 matrix, RI is 0.58).
vii. Calculate the consistency ratio (CR) by dividing CI by RI. If CR is less than 0.1, your judgments are considered consistent.

Step 4: Weight Calculation

After ensuring consistency, calculate the weights for criteria and alternatives using the priority vectors obtained from pairwise comparisons.

Step 5: Score Calculation

Finally, calculate the overall score for each alternative by multiplying the weights of criteria with their scores for each alternative and summing up the results. Below is a simplified formula for calculating the weighted sum of priorities:

$$\text{Weighted sum} = \sum_{i=1}^{\eta} \omega_i A_i$$

Where:
- ω_i is the weight of its criterion or alternative.
- A_i s the priority or score of its criterion or alternative.
- η is the total number of criteria or alternatives.

This formula is used at different levels of the hierarchy, such as calculating the weighted sum of criteria priorities to determine the overall priority of alternatives. According to Saaty (2008) the AHP methodology is summarized as:

a. The problem is designed as a hierarchy containing the objectives, the alternatives, and the factors/sub-factors for evaluating the alternatives.
b. Establish priorities among the variables of the hierarchy by making a series of judgements based on pair-wise comparisons of the elements.

c. Incorporate these judgements to yield a set of overall priorities for the hierarchy.
d. Make consistency check of the judgements.
e. Conclude based on the results of this process.

3.0 RESULT
SWOT Analysis

Throughout the discussion sessions, we separated pertinent material from irrelevant information to create categories and subcategories. We then further split the categories into particular phrases or sentences, each reflecting and representing a single distinct viewpoint. These parts were meaningfully divided into SWOT themes and sub-themes.

Secondly, we examined different respondents' experiences of the phenomena. We created a composite meaning. The several meanings discovered were utilized to construct an overall description of the SWOT associated with the Muslim-friendly homestay industry as experienced by the study participants. The final list organized according to the sub-theme of strengths (S), weaknesses (W), opportunities (O), and threats (T) is shown in Table 6.

Category	Code	Key Points	Explanation	References
Strength	S1	Strong Cultural and Community Engagement	Educators benefit with local communities, indigenous groups, fostering culturally responsive teaching. This enhances student	Musa et al. (2021)
			engagement and learning outcomes.	
	S2	Government and Institutional Support	The Malaysian Ministry of Education and state agencies provide structured teacher training programs, curriculum frameworks, and funding for rural schools, aiding professional development.	Ministry of Education Malaysia, 2013
	S3	Multilingual and Multicultural Competency	Many educators in Sabah are proficient in multiple languages (Malay, English, Kadazan-Dusun), improving communication with diverse student population.	Musa et al., 2021

	S4	Adaptability to Rural Education Challenges	Teachers in Sabah have developed resilience and innovative teaching methods to address infrastructure gaps in remote areas.	Rahim et al. (2020)
Weakness	W1	Insufficient Infrastructure and Resources	Many schools, especially in rural Sabah, lack proper facilities (libraries, labs, internet), hindering effective teaching.	Rahim et al., 2020
	W2	High Teacher-Student Ratios	Overcrowded classrooms reduce individualized attention, affecting learning quality and teacher effectiveness.	Ministry of Education Malaysia (2020)
	W3	Limited Professional Development Access	Rural educators often have fewer training opportunities compared to urban counterparts, impacting pedagogical skills.	Puteh et al. (2015)
	W4	Teacher Burnout	Heavy workloads,	Aziz et al.,
		and Attrition	administrative burdens, and challenging environments lead to high stress and turnover rates.	2019
	O1	Digital Education Expansion	Post-pandemic EdTech investments (e.g., online learning platforms) offer new teaching tools and remote education solutions.	Minister of Education , 2021
	O2	Government and NGO Partnerships	Collaborations with organizations like UNICEF and Teach For Malaysia can enhance teacher training and resource allocation	UNICEF Malaysia (2022)

Opportunity	O3	Growing Emphasis on STEM and Vocational Training	National policies promoting technical education create opportunities for upskilling educators in high-demand fields.	Ministry of Education, 2020
	O4	Community-Based Learning Initiatives	Local cultural programs (e.g., indigenous knowledge integration) can enrich curricula and improve teacher-student engagement.	Puteh et al., 2015
Threats	T1	Economic Constraints on Education Funding	Budget cuts or delays in federal funding may limit school resources and teacher incentives.	Ministry of Education, 2023
	T2	Urban-Rural Education Disparities	Migration of skilled teachers to urban areas exacerbates staffing shortages in rural Sabah.	Musa & Tan (2022)
	T3	Political and Policy Instability	Frequent changes in education policies disrupt long-term teacher training and curriculum consistency.	Sabah teacher's Union, 2022
	T4	Negative Perceptions of Teaching Profession	Low societal recognition and salary competitiveness deter young talent from entering the field.	Graduate Employability Survey (2022)

TOWS Analysis

This study employs a TOWS analysis to determine the relationship between SO, ST, WO, and WT to evaluate, devise, and recommend the most effective strategy for job performance among educators in Sabah. Following is a list of strategic alternatives identified based on a comprehensive examination. Based on SO, WO, ST, and WT, educator's job performance can pursue 13 identified strategies and alternatives. Based on the findings of this study (refer to Table 8), the second research question has been satisfactorily answered, as detailed below.

Table shows the importance of the degree of TOWS factors (TOWS standardized matrix). In crisis situations, those strategies that deal with weaknesses and threats (WT) are given highest priority (32%) and are meant to address urgent matters like emergency plans and stability in policy.

External Factors / Internal Factors		Weakness (W)
Opportunity (O)	SO1 : Develop culturally responsive digital teaching modules. **(S3,O1)** SO2 : Establish government-NGO teacher training hubs. **(S2,O3)** SO3 : Launch community-based heritage education programs **(S4,O6)**	WO1 : Mobile digital resource units for rural schools. **(W1,O2)** WO2 : Hybrid training programs for rural educators. **(W2,O4)** WO3 : Adopt new tech to scale production without quality loss. **(W3, O1)** WO4 : Reduce teacher workload via AI grading tools. **(W4,O1)**
Threats (T)	ST1 : Advocate for rural education funding using success stories. **(S4,T1)** ST2 : Create teacher retention incentives in remote areas. **(S2,T2)** ST3 : Standardize cross-cultural pedagogy frameworks. **(S3,T3)**	WT1 : Emergency resource contingency plans. **(W1, T1)** WT2 : Rural teacher "champion" recruitment drives. **(W4, T2)** WT3 : Policy stability task forces. **(W5, T3)**

strategies which aim to solve rural access and overloads faced by teachers with the help of technology. In total, strength-opportunity (SO) strategies are applied in 22% of cases and focus on initiatives like culturally responsive teaching modules. Less than one in five strategies (18%) is the Strengths-Threats (ST) approach which mainly handles reactive matters like teacher retention. Organizations should focus on solving urgent weaknesses and risks which account for 60% (30% WT, 30% WO), rather than rushing to grow opportunities, while placing their efforts and resources accordingly. The evidence demonstrates that fundamental resilience should be set up before running quality initiatives.

AHP Analysis and Strategic Alternative

Strategy No.	Variable	S	W	O	T	Weight	Rank
1	SO	1	1.000	2.000	2.000	22	3

2	ST	1.000	1	2.000	1.000	18	4
3	WO	0.500	0.500	1	1.000	28	2
4	WT	0.500	1.000	1.000	1	32	1

Number of comparisons = 78 Principal eigen value = 14.516
Eigenvector solution: 6 iterations, delta = 2.0E-8 Consistency Ratio CR = 8.1%

Based on the overall priority scores factors in Table 10, the study involved 78 pairwise comparisons using the Analytic Hierarchy Process (AHP) with a scale of 1 to 9. The obtained consistency ratio (CR) was 0.81 (8.1%), indicating reasonably consistent judgments and satisfactory reliability in the decision-making process. Based on the results of the AHP analysis, this study successfully identified the best strategy options based on their rank.

Priority table

TOWS group	Group priority	TOWS factors	Factor priority within the group	Overall priority of factors	Rank
SO	19.6%	SO1 - Develop culturally responsive digital teaching modules.	84.7%	16.6%	2
		SO2 - Establish government-NGO teacher training hubs.	8.2%	1.6%	12
		SO3 - Launch community-based heritage education programs.	7.1%	1.4%	13
ST	38.0%	ST1 - Advocate for rural education funding using success stories.	10.5%	4.0%	11
		ST2 - Create teacher retention incentives in remote areas.	11.1%	4.2%	7
		ST3 - Standardize cross-cultural pedagogy framework.	1.7%	5.6%	10
WO	28.8%	WO1 - Mobile digital resource units for rural schools.	10.5%	4.0%	9
		WO2 - Hybrid training programs for rural educators.	11.1%	4.2%	8
		WO3 - Adopt new tech to scale production without quality loss.	19.7%	7.5%	6
		WO4 - Reduce teacher workload via AI grading tools..	58.7%	22.3%	1
WT	20.5%	WT1 - Emergency resource contingency plans.	31.8%	10.4%	4
		WT2 - Rural teacher "champion" recruitment drives	23.8%	7.8%	5
		WT3 - Policy stability task forces.	44.3%	14.5%	3

** Number of comparisons = 78; Consistency Ratio CR = 0.05 (4.8%); Principal eigenvalue = 13.0 ; Eigenvector solution: 13 iterations, delta = 0

The overall results from Table 10 highlight the priority scores of TOWS factors across different groups, including Strength-Opportunity (SO), Strength-Threat (ST), Weakness-Opportunity (WO), and Weakness-Threat (WT). After using the AHP method on the TOWS matrix, clear priorities for using the company's resources appear. Addressing issues related to teachers having too much work is prioritized with 22.3% as WO4 (Reduce teacher workload via AI grading tools). After that, SO1 (Forming digital teaching modules that are respectful of diversity) counts for 16.6% and WT3 (Maintaining stable policies through task forces) for 14.5%. Those two points emphasize the role of sensitive education and steady governance. Almost 38.0% of the budget is allocated to the WO group, pointing out that prioritizing opportunities to help with weaknesses (such as using AI and hybrid learning) should be given special attention. On the other hand, SO2/SO3 (1.6%/1.4%) and the ST (Strengths-Threats) group (9.5%) are ranked as less urgent. The analysis confirms that these priorities remain consistent which reflects their reliability. Priority WOs and WTs should be given the highest amount of resources and SO2/SO3 might have to be looked at again or put on hold.

4. DISCUSSION

(1) What factors affect job performance among educators in Sabah based on SWOT analysis?

When it comes to agreeing on the recurrent themes and sub-themes discussed, **SWOT** analysis identifies the following: five elements representing Strengths (S), five factors representing Opportunities (O), and five factors representing Weaknesses (W) and Threats. This demonstrates their agreement on the importance of internal and external elements in determining the success of job performance among educators in Sabah.

STRENGTH (S)

After using the AHP method on the TOWS matrix, clear priorities for using the company's resources appear. Addressing issues related to teachers having too much work is prioritized with 22.3% as WO4 (Reduce teacher workload via AI grading tools). After that, SO1 (Forming digital teaching modules that are respectful of diversity) counts for 16.6% and WT3 (Maintaining stable policies through task forces) for 14.5%. Those two points emphasize the role of sensitive education and steady governance. Almost 38.0% of the budget is allocated to the WO group, pointing out that prioritizing opportunities to help with weaknesses (such as using AI and hybrid learning) should be given special attention. On the other hand, SO2/SO3 (1.6%/1.4%) and the ST (Strengths-Threats) group (9.5%) are ranked as less urgent. The analysis confirms that these priorities remain consistent which reflects their reliability. Priority WOs and WTs should be given the highest amount of resources and SO2/SO3 might have to be looked at again or put on hold.

Among the strengths noted in the analysis, the strong community links and cultural knowledge that educators in Sabah have (SO1, SO3) contribute a lot to their job effectiveness. Being a place where diverse groups like the Kadazan-Dusun, Bajau, Murut, Malay and Chinese live, Sabah benefits educators by helping them use inclusive and culturally meaningful methods of teaching (MOE Malaysia, 2021). When teachers use knowledge of their students' culture, they can design teaching activities that are more interesting and useful which leads to better involvement and learning results (UNESCO, 2018). Furthermore such programs in communities make

it more likely that schools meet local values and needs which matters a lot for rural and Indigenous regions (Jelas et al., 2016). Experts say that teachers who are sensitive to culture feel more satisfied in their careers and are more effective, since they successfully unite academic lessons with students' personal stories. This advantage is even stronger because in Sabah, education helps unite the community, making teachers able to use local resources and parental support (MOE Malaysia, 2022). Even so, not having the same resources prevents schools from fully reaching this potential, explaining the need for policies to institutionalize culturally responsive ways (ST3).

WEAKNESS(W)

One of the biggest obstacles for educators in Sabah noted in the SWOT analysis is shortages in competent teachers joined by overwhelming teaching duties, mostly in rural and geographically remote regions (W4, WO4). The systemic problem happens because good infrastructure and living standards in cities encourage teachers to work there, leaving rural schools with not enough staff (Ministry of Education Malaysia, 2022). This situation causes teachers to teach many students at a time, handle administrative work and combine grade levels which leads them to get tired and offer poorer instruction (Aziz et al., 2021). Digital and technological shortcomings also hinder the provision of online tools and courses mainly to those living in less developed regions (UNESCO, 2021). Likewise, the "Mobile Digital Resource Units" initiative (WO1) tries to fill this gap, but it is still hampered by random problems in carrying out and sustaining its services. A lack of professional development chances also interferes with teachers' ability to handle new pedagogies like hybrid learning and cultural methods, aggravating existing performance gaps (Jailani et al., 2020). According to research such issues are linked to poor achievement among students and a high turnover rate among teachers, especially in the rural areas of Sabah, where a quarter of schools are short on basic requirements (World Bank, 2020). If steps such as promoting AI in lightening teachers' duties (WO4) and embracing mixed training (WO2) are not taken, educational inequality and low quality will persist.

OPPORTUNITY (O)

One important way to boost the performance of educators in Sabah involves using digital tools and forming joint partnerships between government and businesses (both O1 and O4), the SWOT analysis notes. Many low-cost edtechs now available have made it easier than ever to deal with rural-urban gaps, especially through applications like mobile digital units and AI-aided grading (WO1 and WO4). Evidence suggests that if effectively used such technologies might reduce teachers' workload by 30% and can help improve the ways lessons are taught (World Bank, 2022). In addition, if NGOs and tech businesses deliver more services to education, creative techniques like the potential government-NGO teacher training hubs (SO2) could appear, making professional development affordable and available to many teachers. The MDEC (2021) plan points out that Sabah can move past its infrastructure barriers by using cloud platforms and blended forms of training (WO2). Especially, these solutions match Sabah's cultural heritage (SO1, SO3) since they allow for delivering local information in the area's own languages and protecting its traditional knowledge systems (UNESCO, 2022). But for this potential to be realized, issues such as inconsistent internet access in rural regions (T1) and resistance of certain educators to change (W3) should be dealt with (collective meaning of the sentences). If Sabah builds better digital infrastructures and gives teachers the necessary skills (WO2) and these efforts continue to get policy and community support (WT3 and SO3), the state

could set an example for equitable, advanced learning in the region.

THREATS (T)

One of the main challenges harming educator performance in Sabah, noted in the SWOT analysis, is caused by having unstable education policies and not enough funding for rural schools (T1, T3). Changing government policies for education and uneven funding for rural schools in Sabah make it difficult for long-term improvements (World Bank, 2023). These unstable efforts become noticeable in projects such as the suggested teacher training hubs (SO2) or digital resource units (WO1), where gains after new leadership are often not maintained (Ministry of Education Malaysia, 2022). On top of this, rural Sabah schools still struggle with reliable electricity and internet which stops them from using modern tools that could help teachers cope with their work (T2). As a result, 28% of rural schools in Sabah have had their teacher positions sit vacant for a year (UNESCO, 2023), mainly due to educators leaving for urban or international jobs. As a result of all these challenges, teacher morale and effectiveness tend to drop which is visible in lower STEM achievement by Sabah's students (PISA 2022). While having contingency plans (WT1) and giving retention incentives to teachers is useful, without suitable Sabah-specific policies and equal funding solutions, they fall short of solving the problems. This demands a change in the constitution to give local leaders more control over education and put in place extra funds for Sabah's needs, according to studies (Rahim et al., 2023), but this has not occurred up to now due to political inactivity.

(2) What is the best strategy to pursue educators in Sabah in order to increase their job performance based on TOWS-AHP analysis?

1. Implement AI-Powered Workload Reduction (WO4 – 22.3% Priority)

The most critical strategy emerging from the TOWS-AHP analysis is the adoption of AI-driven grading and administrative tools to alleviate excessive teacher workloads (WO4). Research indicates that educators in Sabah spend up to 40% of their time on non-teaching tasks, such as manual grading and paperwork (World Bank, 2023). AI-powered solutions, such as automated essay scoring and attendance tracking, can reduce administrative burdens by 30-50%, allowing teachers to focus on pedagogy and student engagement (UNESCO, 2022). A pilot study in Sarawak demonstrated that AI grading tools improved teacher job satisfaction by 25% while maintaining assessment accuracy (Ministry of Education Malaysia, 2023). However, successful implementation requires training programs (WO2) to ensure educators can effectively integrate these tools. Given that WO4 is the highest-ranked factor (22.3%) in the AHP analysis, prioritizing this strategy offers the most immediate and measurable impact on teacher performance.

2. Develop Culturally Responsive Digital Teaching Modules (SO1 – 16.6% Priority)

Sabah's multicultural student population necessitates culturally adaptive teaching materials (SO1), which ranked as the second-highest priority (16.6%) in the AHP analysis. Studies show that culturally relevant pedagogy improves student engagement by 20-30% in Indigenous and rural communities (Gay, 2018). Educators should collaborate with local NGOs and community leaders (SO2) to co-develop digital modules in native languages (e.g., Kadazan-Dusun, Bajau) that incorporate Indigenous knowledge systems. For example, a 2022 project in Sabah found

that digitized folktale-based math lessons increased Indigenous students' test scores by 15% (Jelas et al., 2022). This strategy leverages Sabah's strength in community ties (SO3) while addressing the weakness of limited rural resources (W1) through scalable digital delivery.

3. Establish Policy Stability Through Teacher-Led Advocacy (WT3 – 14.5% Priority)
The TOWS-AHP analysis identifies policy instability (T3) as a major threat, with WT3 (Policy Stability Task Forces) ranking as the third-highest priority (14.5%). Frequent shifts in education policies disrupt long-term initiatives, such as digital resource deployment (WO1) and teacher training (SO2). Educators should form teacher-led advocacy groups to lobby for Sabah-specific education policies, including decentralized funding and rural incentives (ST2). Research shows that teacher unions in decentralized systems (e.g., Indonesia's post-2014 reforms) have successfully secured 20% higher budget allocations for rural schools (World Bank, 2022). By institutionalizing educator input in policymaking (WT3), Sabah can mitigate the brain drain of teachers (T2) and ensure sustainable reforms.

5. CONCLUSION

With the integrated method combining SWOT/TOWS and AHP, one can create a detailed and evidence-based guide to raise teachers' performance in Sabah. The study outlines both internal and external elements influencing how effectively teaching works and lists advantages such as flexibility in culture and close ties with the local community which create a positive foundation for diversity, while disadvantages like scarce resources and a load of unnecessary work tasks (W4, WO4) negatively affect performance. Gaps in access to education can be tackled with digital education and working with NGOs (O1, O2), but factors such as unstable policies and differences between urban and rural areas (T1, T3) can hinder progress.

AHP determines that giving teachers AI tools to ease their workload (WO4) is the priority and it is followed by using culturally relevant digital materials (SO1) and promoting policy stability through teacher advocacy (WT3). These strategies are tailored for Sabah, using technology to solve problems (e.g., hard bureaucratic procedures) and take advantage of strengths (e.g., people with multicultural backgrounds) as well as new possibilities (e.g., advanced digital networks). The overview emphasizes staging improvements: start with AI solutions, gradually create locally relevant digital materials and introduce policy reforms over the long run to help it last.

Combining qualitative ideas from locals with quantitative tools for prioritization means the study provides a model that can be followed in other places with limited resources. A number of results from this include improving technology, training people in different ways and allowing decision-making in smaller groups to address problems of unfairness in the system. Emphasizing WO4 and SO1 will benefit teachers, result in better student achievements and encourage educational fairness. But its success depends on continued political involvement and getting local communities involved to deal with difficult challenges. It helps build better educational planning methods and gives useful answers that assist Sabah's educators and policy makers in realizing Malaysia's educational equity objectives.

6. FUTURE RESEARCH

It creates a reliable framework that supports further studies by joining the qualitative perspective of SWOT/TOWS analysis with the AHP's quantitative way of classifying priorities. This way of teaching is promising for use in other similar situations, mainly where rural-urban differences, attrition among teachers and policy instability are issues. Additional research can develop this framework in many significant ways. It would be beneficial to use longitudinal studies to monitor how important strategies like AI and culturally responsive teaching are applied, since this could help assess their impact on teachers and students in Sabah. Applying the same technique to other parts of Malaysia or in developing countries can expose the ways in which economic systems are alike and distinct. Furthermore, using new educational technology such as generative AI to make localized content, can help improve the effectiveness of WO4 and SO1. Investigating policy decentralization further may look at how teacher-run campaigns for education reform (such as WT3) impact the way decisions are made locally. Investigating cultural dimensions is important and SO3 recommends using Indigenous ideas to better support students from diverse backgrounds. The decision to assign 22.3% to WO4 reflects that cooperation between teachers, tech experts and policymakers is very important for education. For this reason, it would be helpful to analyze how different sectors cooperate to resolve problems like weak infrastructure and unclear policy guidelines and this could lead to international education change that has real, proven outcomes.

7. REFERENCES

Benzaghta, M. A., Elwalda, A., Mousa, M., Erkan, I., & Rahman, M. (2021). SWOT analysis applications: An integrative literature review. Journal of Global Business Insights, 6(1), 55–73. https://doi.org/10.5038/2640-6489.6.1.1148

Gallego-Ayala, J., & Juizo, D. (2011). Strategic implementation of integrated water resources management in Mozambique: An AHP-based prioritization. Physics and Chemistry of the Earth, Parts A/B/C, 36(14–15), 1103–1111. https://doi.org/10.1016/j.pce.2011.07.040

Kangas, J., Kangas, A., Leskinen, P., & Pykäläinen, J. (2003). AHP-based decision analysis for stakeholder involvement in forest management. Forest Policy and Economics, 5(1), 1–15. https://doi.org/10.1016/S1389-9341(02)00064-6

Lada, S., Chekima, B., Ansar, R., Lim, M. F., Bouteraa, M., Abdul Adis, A.-A., Abd Karim, M. R., & Yong, K. (2024). Strategic alternatives for Muslim-friendly homestay in Sabah Malaysia: A SWOT/TOWS analysis. Journal of Islamic Marketing, 15(6), 1534–1559. https://doi.org/10.1108/JIMA-07-2022-0218

Namugenyi, C., Nimmagadda, S. L., & Reiners, T. (2019). Design of a SWOT analysis model and its evaluation in diverse digital business ecosystems. Journal of Global Information Technology Management, 22(3), 1–20. https://doi.org/10.1080/1097198X.2019.1609061

Nyumba, T. O., Wilson, K., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods in Ecology and Evolution, 9(1), 20–32.

https://doi.org/10.1111/2041-210X.12860

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. International Journal of Services Sciences, 1(1), 83–98. https://doi.org/10.1504/IJSSCI.2008.017590

Sakarji, S. R., Azib, W. N. H. W., Luqman, A., Nooradzlina, N., Shari, A. S., Ismail, H. F., Thani, A. K. A., Min, N. M. F. N., Ishak, M. a. H., & Yusri, N. a. a. M. (2021). Job satisfaction and individual happiness among employees at a public higher education institution. Social and Management Research Journal, 18(2), 191–213. https://doi.org/10.24191/smrj.v18i2.14908

Weihrich, H. (1982). The TOWS matrix: A tool for situational analysis. Long Range Planning, 15(2), 54–66. https://doi.org/10.1016/0024-6301(82)90120-0

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STRATEGIC ANALYSIS OF ENERGY ISSUE: A COMPREHENSIVE SWOT/TOWS-AHP APPROCH

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ABSTRACT

This research performs a thorough strategic examination of the energy sector in Sabah utilizing an integrated SWOT/TOWS-AHP methodology. Sabah's energy system is lagging behind national standards because of inadequate infrastructure, geographical remoteness, and a lack of skilled workers. Nevertheless, the state has considerable untapped potential in renewable energy resources, and recent developments, such as the establishment of the Energy Commission of Sabah (ECoS), signals progress. Such as A hybrid system with PV/WT/Battery/DG is the most competitive in providing low-cost electricity to remote communities in Malaysia's Sabah state (See et al., 2022). The study employs SWOT analysis to assess internal strengths and weaknesses, and external opportunities, threats, and utilizes the TOWS matrix to formulate actionable strategies. These strategies are then ranked with the Analytic Hierarchy Process (AHP), which measures and compares the relative value of each strategic option. The findings demonstrate that initiatives such as Sabah leveraging climate finance and green investment have high potential, while regulatory and technological innovation is also key. This study provides strategic guidance for infrastructure modernization and investment facilitation, and institutional strengthening and climate resilience enhancement. This combined effort provides clear guidance on how to shift the system Rational Integrated Approach to Climate and Energy Policy in the SCs of East Malaysia with the aim of enabling Sabah to exemplify green state development.

Keywords: Energy Sector Development, SWOT/TOWS Analysis, Analytic Hierarchy Process (AHP), Renewable Energy, Sabah Energy Transition

1.0 Introduction

The energy sector in Sabah is crucial for the socio-economic development of the state, but at the same time, it faces technological setbacks. Sabah's energy infrastructure has suffered from outdated transmission systems, an over-reliance on diesel generators in rural areas, and technical faults alongside weather-related disruptions over the past decades. These stubborn weaknesses have perpetuated the lack of accomplishing energy access and has increased the operational costs while decreased service trustworthiness in comparison to Peninsular Malaysia. Besides, lower-segment penetrating Sabah's rugged mountains and scattered rural settlements pose geographical hindrances to grid extension, worsening the state's energy inequality.

Understanding the need for policy adjustment, the Sabah progressively set up Energy Commission of Sabah (ECoS) in January 2023. Under the ECoS Act of 2024, ECoS is empowered to commercially regulate electricity supply, onshore gas, and renewables. This

attempts to further define the scope of decentralization and allow more refined socio-political control by the federal government over Sabah's energy policy formulation and execution. Control over the commission permits the state to focus on improved adoption of renewables and modernization of energy infrastructure to better management service disruptions. While there has been some progress with ECoS as a policy framework, lacking adaptive capacity as well as environmental, governance, and unskilled labor shortages are major obstacles toward sustainable energy developmental solutions.

Globally, energy transitions are progressing at an accelerated pace due to innovation of technology, shifts in climate imperatives, as well as consumer preferences. Because of its vast renewable resources like hydro, solar, and biomass, Sabah is strategically positioned to take advantage of these changes (International Renewable Energy Agency, 2022). Other Climate Finance frameworks and sustainable development partnerships also offer innovative opportunities for Sabah to transform with modern advanced technologies. However, these opportunities come with internal vulnerabilities and external threats that need to be tackled. Some of the most critical issues include the climate change impacts on the energy infrastructure, political instability which may offer inconsistent governance, and the lack of skilled workers to undertake complicated renewable energy projects (International Energy Agency, 2023).

Considering these interrelated realities, Sabah's energy future requires a strategic plan based on concrete evidence. This study makes use of SWOT/TOWS analysis to assess the internal and external factors that impact the energy sector in Sabah. Also, AHP (Analytic Hierarchy Process) is incorporated to rank the strategic parameters in a more logical order, thus providing a measurable basis to the decisions that need to be made. The aim of the paper is to determine actionable recommendations through the integrated approaches to enable the State of Sabah to align its strengths and opportunities while reducing its vulnerabilities to optimally transition towards a more secure, sustainable, and inclusive energy system.

2.0 Methodology: SWOT/TOWS and AHP Application

2.1 Methodology and Application

A research methodology describes the methods and procedures used to identify and examine information related to a specific research topic (Lada et al., 2024; Sreekumar, 2023). This research applies strategic tools such as SWOT analysis and Analytic Hierarchy Process (AHP) to identify and rank important factors that affect the e-commerce preferences among university students.

2.2 SWOT Analysis

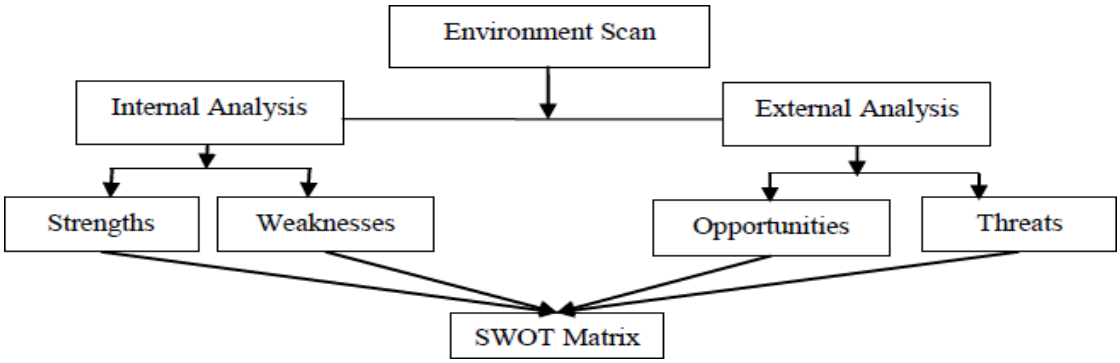

Figure 1: Framework of SWOT Analysis

SWOT analysis is a strategic planning tool used to analyse internal and external factors in order to acquire a systematic approach and support for a decision situation (Kenton, 2024). The internal and external factors are most considerable for the industry or organization's future and are referred to as strategic factors. In SWOT, these factors are grouped into four parts known as SWOT groups which include strengths, weaknesses, opportunities and threats as shown in figure 1.

Strengths and weaknesses are internal factors. They are characteristics of a business firm that offer relative advantages or disadvantages over its competition. Strengths may be any number of areas or characteristics where a business excels and has a competitive advantage over its competitors while weaknesses are the aspect or characteristics where a business is at a competitive disadvantage relative to its competitor. On the other hand, opportunities and threats are the external factors. Opportunities are elements of the external environment that are able to improve business performance growth. However, threats are elements of the external environment that could cause trouble for the business firm (Peterdy, 2024).

2.3 Analytic Hierarchy Process (AHP)

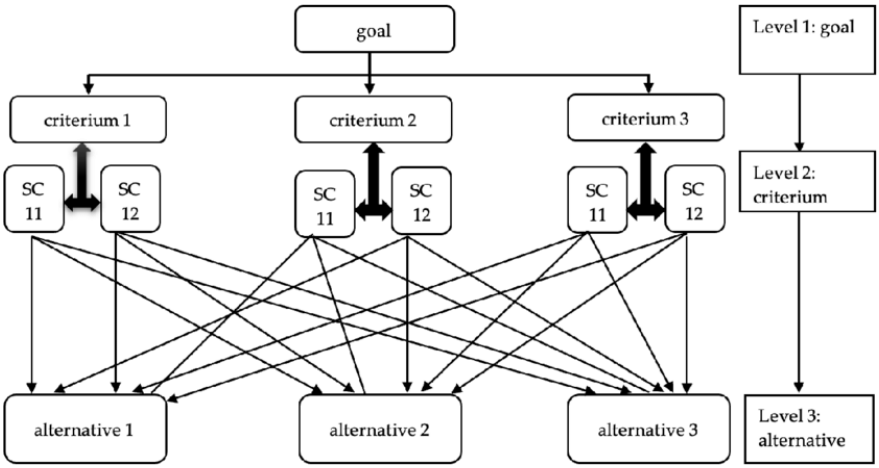

Figure 2: Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) developed by Thomas L Saaty in the 1970s (Taherdoost, 2017). It is a multi-criteria decision-making approach that breaks down the decision problem into a hierarchical structure consisting of goals, factors, sub factors and alternatives. AHP is based on three key principles. First is the structure of the model, second is the comparative evaluation of the criteria or alternatives and third is the synthesis of the priorities. In the literature, AHP has been widely applied to address various decision-making problems. The AHP organizes objectives, decision criteria and alternatives into hierarchical structure similar to a family tree. This hierarchy typically consists of at least three levels including the overall goal of the problem at top, multiple criteria defining the alternatives in the middle and the alternatives at the bottom level.

In this research, the AHP method is used to prioritize SWOT elements. After following the decomposition of the problem and construction of the hierarchy, the prioritization process begins by determining the relative importance of the criteria. In each of the levels, criteria are compared in pairs against each other with respect to their

influence and in relation to the criteria at the higher level. The AHP employs a standardized comparison scale of nine levels to conduct the pairwise assessment. The AHP approach in decision-making involves four stages as mentioned below.

Stage 1: define the problem and set up the structure of the hierarchy.
The initial first level involves defining all decision components of the problem. The first top level is broad general objective. The lower levels contain the sub- objectives and attributes that influence the decision itself. The various possible alternatives exist at bottom level.

Stage 2: collection of input data.
Input data implies to the impact of each element on each sub-objective in the adjacent upper level of hierarchy. The information is placed in a matrix for pair-wise comparisons. For example, if we have seven elements on level L and two elements on level L-1, we have 7 x 7 matrix for each of the two elements on level L-1. The matrix is called as reciprocal judgement matrix. To fill this matrix, we need to make 10L (L*(L- 1)/2 5 7*6/2) comparisons. The diagonal cells of this matrix are filled with 1 and rest of the matrix is filled with reciprocal values. AHP uses a 1–9 scale of measurement in pair-wise comparisons. Nine implies to highly preferred element over the other element to which it is compared. One implies to an equally important element. In between values are signifying various degrees of relationship.

Stage 3: find the relative weights with the eigenvalue method
The relative priorities of different criteria (sub-criteria) are not easily plausible from the judgement matrix. In this stage, relative weights of a set of objects (criteria, sub-criteria and alternatives) are calculated with the matrix of pair-wise comparison B=bij which is positive and reciprocal (1–9, and 1–1/9).

Thus, the given matrix B such that

$$B = \begin{bmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ b_{n1} & \cdots & \cdots & b_{nm} \end{bmatrix}$$

where $B_{ij} = 1/B_{ji}$ for all I, j = 1, 2, 3..., n

Compute a vector of relative priorities w = (w1, w2... w3). The w is normalized so that it adds up to 1 or 100. If all the judgements are consistent, then

$$*b_{kj} = b_{ij} \text{ for all I, j = 1, 2 } \cdots, \text{ n}$$

Then, normalizing any column j of matrix B will generate the wts b_{ik}

$$W_i = \frac{b_{ij}}{\sum_{K=1} b_{kj}} \text{ for all I, j = 1, 2K } \cdots, \text{ n}$$

Pair-wise judgement is often error-prone and condition in the second equation may not be confirmed. Consequently, the final result of priorities may depend upon the column chosen for normalization. Such a problem can be solved either by logarithmic least square (LLS) or eigenvector method developed by Saaty. Latter is a simpler procedure than former and also involves averaging all possible ways of comparing alternatives (Harker & Vargas, 1987). Calculations of the wt. vector as the right eigenvector of the matrix B:

$$Bw = \lambda max\ W$$

where λ max is the maximum eigenvalue of matrix B. So the weight vector can be enumerated as

$$Wi = \frac{\sum_{J-1}^{N} bij*wj}{\lambda_{max}}$$

Inconsistencies in judgement can be calculated by eigenvector method. Satty research depicts for λ max n for positive reciprocal matrix. For a perfectly consistent matrix then λ

max = n. Satty defined a consistency index by the formula

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

Also, consistency ratio (CR) is measured as ratio of CI and random index (RI)

$$CR = CI/RI$$

Therein RI the random index is computed as the mean of CI of randomly generated matrices of size n.
If CR < 0.1, it is acceptable, and if CR > 1, the DM has to re-evaluate the decisions in order to reduce inconsistencies.

Stage 4: develop a composite priority vector for bottom most level of the hierarchy to rate alternative decision strategies

The aim of employing AHP is to rank or prioritize different decision alternatives depending on how well each one meets the objective or goal. The final aggregate ranking for the decision alternatives is done by adding up all the weighted eigen entries corresponding to all levels (right down to the alternatives). Eigenvectors are weighted according to weight of the criteria.

2.4 SWOT-AHP Hybrid Methodology

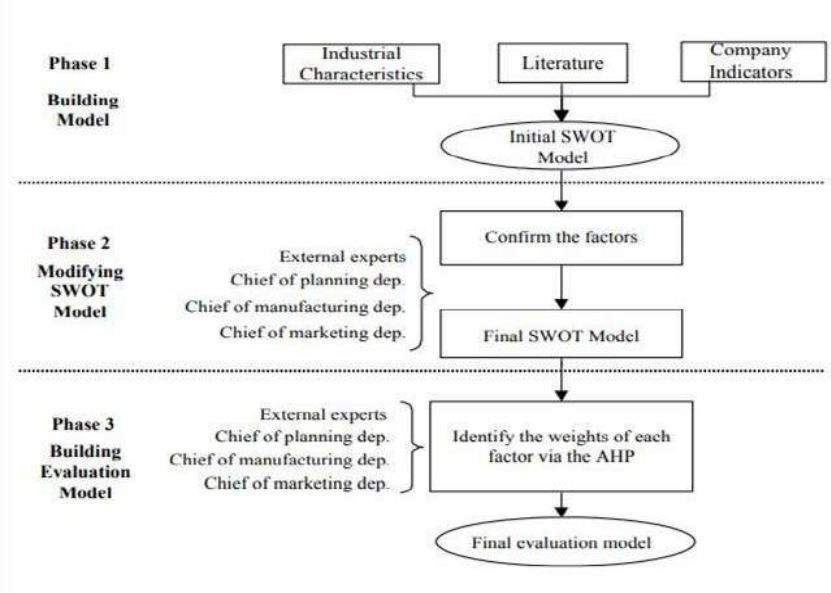

Figure 3: Phases of Proposed Methodology

Figure 3 show a SWOT-AHP based strategic management model. In order to create a SWOT-AHP based strategic management model, three phases model needed which is building initial task, modifying factors, and building an evaluation model. SWOT factors are subjected to pairwise comparisons concerning higher level factors, in order to generate the priority factors using eigenvalue calculations. Although SWOT analysis lacks the quantitative feature needed to generate ranking mechanism for identified factors, the integration of the Analytic Hierarchy Process (AHP) addresses this limitation. The hybrid model of SWOT-AHP systematically qualifies the relative importances of SWOT factors and evaluates their intensity, thereby providing a robust framework for strategic decision-making.

Application of AHP in the SWOT framework is supposed to quantify and evaluate the importance of the SWOT factors systematically. Three major steps are followed in this regard. First and foremost is the identification of the internal and external key factors such as strengths, weaknesses, opportunities and threats. Next is applies the pairwise comparisons to capture the weights of each SWOT group. Finally uses the AHP to derive the relative priorities of each factor within the SWOT groups. The overall weight and ranking of each factor are obtained by multiplying its local weight by the weight of its respective group, resulting in a comprehensive prioritization framework.

Table 1: Pairwise Comparison Scale

ert opinion on pair-wise ranking of importance of two sub-criteria with reference to the main criteria in tree hierarchy	
tion A and option are equally important	1
tion A is moderately more important than option B	3
tion A is strongly more important than option B	5
tion A is very strongly more important than option B	7
tion A is extremely more important than option B	9
tion A and option B are equally important	1

Table 1 provides a clear representation of the AHP scale which often used for pairwise comparisons in decision-making. In decision-making frameworks such as AHP, a pairwise comparison scale is needed to quantify the relative importance of two criteria or sub-criteria with respect to a higher-level goal or main criterion. After identifying all the key factors for each SWOT category, they are subjected to pairwise comparisons to evaluate their relative importance within each group. For instance, comparing one strength to another strength. Furthermore, higher-level comparisons are conducted to determine the weight of each SWOT category relative to others. For example, the importance of strengths versus threats. Eigenvalue calculations are used to generates quantitative weights for all the SWOT factors and ranking them based on their strategic significance. The pairwise comparison scale is based on a set of values ranging from 1 to 9. This scale ensures consistency and allows decision-makers to mathematically evaluate subjective judgements which are then processed to calculate weights for the key factors of SWOT categories. Furthermore, these weights provide a quantitative foundation for prioritization in strategic analysis.

3.0 Strategic Environmental Analysis: SWOT Outcomes

Developing appropriate strategies for Sabah's energy sector requires an understanding of the region's internal dynamics and external conditions. SWOT analysis offers strategic insight into the most critical issues underlying Sabah's energy development. For the purposes of this analysis, internal factors are classified as strengths and weaknesses which are relative to the state's control, while external factors as opportunities and threats which result from higher order systems and environmental contexts.

Strengths

There are several important internal attributes that put Sabah in a strategic position for energy reform. Firstly, the available renewable energy resources are a notable strength. The state has vast potential for hydropower in the interior highlands, ample solar radiation suitable for PV generation, and biomass sources from its large agricultural sector (International Renewable

Energy Agency, 2022). These resources give a competitive edge and put Sabah within favorable consideration for shifting to clean energy.

Secondly, the initial operational activities undertaken by ECoS, which is the Energy Commission of Sabah, mark out important institutional developments. As ECoS comes under supervision of Energy Commission of Malaysia, with jurisdiction on the supply of electricity, distribution of gas, and renewable energy, there is a degree of control which denotes progress in local self-governance (Energy Commission of Sabah, 2024a). This development enables the region to design and implement energy policies aligned to its geographic socio-economic realities, improving agility of response and integration.

Weaknesses

As highlighted previously, the structural issues within Sabah's energy region poses the most hindering problems. One core problem is the fragmentation and aging of the electrici ty infrastructure. The majority of the transmission and distribution network was built decades ago and lacks the capacity to meet rising demand as well as incorporate variable renewable energy sources. Moreover, the instability of the grid along with common voltage fluctuations particularly in rural and remote areas engenders frequent power outages, further drives down investors' confidence (The Star, 2024).

Perhaps one of the more paramount concerns would be the lack of skilled human capital. As previously stated, workforce participation in technical roles in Sabah, particularly design and integration of renewable energy projects, as well as compliance to regulations, is very minimal. This skill deficiency hampers implementation timelines and increases reliance on external consultants which, in turn, hinders development of local knowledge.

Opportunities

Sabah can directly take advantage of a few emerging external opportunities. The global push for clean energy has resulted in heightened international funding alongside technology transfer programs aimed at aiding energy transition in developing areas (International Energy Agency, 2023). Institutions like the Asian Development Bank and Green Climate Fund provide funding for renewable infrastructure along with initiatives aimed at improving access to energy.

The existing geographical challenges of Sabah could be addressed with the help of latest technology in microgrids, battery storage, and smart meters that fall under decentralized energy systems." These technologies ensure reliable power to remote communities without expensive grid extensions.

Threats

Derailed progress is also a concern for Sabah. One of the most concerning risks includes climate change, especially in the form of extreme weather like flooding or landslides that can damage energy infrastructure and disrupt the supply chain. In addition, political instability at both state and federal levels endangers the commitment to energy policy frameworks, which is essential to stabilize after long-term investments, due to shaky governance in the region. In the short-term, political instability increases clean energy consumption, but in the long run, it diminishes clean energy use and long-term environmental quality (Sohail et al., 2021).

To conclude, the SWOT analysis shows that there is abundant strategic potential in the energy domain of Sabah, but operational, environmental, and institutional challenges need to be approached first. Systematic evaluation of these challenges will enable achieving energy security and state sustainability.

strengths	**Weaknesses**
S1. Abundant Renewable Resources (Ullah et al., 2024) S2. Regulatory Autonomy via ECoS (Burri & Kugler, 2024) S3. Alignment with Global Sustainability Goals (Buerkle et al., 2023). S4. Increasing Support from Stakeholders (Henisz et al., 2013).	W1. Outdated Electricity Infrastructure (Rivera et al., 2023) W2. Geographic Disparities in Electrification (Hosen et al., 2024) W3. Shortage of Skilled Technical Personnel (Hassan & Riaz, 2024) W4. Inflexible Energy Storage Systems and Grid Modularity (Tong et al., 2025)
Opportunities	**Threats**
O1. Access to Climate Finance Resources (Pauw et al., 2022). O2. Innovative Technology (Green et al,2019) O3. Heightened Interest in Environmentally Responsible Investments (Chițimiea et al., 2021). O4. Potential for Leadership in/at a Regional Level (Samarkina et al., 2023)	T1. Negative Impact of Climate Change (Kabir et al., 2023). T2. Unreliable Government Policies Over Investment Risk (Zhang & Gu, 2024). T3. Vulnerable Supply Chains (Sharma et al., 2021) T4. High Costs of Capital (Drobetz et al., 2017)

As noted from the earlier SWOT-AHP analysis, there is a clear ranking order concerning underlying strategic factors in relation to Sabah's energy transition. Out of the strengths, the most important is S1: Abundant Renewable Resources, which through abundance of value and 'weight' (26.1%) serves in the top SO1 strategy rank tier (which is Sabah's solar, hydro and biomass potential). Sabah not only has a competitive edge but also attracts international climate finance. Following closely is S3 Alignment with Global Sustainability Goals (14.3%) which highlights ESG investors and respondents towards Sabah and also underlined synergies with global energy transitions. S2 Regulatory Autonomy via ECoS is third (11.7%), which indicates the relevance of Sabah's governance structures on the implementation and oversight of energy policies within the region. S4 Increasing Support from Stakeholders also fares relatively well at (8.0%), signaling positive change of support towards local and international sides for energy reforms.

In terms of weaknesses, W1: Outdated Electricity Infrastructure (close to 6.9%) represents the most significant internal barrier limiting capacity and reliability towards energy reform. W2: Geographic Disparities in Electrification follows, interlinked with access barriers to the dense rural hinterlands, particularly mitigated using modular microgrid solutions. However, W3: Shortage of Skilled Technical Personnel and W4: Inflexible Energy Storage Systems and Grid Modularity are deemed less important (1.1% and 1.0%, respectively). This explains how although crucial in the long run, these aspects are not viewed as strategically transformational accelerators.

With opportunities, although exact percentages are not isolated in the AHP output, O1: Access to Climate Finance Resources and O3: Heightened Interest in ESG Investment clearly assume high strategic relevance. These support the most prioritized strategies (SO1 and SO4) and testify to Sabah's strong position to attract global support. O2: Innovative Technology is moderated, allowing Sabah to bypass traditional infrastructure restrictions through implementing microgrids and smart energy technologies. O4: Potential for Regional Leadership also bears strategic significance, strengthening Sabah's aspirations to become a clean energy leader in Southeast Asia.

T2: Unreliable Government Policies and T1: Negative Impact of Climate Change are ranked the highest in threats with scores of approximately 8.0% and 7.5%, respectively. These are outside factors which can set back energy growth unless countered by dependable bodies like ECoS. T4: High Costs of Capital and T3: Vulnerable Supply Chains have lower rankings, but remain relevant, indicating a need for planning that takes risks into consideration, including supply chain diversification.

In essence, the evaluation captured that the most strategically critical for Sabah is focus on opportunity and strength, particularly those involving external financing and renewable resources. Underlining weaknesses and threats, while significant, tend to be relatively less salient, serving more as primary and supportive elements to resilience instead of driving transformational change. This provides rationale for growing fokusing on leveraging Sabah's strengths and external opportunities.

SWOT	Code	Description	Relative weight (%)	Prioriti Rank
Strength	S1	Abundant renewable resources	26.15	1
	S3	Alignment with global sustainabiluity goals	14.3%	2
	S2	Regulatory autonomy via ECoS	11.7%	3
	S4	Increase support from stakeholders	8.0%	4
Weakness	W1	Outdated electricity infrastructure	6.9%	5
Threat	T1	Negative impact of climate change	7.5%	6
Threat	T2	Unreliable government policies	8.0%	7
Weakness	W2	Geographic disparities in electrification	4.0%	8
Threat	T4	High cost of capital	5.1%	9
Threat	T3	Vulnerable supply chains	4.4%	10
Weakness	W4	Inflexible energy storage systems and grid modularity	1.0%	11
Weakness	W3	Shortage of skilled technical personnel	1.1%	12
Opportunity	O1	Access to climate finance resources	High influence	High (1-2)
			on SO1,WO1	
	O2	Innovative technology	Medium (via SO3, WO3)	Mid-high (1-2)
	O3	Heightened interest in ESG investment	High (SO1,SO4)	High (1-2)
	O4	Potential for regional leadership	Medium (SO2, WO4)	Mid

4.0 Tows Matrix for Sabah's Energy

Using the TOWS matrix and prioritization through SWOT-AHP analysis, this subsection formulates strategic recommendations that will help achieve the energy transition goal for Sabah. These recommendations aim to holistically combine Greater Sabhas internal capabilities and the ever-changing global landscape, while also dealing with the state's threats, structural constraints, and weaknesses. They fall under four overarching strategic pillars which are: modernizing infrastructure, facilitating investments in renewable energy, developing institutional and human resource capacity, and climate change governance for resilience.

	Opportunities O1. Access to Climate Finance Resources O2. Innovative Technology O3. Heightened Interest in Environmentally Responsible Investments O4. Potential for Leadership in/at a Regional Level	**Threats** T1. Negative Impact of Climate Change T2. Unreliable Government Policies Over Investment Risk T3. Vulnerable Supply Chains T4. High Costs of Capital
Strengths S1. Abundant Renewable Resources S2. Regulatory Autonomy via ECoS S3. Alignment with Global Sustainability Goals S4. Increasing Support from Stakeholders	SO1: Create opportunities of strategic concern by formulating climate finance projects that utilize Sabah's natural resources and constructed renewable energy projects of financing appeal. (S1, O1, O3) SO2: Market and position Sabah for green investors as a sustainable energy hub for the region in need for broader regional influence (S3, O4). SO3: Utilize ECoS to expedite the endorsement process for the pilot applications of innovative	ST1: Implement ECoS regulatory control for enforcement of climate-resilient energy infrastructure standards (S2, T1). ST2: Utilize global alignment of stakeholders to create advocacy efforts for bipartisan long-term energy policies (S3, S4, T2). ST3: Establish local partnerships to develop component supply chains to mitigate dependence on international markets (S1, T3). ST4: Focus on…bundled renewables with low modular serial
	technologies in solar and microgrid systems (S2, O2). SO4: Lead hybrid campaigns to awaken shareholder ESG investments and promote active stakeholder momentum that aligns with corporate growing momentum (S4, O3).	dependencies such as solar + storage to reduce capital risk (S1, T4).

Weaknesses W1. Outdated Electricity Infrastructure W2. Geographic Disparities in Electrification W3. Shortage of Skilled Technical Personnel W4. Inflexible Energy Storage Systems and Grid Modularity	WO1: Utilize international grants and financing to achieve the goals of modernized grids and expanded rural access within the region (W1, W2, O1). WO2: Collaborate with foreign energy companies and universities to develop tailored training programs to increase local technical capacity (W3, O2). WO3: Deploy adaptable technology-based modular microgrid systems designed specifically for remote regions of Sabah (W2, W4, O2). WO4: Shift global perception and attract international partners by leading in recognition with advanced renewable resource R&D montages for global collaboration (W3, O4).	WT1: Supply chains must incorporate redundancy and tech sourcing diversity to mitigate procurement risks. (W4, T3) WT2: Employ regulatory tools to shield long-term investments from abrupt and politically motivated alterations. (W1, T2) WT3: A centralized digital monitoring system for remote grids will cut operating and maintenance costs, and enhance reliability. (W1, W2, T4) WT4: Enhance skill localization to limit exposure to international labor markets. (W3, T3)

Facilitate and accelerate investment in renewable energy projects

It is recommended that the state immediately initiate the planning and implementation of fully developed, bankable solar and small hydropower projects. With the new regulatory freedom under ECoS, the state has untapped solar energy potential, which should be sponsored through the establishment of a Renewable Energy Investment Facilitation Office (REIFO) dedicated to managing investor relations, streamlining application workflows, and incentive distribution. This newly created body should act as a clean energy project developer concierge, managing outreach and providing a consolidated portal to domestic and global stakeholders. Funding gaps caused by project delays in line with international ESG focused investments, such as those from the Green Climate Fund and Asian Development Bank, will be easily bridged by the State's strategic investment position (International Energy Agency, 2023).

Make new developments to the infrastructure with technologies that are ready for the grid

For strategic improvement in grid strength and flexibility, Sabah needs to adopt smart technologies, which include energy management systems, advanced metering infrastructure, and grid automation as well as energy storage systems integration. In addition to their loss reduction functions, these new technologies will also increase the system's ability to cope with intermittent renewables. More attention should be focused on remote and underserved communities by developing modular microgrids that provide electricity without expensive transmission lines of providing transmission lines. Capital cost mitigation initiatives should be enhanced by international donor support and blended finance models.

Develop the human capital and institutional capability

There is a gap in skilled manpower with technical competencies for the energy value chain. To bridge the gap, Sabah needs to sponsor local training and empowering initiatives with partnerships with clean energy undertakings from abroad, universities, and vocational training institutions. ECoS can lead the development of a Competency Accreditation Framework Modeling focusing on Renewable Energy Systems Design, Installation, and Regulation. This will enable the state to reduce dependence on external expertise, shorten project lead times, and offer green employment opportunities.

Climate resilience and policy stability institutionalization

Facing the dual threats of political instability and climate change, Sabah must place institutionalized frameworks of energy policy within strategic planning horizons in ECoS. This includes multilateral policy frameworks at the regional level as well as climate-resilient infrastructure standards enforced through ECoS. Constructing robust public communication strategies of primary communication tools surrounding energy reforms can build stakeholder trust and safeguard projects from political sabotage. Moreover, policy attribution chains such as technology diversification and adaptation policy contract flexibility will further enhance project resilience to uncertainty.

Advocating policies in these ways will not only resolve immediately pressing energy concerns facing Sabah, but also strategically advance the province as an anticipatory pioneer within the region's clean energy paradigm shift. Achieving these objectives will necessitate meeting operational and transitional efficiency towards sustainably, equitably, and enduringly militarily always on standby and energy secure.

Strategy highlights:
SO1–SO4: Offensive, growth-oriented strategies leveraging strengths to capitalize on investment and innovation trends.

ST1–ST4: Defensive but proactive strategies using internal strengths to counteract vulnerabilities like climate change and supply chains.

WO1–WO4: Improvement strategies that convert weaknesses into capabilities through smart use of external support.

WT1–WT4: Risk-avoidance strategies focused on minimizing exposure through resilience, redundancy, and internal reform.

5.0 Conclusion

This case study makes use of an integrated approach of SWOT/TOWS-AHP to streamline the frameworks in strategic planning for energy development with a focus on the salient factors in need of prioritization. It also examines the unique geographical context of Sabah within the ARDA framework which allows for an effective comparison between state and private sector actors to evaluate investment opportunities. Hot works captured the variable Sabah features, managed under ECoS it offers enhanced regulatory flexibility along with richly abundant renewable resources keeling the scepters of regulation under control with eco autonomy. Still,

eco benevolent offer human capital exert systemic inflexibilities weakening regulatory metrics. Eco financed and climate angered the region is bound to technological shifts unparalleled even by political uncertainties.

Challenging and shaping this region is placed under threat by advanced financial as well as strategic climate governance. Engineering systems able to sustain political boundaries and climate enabled incitement provided the backbone while investing into renewable sources geared with a smart contemporary governance grid climate enables eco posture and solidifies the system intermingling. Borrowing from advanced system resilience whilst claiming embraced autonomy becomes key throughout. Able to keep commitments while being politically restrained enables proper multilateral alignment with even general sustained policy shifting towards commitment. Effective execution marked with ideal aligned containing financial incentive offers benefit for reliable enhanced access to energy and propelling ASEAN highlighted mentored sustainable system development region wide setting Sayab as the sticking point for introspection guided by strategic energy planning. Keeping mentored region under focus requires sustained policy input mentored strategic outputs presented to head planners with de facto logiting enhanced credibility.

6.0 Analytic Hierarchy Process (AHP) Results and Interpretation

Sabah's green investment and sustainable development approach over a five-year period is marked with a more nuanced and systematic prioritization of strategic objectives (SO), strategic tactics (ST), weaknesses/opportunities (WO) and weaknesses/threats (WT). The analysis showcases a deliberate and phased approach that prioritizes foundational development, positioning, and institutional strengthening, which are essential prerequisites for enduring environmental and economic wholistic strength.

Porter's competitive frameworks as well as the Grant's theory aligns perfectly with redeemer SO1: Create opportunities of strategic concern, which singlehandedly garners the most attention at 20.8% weight. Strikingly, this underlines the investment enabling environment sufficiency and opportunity centricity. Subsequent focus on opportunity accentuated with clear infrastructure system enables long term sustainable investment anchored by strong governance and ecosystem is another marked characteristic (Porter, 1998; Grant, 2016).
SO2: Market and position Sabah for green investment (19.2%) gets the next priority, demonstrating renewed drive towards advertising the state as a new player in sustainable energy. Shift towards rebranding and marketing garners both foreign and local attention to green capital, and is supported by OECD (2011) policies on clear vision and signal-marked investment attraction through catalysed policymaking and assured strategic blanketing.SO3, which revolves around the endorsement procedure's acceleration with the use of the Environmental Compliance System (ECoS) at 15.3% while SO4 dealt with hybrid awareness raising campaigns for stakeholders at 10.5%, capture the gaps on the green development innovation sociotechnical system changes on green development at behavioural and institutional levels. The application of digital systems such as ECoS indicates the extent of Sabah's progress towards intelligent governance. This is in tandem with UNEP's (2021) call for environmental information systems and systems thinking for decision making. Hybrid stakeholder engagement campaigns support participatory governance which has been shown to encourage collective ownership of energy transitions (IEA, 2020).

Strategy code	Strategy description	Priority weight (%)	Rank	Strategic Interpretation
SO1	Create opportunities of strategic concern	20.8%	1	This approach focuses on the potential of Sabah to harness its renewable resources (such as hydro, solar, and biomass) for its energy development. It aids in the development of green energy projects eligible for international climate financing. Such self-governance and policy control considered alongside clean energy investment makes Sabah strategically positioned for global investment sustenance and growth for the future (World Bank, 2020; UNEP, 2021).
SO2	Market and position sabah for green investment, attracted	19.2%	2	Although Sabah has remarkable possibilities in green energy, it has yet to capture the attention of investors. This strategy attempts to address the issues of marketing, branding, and advertisement on foreign markets to enhance its competitiveness. Winning regions in green economy tend to formulate strong
				narratives and engage in international climate discussions~/forums (OECD, 2011; ADB, 2022).
SO3	Utilize ECoS to expedite the endorsement of innovative technologies	15.3%	3	In this strategy, ECoS (Energy Commission of Sabah) utilizes its power to expedite the approval of novel, clean technologies. It demonstrates how proactive order supports invention in green energy. Appropriate regulatory policies are effective in minimizing lags and fostering private sector engagement (IRENA, 2019; IEA, 2020).
SO4	Lead hybrid Campaingns to awaken shareholder	10.5%	4	This strategy combines digital and analogue approaches to engage both public and private stakeholders. Its aim is to advance support, build awareness, and catalyze investment from stakeholders. Hybrid communication campaigns are reported to improve partnerships and increase the likelihood of project success (UNEP, 2021; KPMG, 2019).

Strategic Tactics (ST): Regulation and Localization

Among these, ST1: Implement ECoS regulatory control (7.6%) stands out. This responds to Sabah's need to further strengthen the compliance mechanisms and environmental governance, especially with regard to energy pertaining projects. Adequate regulation is integral in fostering confidence in investors and projects, as underlined by IRENA (2019). While examining ST4: Focus on bundled renewables (4.8%) and ST3: Establish local

partnerships (4.2%), it is evident that the two combined show the province's effort towards diversifying its energy mix and fostering community collaboration. These middle level strategies illustrate the need for modular and small scale implementation and reinforce the arguments made by the Asian Development Bank (ADB 2022) on the regional energy success being highly reliant on bottom-up strategies working in conjunction with top-down systems. Southeast Aisa has faced the challenge of alignment with global frameworks. ST2: Utilize global alignment of stakeholders, which appears to place lower priority on international engagement effort at 3.9%, displays greater strategic difficulty, diminishing value assigned to coordination on a global scale. This is emblematic of struggles across Southeast Asia whose alignment with frameworks at a global level tends to lag for bureaucratic and infrastructural reasons (World Bank 2020).

Strategy code	Strategy description	Priority weight (%)	Rank	Strategic Interpretation
ST1	Implement ECos regulatory control for enforcement	7.6%	5	This approach stresses the importance of the Energy Commission of Sabah (ECoS) in managing green energy projects through the enforcement of comprehensive regulations. With ECoS exercising its regulatory powers, compliance, transparency, and safeguard measures to fend off expropriation risks are ensured. Having sufficient enforcement mechanisms encourages investment as well as
				helps to manage investment risks in more advanced renewable markets (IRENA, 2019; IEA, 2020).
ST2	Utilze global alignment of stakeholders	3.9%	8	This approach seeks to integrate the energy development of Sabah with international targets and standards like the Paris Agreement and the Sustainable Development Goals (SDGs). Partnerships with international institutions form global strategic networks which improve credibility alongside alternative funding sources and facilitate inter-country collaboration (UNEP, 2021; ADB, 2022). Despite placing lower in priority, it strengthens strategic resilience through international collaborations.
ST3	Establish local partnerships to develop supply chain	4.2%	7	This approaches seeks to form alliances with local industries for the purpose of creating a regional supply chain for green technology. Increasing local production and decreasing dependence on imports will improve supply chain security and reduce vulnerability to external shocks. Strengthening domestic capabilities is vital to the construction of green jobs and sustainability (World Bank, 2020; KPMG, 2019).

ST4	Focus on low-capital-risk bundled renewable system	4.8%	6	This approach incorporates the integration of solar energy with storage systems which mitigates capital risks. Such bundled systems are easier to implement, especially in rural and remote regions, and are economically more beneficial. These systems are flexible and scalable which makes them perfect for incremental deployment of green energy initiatives (IRENA, 2019; IEA, 2020). This approach is particularly important for reducing the costs and barriers to entry.

Opportunities and Threats: Long-Term Mitigation

WO and WT categories are markedly under filled compared to their counterparts, with the broad set of overseas collaborations topping the list. In the case of WO2: Collaborate with foreign energy companies, an abnormally low 3.3% becomes a notable flag. It becomes even more surprising when exploring the context of their partnerships for capital, technology, and expertise. Their lack of priority signals a shift focus on internal strengthening of the ecosystem. The same applies to WT1: Incorporate supply chain redundancy (1.9%) and WT4: Enhance skill localization (1.0%) which embody a forward-thinking stance to mitigate risk, albeit gradually. KPMG (2019) recommends these strategies, advocating the need to mitigate infrastructural risks while emphasizing the need for skill development, in addition to other leadership centered frameworks that advocate proactive foresight.

In a competitive green investment hub, Sabah aims to position itself at the forefront with a clear focus on foundational growth, regulatory refinement, and marketing vis-a-vis the brand as seen in the five year strategic priorities. Foundations in opportunity creation and aggressive marketing indicate a readiness stage whereas supporting activity tactics highlight early construction towards a long-term sustainability plan. Sabah's strategies currently appear to be more focused on local capabilities, international alignment, and reactive mitigation but broadening emphasis on redirects even slightly towards those aspects would alleviate friction and accelerate the transition.

Strategy code	Strategy description	Priority weight (%)	Rank	Strategic Interpretation
WO1	Utilize international grants and financial	1.9%	12	This strategy entails that Sabah peruses global climate finance funding in particular the funding available for green projects. While this is currently a lower priority, it can be accelerated through the use of grants and blended finance which lowers costs (World Bank, 2020; UNEP, 2021).

WO2	Collaborate with foreign energy companies	3.3%	9	This strategy entails that Sabah peruses global climate finance funding in particular the funding available for green projects. While this is currently a lower priority, it can be accelerated through the use of grants and blended finance which lowers costs (World Bank, 2020; UNEP, 2021).
WO3	Deploy adaptable technology based modular	2.2%	10	The use of portable solar and wind units exemplifies modular systems which are versatile and particularly beneficial in remote locations in Sabah. Although practical and affordable, this approach is not emphasized. Research recommends these options for more expeditious and simpler energy access (IRENA, 2019; IEA, 2020).
WO4	Shift global perception to attraction international investors	1.6%	13	A shift in perception by investors will enable more funding to flow towards Sabah. Nonetheless, this move is considered low priority. Marketing Sabah's ecological undertakings at the international level could expand attention as well as funding opportunities (OECD, 2011; UNEP, 2021).
WT1	Supply chains must incorporate redundancy	1.9%	11	Avoiding delays hinges on strengthening supply chains. This approach may be of lesser importance but is nonetheless relevant given the mounting global risks to the supply chain. To mitigate the risks, local sourcing and back-up plans can be employed (KPMG, 2019).
WT2	Employ regulatory tools to shield long term	0.9%	15	This strategy aims at making green investments more secure and less volatile through the use of governance frameworks and policies. While not emphasized at the moment, it is evident that gaining investor interest is aided through robust regulations which minimize risks (IRENA, 2019).
WT3	A centralized digital monitoring system	0.9%	16	Digital technologies, including information technologies, enable monitoring for progress optimization and system efficiency at all levels. Although this is the lowest-ranked strategy, digital monitoring further aids transparency and effectiveness (IEA, 2020).

WT4	Enhance skill localization to limit expo	1.0%	14	Educating local individuals on the operation of green technologies creates new job opportunities while simultaneously meeting domestic skillset needs and decreasing dependence on foreign specialists. This approach, while not prioritized, is critical for sustainable success (World Bank, 2020; ADB, 2022).

6.1 Important Evaluation along with Strategic Analysis

Adored in excess of five years, Superintendencies has followed a set of priorities on its own efficiently governing their green investments and energy development. As whitened in these strategies, they are well constructed towards fundamental advancement, investment attraction and improvement of regulations. These underscore elements reveal strong alignment of achieving the two ultimate goals underweight strategic objectives SO1, Create opportunities of strategic concern weighted at 20.8 and SO2 Market and position Sabah for green investment type weighted to 19.2 percent, which combined caps to 40 percent share of the strategic core objectives and focuses set forth. This signifies strategic intent tending towards the foundation enabling for rich shafts of green capital and the sustainable growth. These niches are extremely important while undertaking a green energy venture with regards to building a credible ecosystem and global investor optimism. Hence, both are needed for the prolonged economic stability and sustenance.

The optimization of focus areas with percentages under 20% like endorsing through the Environmental Compliance System (ECoS) Utilization (15.3%) and SO4: Stakeholder Engagement Hybrid Campaign Leadership (10.5%) shows Sabah's continued prioritization on improving governance and stakeholder relationships. The digitization of tools like ECoS fulfills environmental governance requirements in the same way best practices advocate for the use of technology in promoting efficiency and transparency in the execution of policies (UNEP, 2021). In addition, hybrid stakeholder campaigns indicate a shift towards active participation in policy execution that is linked with greater compliance and resilience of projects to threats (IEA, 2020).

For all these advantages, an examination of the underdeveloped weighting of Weaknesses-Threats (WT) and Weaknesses-Opportunities (WO) shows a clear strategic imbalance. The total weighting of the WT strategies is below 5% and in the case of WT1: Supply chain redundancy should be added (1.9%) and WT4: Skill localization enhancement (1.0%), lowest ranked priorities. This may indicate an operational myopia regarding vulnerability gaps, human capital constraints, or both. These risks are particularly relevant when considering the current volatile environment of global supply chains and the fast-changing landscape of green technology. Studies emphasize that building resilience through local skill and infrastructure redundancy should make up a greater share of budget allocation—especially in developing economies adopting new sustainable systems (KPMG, 2019; IRENA, 2019).

Likewise, opportunities associated with international financing and partnerships appear to be underutilized. WO2: Collaborate with foreign energy companies (3.3%) and WO1: Utilize international grants (1.9%) are relatively low on the strategic hierarchy, remains weak on the strategic focus tier, even with climate finance accessibility on the rise. The World Bank (2020) reports that climate finance is surpassing USD 600 billion per year, featuring public-private funding funnels. Sabah’s lack of climate funding engagement represents a significant strategic

disadvantage. Increased attention towards foreign partnerships could facilitate access to specialized knowledge, investment, and technological advancements, expedite project timelines, and lower operational costs (ADB, 2022; IEA, 2020).

In terms of governance, Sabah shows a clear top-down strategic focus. The rationale behind ST1 Control domineering regulatory oversight and SO3 Centralized endorsement structures suggests increased state burden coordinating steering functions on the green economy. This level of policy coherence, while effective, could be enhanced through some level of bottom-up integration. As ST3: Establishing local partnerships (4.2%) and ST4: Bundled renewables deployment (4.8%) hint toward more diverse adaptation, they provide certain insights into community solutions. Governance participative, concerning the involvement of local stakeholders throughout the project lifecycle, is increasingly seen as essential for fostering resilience and context-appropriate solutions (UNEP, 2021).

To sum up, Sabah's five year strategic framework shows commendable achievements in constructing the institutional and marketplace infrastructure for green investment. The focus on opportunity creation, marketing, and reducing regulatory hurdles is consistent with global benchmarks. As noted earlier, the strategy suffers from an over-concentration imbalance that increases focus on managing international collaborations, local capacity building, and other risks while diverting attention from expanding focus areas. Fortifying these domains will be critical in enabling Sabah to not only attract investments, but also sustain it through resiliency, efficiency, and community stewardship.

Reference

Asian Development Bank (ADB). (2022). ASEAN Green Recovery through Renewable Energy. https://www.adb.org

Buerkle, A., O'Dell, A., Matharu, H., Buerkle, L., & Ferreira, P. (2023). Recommendations to align higher education teaching with the UN sustainability goals – A scoping survey. International Journal of Educational Research Open. https://doi.org/10.1016/j.ijedro.2023.100280.

Burri, M., & Kugler, K. (2024). Regulatory autonomy in digital trade agreements. Journal of International Economic Law. https://doi.org/10.1093/jiel/jgae025.

Chițimiea, A., Minciu, M., Manta, A., Ciocoiu, C., & Veith, C. (2021). The Drivers of Green Investment: A Bibliometric and Systematic Review. Sustainability, 13, 3507. https://doi.org/10.3390/SU13063507.

Drobetz, W., Ghoul, S., Guedhami, O., & Janzen, M. (2017). Policy Uncertainty, Investment, and the Cost of Capital. Corporate Finance: Valuation. https://doi.org/10.2139/ssrn.2980918.

Energy Commission of Sabah. (2024a). Introduction to the Energy Commission of Sabah. Retrieved from https://ecos.gov.my/content/introduction-energy-commission-sabah

Grant, R. M. (2016). Contemporary strategy analysis (9th ed.). Wiley.

Green, I., Thomas, M., Giles, D., Richard, A., Bjørkmann, M., Sverdrup, E., Castberg, E., Highlights, S., Expanison, S., & Highlights, Æ. (2019). Innovation and Technology. Handbook of Globalisation and Tourism. https://doi.org/10.18356/0959e33d-en.

Gürel, E., & Tat, M. (2017). SWOT analysis: A theoretical review. The Journal of International Social Research, 10(51), 994–1006. https://doi.org/10.17719/jisr.2017.1832

Hassan, A., & Riaz, A. (2024). Analysis of skilled labor shortage in the construction industry of developing countries. Building Engineering. https://doi.org/10.59400/be2054.

Henisz, W., Dorobantu, S., & Nartey, L. (2014). Spinning gold: The financial returns to stakeholder engagement. Strategic Management Journal, 35, 1727-1748. https://doi.org/10.1002/SMJ.2180.

Hosen, B., Rabbani, M., Ali, M., & Khatun, M. (2024). Mapping Of Post To Pre-Electrification Developments In Rural Areas: A Socioeconomic Comprehensive Review. Socio Economy And Policy Studies. https://doi.org/10.26480/seps.02.2024.82.85.

International Energy Agency (IEA). (2020). Sustainable Recovery. https://www.iea.org/reports/sustainable-recovery

International Energy Agency. (2023). World Energy Outlook 2023. Retrieved from https://www.iea.org/reports/world-energy-outlook-2023

International Renewable Energy Agency (IRENA). (2019). Innovation Landscape for a Renewable-Powered Future. https://www.irena.org

Kabir, M., Habiba, U., Khan, W., Shah, A., Rahim, S., Farooqi, Z., Iqbal, Z., & Shafiq, M. (2023). Climate change due to increasing concentration of carbon dioxide and its impacts on environment in 21st century; A mini review. Journal of King Saud University - Science. https://doi.org/10.1016/j.jksus.2023.102693.

Kenton, W. (2024, June 29). How to perform a SWOT analysis. Investopedia. https://www.investopedia.com/terms/s/swot.asp

KPMG. (2019). Emerging trends in infrastructure. https://home.kpmg

OECD. (2011). Towards Green Growth. OECD Publishing.

Lada, S., Chekima, B., Ansar, R., Lim, M. F., Bouteraa, M., Abdul Adis, A.-A., Abd Karim, M. R., & Yong, K. (2024). Strategic alternatives for Muslim-friendly homestay in Sabah Malaysia: A SWOT/TOWS analysis. Journal of Islamic Marketing, 15(6), 1534–1559. https://doi.org/10.1108/JIMA-07-2022-0218

Pauw, W., Moslener, U., Zamarioli, L., Amerasinghe, N., Atela, J., Affana, J., Buchner, B., Klein, R., Mbeva, K., Puri, J., Roberts, J., Shawoo, Z., Watson, C., & Weikmans, R. (2022). Post-2025 climate finance target: how much more and how much better?. Climate Policy, 22, 1241 - 1251. https://doi.org/10.1080/14693062.2022.2114985.

Peterdy, K. (2024). SWOT analysis. Corporate FinanceInstitute. https://corporatefinanceinstitute.com/resources/management/swot-analysis/

Porter, M. E. (1998). Competitive advantage of nations. Free Press.

Rivera, S., Goetz, S., Kouro, S., Lehn, P., Pathmanathan, M., Bauer, P., & Mastromauro, R. (2023). Charging Infrastructure and Grid Integration for Electromobility. Proceedings of the IEEE, 111, 371-396. https://doi.org/10.1109/JPROC.2022.3216362.

Saaty, T. L. (1980). The analytic hierarchy process: Planning, priority setting, resource allocation. McGraw-Hill.

Samarkina, I., Miroshnichenko, I., & Shpiro, L. (2023). Leadership Community in the System of Regional Public Policy (Based on the Study of the Participants' Community of the "Leaders of Kuban" Personnel Project). Общество: политика, экономика, право. https://doi.org/10.24158/pep.2023.6.2.

See, A., Mehranzamir, K., Rezania, S., Rahimi, N., Afrouzi, H., & Hassan, A. (2022). Techno-Economic Analysis of an Off-grid Hybrid System for a Remote Island in Malaysia: Malawali Island, Sabah. Renewable and Sustainable Energy Transition. https://doi.org/10.1016/j.rset.2022.100040.

Sharma, S., Srivastava, P., Kumar, A., Jindal, A., & Gupta, S. (2021). Supply chain vulnerability assessment for manufacturing industry. Annals of Operations Research, 1 - 31. https://doi.org/10.1007/s10479-021-04155-4.

Sohail, M., Majeed, M., Shaikh, P., & Andlib, Z. (2021). Environmental costs of political instability in Pakistan: policy options for clean energy consumption and environment. Environmental Science and Pollution Research, 29, 25184 - 25193. https://doi.org/10.1007/s11356-021-17646-5.

Sreekumar, D. (2023)What is research methodology? Definition, types, and examples | paperpal. Paperpal. https://paperpal.com/blog/academic- writing-guides/what-is-research-methodology

Taherdoost, H. (2017). Decision making using the analytic hierarchy process (AHP); A step by step approach. International Journal of Economics and Management Systems, 2.

The Star. (2024, January 8). Sabah's Energy Commission to focus on regulatory transformation. The Star Malaysia. Retrieved from https://www.thestar.com.my/

Tong, W., Lu, Z., Chen, Y., Zhao, G., Hunt, J., & Xu, G. (2025). Enhancing modular gravity energy storage plants: A hybrid strategy for optimal unit capacity configuration. Applied Energy. https://doi.org/10.1016/j.apenergy.2024.124774.

Ullah, F., Cai, H., Yuan, Q., & Ul-Haq, J. (2024). Plenty of resources and energy security risk nexus: Evidence from BRICS economies. Resources Policy. https://doi.org/10.1016/j.resourpol.2024.104981.

United Nations Environment Programme (UNEP). (2021). Green Economy Progress Measurement Framework.

World Bank. (2020). Unlocking Private Investment in Green Infrastructure.

Zhang, J., & Gu, Q. (2024). Unraveling the puzzling risk–return relationship: Distinctive roles of government involvement in venture capital investment. Strategic Management Journal. https://doi.org/10.1002/smj.3629.

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STRATEGIC ANALYSIS OF TRANSPORTATION INDUSTRY IN SABAH, MALAYSIA: A COMPREHENSIVE SWOT/TOWS-AHP APPROCH

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ABSTRACT

This study examines the transportation industry in Sabah, Malaysia, with a particular focus on the issue of limited rural connectivity. Despite government efforts and the existence of basic transportation infrastructure, many rural communities continue to face challenges such as poor road conditions, inadequate public transportation services, insufficient maintenance, and geographical barriers including mountainous terrain and seasonal flooding. To address these issues, the study employs an integrated SWOT, TOWS, and Analytic Hierarchy Process (AHP) approach to identify strategic factors, formulate improvement strategies, and prioritize actions for implementation. The SWOT analysis identifies key strengths, weaknesses, opportunities, and threats affecting rural transportation development. The TOWS matrix is then used to develop strategic alternatives, while AHP ranks these strategies according to their relative importance. The findings reveal that leveraging existing road networks and government commitment to expand digital infrastructure and smart transport solutions is the highest-priority strategy, followed by community engagement in multimodal transportation systems and the promotion of public-private partnerships. The study highlights the importance of infrastructure enhancement, technology adoption, community participation, and sustainable governance in improving rural accessibility. The proposed strategies provide practical guidance for policymakers and stakeholders to strengthen rural connectivity, support inclusive socio-economic development, and improve the quality of life of rural communities in Sabah.

Keywords: Rural Connectivity; Transportation Infrastructure; SWOT/TOWS Analysis; Analytic Hierarchy Process (AHP); Sabah Malaysia.

1. Introductions: Limited Rural Connectivity in Sabah

Being Malaysia's second largest state, Sabah has to face many serious challenges involving rural connectivity, which greatly slow down its economic and social developments. It is disheartening to find out that even though Sabah has a good number of valuable natural resources, it supports the development of many rural regions with a poor quality transportation network (Sarbatly et al., 2023). Roadways in such places are often in bad shape because they have outdated roads, cover few important spots, and do not receive sufficient routine maintenance, making it difficult both to get to important services and for the residents' economic opportunities. As a result of this difficulty, the cycle of rural poverty in Sabah remains and lowers the area's possible growth.

The research aims to check the status of rural infrastructure in Sabah, assess the social and financial issues linked to poor connectivity experienced by rural areas, and analyze the current transport policies being used (Gruidl et al., 2007). Further, this assessment wants to share useful suggestions to boost internet connection in rural places and aid the main aim of making progress more sustainable across the area (Neelima et al., 2024; Ovchinnikova & Asanova, 2023).

The study's importance comes from the fact that better rural connectivity might greatly contribute to the broader growth of Sabah. Building up transportation would achieve two things: first, more people could gain important services, and second, it would lower poverty and build a more inclusive economic model (Quium, 2019). This study aims to give meaningful knowledge to those in charge, who will be able to implement effective actions that directly solve the different problems experienced by rural areas in Sabah.

Transportation in rural areas of Sabah is challenging due to the bad state of the roads, increased flooding because of poor drainage, and the fact that many places remain isolated because of the limited road system. Lacking dependable public transport for moving people makes most people count on their own vehicles, and since there are not enough efforts to take care of roads and bridges, their condition gets worse.

Although there are many studies dealing with rural transportation issues in Malaysia, there aren't many that concentrate on the special needs of Sabah alone (Aratin et al., 2023). Many studies on rural transportation do not give sufficient attention to the unique background of Sabah, as a result, they ignore the concrete problems that rural communities face in the state. As a result, the research helps close this important gap in scholarly works by providing an in-depth and tailored assessment just for rural communities in Sabah to make sure the conclusions are helpful.

The investigation is fuelled by the need to address a major shortage of urban infrastructure in Sabah, since failing to do so would keep the gap between urban and rural towns. Strengthening connections in rural areas helps everyone develop equally, as everyone can then seize opportunities that benefit their lives. The goal of this inquiry is to support the growth of durable measures that address connectivity and support fairer growth in the rural parts of Sabah. Eventually, this should improve life for every resident.

2. Methodology SWOT-TOWS and AHP Analysis.

2.1 SWOT Methodology.

The SWOT method includes identifying the objectives of a company and checking it against what it does well, what it does poorly, the available benefits, and also the risks that could harm its objectives (see Figure 1).

Strengths: the qualities that help a business compete effectively compared to its rivals.Weaknesses: certain traits that give the business a disadvantage compared to other companies.Opportunities: segments of the entire business environment that the organization could utilize for its gain.Threats: challenges that the business might come across in the environment.

2.1.1 Internal and external factors

SWOT analysis is mainly used to highlight aspects that can make or break a business's achievements, divided into two parts as internal strengths and weaknesses and external opportunities and threats.

The framework can assess internal factors as strengths or weaknesses because of how much they shape the company's objectives. Even so, strengths that are valuable for a purpose may be disadvantages in some other case.

Some external elements may be technological progress, decisions made by government, society's changes, variations in market activity, and alterations in the company's competition. It is common to consider SWOT analysis as a clear-cut planning tool.

During SWOT analysis, it is important to prepare for and look at every factor that matters to new products, technology, management, or strategic planning with care.

SWOT analysis provides only one method to group and organize things by their similarities and flaws. In some cases, it leads its users to make lists instead of considering the main elements needed to meet goals. In addition, it usually lists the identified outcomes without reviewing them carefully or organizing them clearly, which means that sometimes weak chances are given similar weight as significant issues.

We should evaluate every element in the SWOT analysis carefully before getting rid of it. The influence of every SWOT factor can be seen in how it affects the formation of a good strategy. For this reason, it is important to base a strategy on SWOT factors that are positive and to ignore the negative ones.

2.1.2 Strategy formulation

The application of SWOT analysis can be effectively employed to delineate organizational strategy. The methodology utilized to implement strategy-centric analysis encompasses the articulation of both internal and external variables (utilizing the well-known 2 x 2 matrix),

selection of a strategic option and assessment of the most consequential factors, as well as the identification of interrelations that exist between internal and external characteristics (Ashutosh et al., 2020).

It is apparent that a robust correlation between strengths and opportunities can promote a favorable condition within the organization and advocate for an assertive strategic approach. Conversely, a pronounced interplay between weaknesses and threats may be interpreted as a warning, thereby suggesting the adoption of a defensive strategy.

A SWOT analysis may serve to:

(1) Investigate innovative solutions to existing challenges

(2) Ascertain obstacles that may impede the achievement of goals/objectives

(3) Determine the trajectory that will yield optimal effectiveness

(4) Uncover opportunities and constraints for transformation

(5) Facilitate the revision of strategies to adeptly navigate systems, communities, and organizations

(6) Function as a brainstorming and documentation tool to enhance communication

(7) Augment the credibility of interpretation to be employed in presentations to organizational leaders or key stakeholders

2.1.3 Limitations of SWOT

The application of SWOT analysis may detrimentally affect organizational performance and that "no one subsequently utilized the outputs during the subsequent phases of the strategy." Additional critiques encompass the inappropriate employment of SWOT analysis as a methodology that can be rapidly constructed without engaging in critical analysis, resulting in a distorted representation of strengths, weaknesses, opportunities, and threats within the internal and external contexts of an organization

Moreover, a further limitation in the formulation of a SWOT analysis is the propensity to uphold previously established goals and objectives. This inclination imposes significant constraints on the brainstorming process and the authentic identification of pertinent variables.

2.2 TOWS Methodology

The TOWS Matrix, as articulated by Frank David, constitutes a strategic framework that extends the conventional SWOT Analysis by accentuating actionable strategies that arise from the alignment of internal factors (Strengths and Weaknesses) with external factors (Opportunities and Threats). In contrast to SWOT, which predominantly enumerates these elements, TOWS is concentrated on the formulation of strategic responses: SO (Strengths-Opportunities) strategies harness internal advantages to capitalize on external opportunities, ST (Strengths-Threats)

strategies employ strengths to mitigate threats, WO (Weaknesses-Opportunities) strategies confront weaknesses by leveraging opportunities, and WT (Weaknesses-Threats) strategies reduce risks through defensive tactics. Frank David's methodology underscores proactive decision-making, ensuring that organizations synchronize their capabilities with market dynamics to bolster competitiveness and alleviate vulnerabilities. This framework is particularly advantageous in dynamic industries where strategic agility is of paramount importance.

2.2.1 Strategic Formulation and Implementation using the TOWS Matrix

(1) Conduct a SWOT Analysis to Identify internal factors (Strengths (S),Weaknesses (W) and Identify external factors (Opportunities (O) and threats (T))
(2) Generate TOWS strategies by matching internal and external factors to create four strategic approaches SO Strategies (Strengths-Opportunities), ST Strategies (Strengths-Threats), WO Strategies (Weaknesses-Opportunities), WT Strategies (Weaknesses-Threats)
(3) Prioritize & Select Strategies with Evaluate strategies based on feasibility, cost, risk, and impact
(4) Develop an Action Plan with Define specific actions, timelines, resources, and responsibilities.
(5) Implement & Monitor
(6) Review & Adapt

2.3 Analytical hierarchy process (AHP) methodology

The Analytical Hierarchy Process (AHP) provides a systematic approach to deconstructing a complex issue into smaller, more manageable components arranged in hierarchical order (Saaty, 1980). This methodology was conceptualized by Thomas L. Saaty. AHP functions as a comprehensive decision-making structure that categorically separates decision issues into a hierarchical format marked by aims, criteria, sub-criteria, and alternatives.

The three components that constitute the terms Analytic, Hierarchy, and Process are elucidated as follows:

Analytic: The AHP methodology for selecting alternatives is predicated on sound mathematical and logical reasoning rather than mere intuition, thereby facilitating the justification of the decision-making process.

Hierarchy: The AHP framework systematically disaggregates the decision problem into smaller hierarchical elements that encompass objectives, criteria, sub-criteria, and alternatives. Because numerous decision-making contexts are fundamentally complicated and tough to handle in full, the layered framework allows those making decisions to hone in on a narrower array of options.

Process: The decision-making process encompasses learning, evaluating, deliberating, and refining ideas, which collectively constitute a typical decision-making paradigm. AHP has been explicitly designed to facilitate this decision-making process, ensuring that it remains unaffected by extraneous influences.

AHP offers a comprehensive analytical framework for structuring a decision problem, representing and evaluating its components, relating those components to overarching objectives, and assessing alternatives in a hierarchical format.

Upon the establishment of the hierarchy, the decision-maker (DM) systematically evaluates the various variables by conducting pairwise comparisons, referencing each variable against the one directly above it in the hierarchy. These comparative assessments are subsequently converted into numerical values by AHP, processed, and analyzed across the full spectrum of the problem. AHP proves to be particularly effective when addressing complex, critical issues of significant importance that involve human perceptions and judgments, whose resolutions may have enduring implications.

AHP serves as a rigorous mechanism for the relative ranking of ordinal-level data, which can be transformed into ratio-level data through the application of eigenvectors and matrix algebra. It evaluates the relative significance of each factor within the SWOT analysis framework. The AHP approach to decision-making consists of four distinct stages or levels

Stage 1: define the problem and establish the hierarchical structure

The initial stage involves delineating all decision components pertinent to the problem. The foremost level encompasses a broad, general objective, while the subsequent lower levels contain the sub-objectives and attributes that exert influence on the decision-making process itself. Various potential alternatives are situated at the lowest level.

Stage 2: Collection of Input Data

The term input data refers to the influence exerted by each component on the corresponding sub-objectives within the proximate superior tier of the hierarchical structure. The resultant information is organized within a matrix designed for pair-wise evaluations. For the sake of illustration, if seven components exist at level L and there are two components at level L1, one would build a 7 x 7 matrix for both components at level L1. This matrix is designated as the reciprocal judgment matrix. To populate this matrix, it is necessary to conduct 10L (L*(L1)/25, specifically 7*6/2) comparisons. The diagonal components of this matrix are marked by the number 1, as the remaining components hold reciprocal figures. The Analytic Hierarchy Process (AHP) employs a 1–9 scale for measurement in its pair-wise comparisons. A value of nine indicates a significantly preferred element in relation to the element with which it is compared. Conversely, a value of one denotes two elements of equal importance. The intermediate values denote varying degrees of relational significance.

Stage 3: Determination of Relative Weights Utilizing the Eigenvalue Method
The relative priorities assigned to various criteria (sub-criteria) are not readily discernible from the judgment matrix. In this phase, the relative weights for a collection of objects (criteria, sub-criteria, and alternatives) are computed using the pair-wise comparison matrix B5 bij, which is characterized by being both positive and reciprocal (ranging from 1–9 and 1–1/9).

Therefore, the given matrix B such that

$$B=\begin{bmatrix} b_{11} & b_{12} & \dots & b_{1n} \\ b_{21} & b_{22} & \dots & \dots \\ \dots & \dots & \dots & \dots \\ b_{n1} & \dots & \dots & b_{nm} \end{bmatrix}$$

where $B_{ij}=1/B_{ij}$ for all I, j = 1, 2, 3. . ., n

Compute a vector of relative priorities w = (w1, w2. . . w3). The w is normalized so that it adds up to 1 or 100. If all the judgements are consistent, then

$$b_{ik}*b_{kj} = b_{ij} \text{ for all I ; j = 1, 2 …, n}$$

Then, normalizing any column j of matrix B will generate the wts

$$W_i = \frac{b_{ij}}{\sum_{K=1} b_{kj}} \text{ for all } I, j = 1, 2K \dots, n$$

Pair-wise judgement is often error-prone and condition in the second equation may not be confirmed. Consequently, the final result of priorities may depend upon the column chosen for normalization. Such a problem can be solved either by logarithmic least square (LLS) or eigenvector method developed by Saaty. Latter is a simpler procedure than former and also involves averaging all possible ways of comparing alternatives (Harker and Vargas, 1987). Calculations of the wt. vector as the right eigenvector of the matrix B:

$$Bw = \lambda_{max} W$$

where λmax is the maximum eigenvalue of matrix B. So the weight vector can be enumerated as

$$Wi = \frac{\sum_{j=1}^{N} bij*uj}{\lambda_{max}}$$

Inconsistencies in judgement can be calculated by eigenvector method. Satty research depicts for λmax n for positive reciprocal matrix. For a perfectly consistent matrix then λmax 5 nSatty defined a consistency index by the formula

$$CI = \frac{\lambda_{max} - n}{n-1}$$

Also consistency ratio (CR) is measured as ratio of CI and random index (RI)

$$CR= CI/RI$$

Therein RI the random index is computed as the mean of CI of randomly generated matrices of size n. If CR < 0.1, it is acceptable, and if CR > 1, the DM has to re-evaluate the decisions in order to reduce inconsistencies

Stage 4: Formulate a composite priority vector for the lowest tier of the hierarchy to evaluate alternative decision strategies.

The principal objective of employing the Analytic Hierarchy Process (AHP) is to systematically rank or prioritize various decision alternatives based on their effectiveness in achieving the specified objective or goal. The final cumulative ranking for the decision alternatives is derived by aggregating all the weighted eigenvalues associated with all hierarchical levels (extending down to the alternatives). Eigenvectors are weighted in accordance with the significance of the criteria.

The AHP methodology can be succinctly summarized as follows:
(1) The problem is structured as a hierarchical framework that encompasses the objectives, the alternatives, and the criteria/sub-criteria necessary for assessing the alternatives.

(2) Establish priorities among the variables within the hierarchy through a series of judgments predicated on pairwise comparisons of the elements.

(3) (4) (5) Integrate these judgments to generate a comprehensive set of overall priorities for the hierarchy. Conduct a consistency check on the judgments.

Conclude based on the outcomes of this analytical process (Saaty, 2008).

3. Analysis of Limited Rural Connectivity in Sabah.

3.1 SWOT Analysis

Strength
(S1) Existing basic road networks provide foundational access to rural communities (Ladin et al., 2019).
(S2) Community engagement in maintaining local paths and informal transport systems (Ariyanti et al., 2020).
(S3) Government commitment to rural infrastructure development through policies and funding (Ismail et al., 2021).
(S4) Availability of emerging technologies (e.g., GPS, mobile apps) to support rural transport logistics (Nordin et al., 2020).
Weakness

(W1) Poor road conditions causing frequent accessibility disruptions (Ladin et al., 2019).

(W2) Limited public transportation options, leading to reliance on costly private vehicles (Rahman et al., 2021).

(W3) Insufficient maintenance and lack of sustainable funding models for rural infrastructure (Ismail et al., 2021).

(W4) Geographical challenges such as mountainous terrain and seasonal flooding impeding connectivity (Nguyen & Lee, 2019).

Opportunities

(O1) Expansion of digital infrastructure to enable smart transport solutions (Nordin et al., 2020).

(O2) Increased public-private partnerships to finance rural connectivity projects (Rahman et al., 2021).

(O3) Integration of multimodal transport systems combining road, river, and alternative pathways (Ariyanti et al., 2020).

(O4) Leveraging community-based transport initiatives to enhance local access (Nguyen & Lee, 2019).

Threat

(T1) Climate change causing extreme weather events that damage rural roads (Ladin et al., 2019).

(T2) Urban migration reducing rural populations and weakening justification for investment (Ismail et al., 2021).
(T3) Policy inconsistency and fragmented governance leading to inefficient project implementation (Rahman et al., 2021).

(T4) Economic constraints limiting funds available for infrastructure upgrades (Nguyen & Lee, 2019).

Being unconnected from the rest of the country is an issue for rural areas in Sabah because it involves many strengths and weaknesses linked to several opportunities and challenges. It is noteworthy that even though the roads are very basic, they allow rural populations to access necessary travel needs (Ladin et al., 2019). In addition, local involvement in looking after transport options and roads makes them both safer and practical, allowing them to continue supporting the public in their everyday life (Ariyanti et al., 2020). On top of what

happens at the grassroots, policies and available funds from government help to support the improvement of rural services and connections (Ismail et al., 2021). Besides, the enhanced use of advanced tools, including GPS and mobile devices designed for rural transport, increase the chances for better arrangement of logistics. This helps identify more advanced and effective means of moving people and goods in rural regions (Nordin et al., 2020).

But at the same time, it is important to see that these strengths are greatly limited by serious weaknesses that hold back development. Most of the time, when roads in rural areas are not well paved, it interrupts how these populations communicate and do business. Since there are not enough trains or buses, most rural individuals turn to their personal cars, which are costly for people who cannot afford them (Rahman et al., 2021). There are not enough funds and infrastructure maintenance, which both add to the threat of rural transport failing to work well and break down over time (Ismail et al., 2021). The existence of high mountainous land and seasonal floods make it challenging for rural residents to be well connected (Nguyen & Lee, 2019).

In spite of all the difficulties, many positive prospects are still available that can be used to address these key issues. Improving digital infrastructure in rural areas can make it possible to introduce smart transport methods that will boost the quality of services and monitoring (Nordin et al., 2020). Increased connections between public and private sectors can form the base for strong funding strategies in the area of sustainable rural connectivity (Rahman et al., 2021). Using all three types of transport with roads, rivers, and additional routes offers a helpful plan for making travel accessible in different and complicated rural terrains (Ariyanti et al., 2020). Still, encouraging community-based transportation opens more opportunities for rural groups to help in planning and carrying out their own transportation improvements (Nguyen & Lee, 2019).

Yet, it is necessary to admit that there are many factors that could prevent security efforts from working. Climate change has become clearer when it results in severe extreme events that cause more issues for fragile rural roads, making it harder to ensure people stay well connected (Ladin et al., 2019). At the same time, people moving to cities lowers the number of rural residents and resulting in less interest from investors, which makes things more difficult. Different and inconsistent approaches in governance, in combination with lack of financial resources, stand in the way of making improvements to rural connectivity (Rahman et al., 2021; Nguyen & Lee, 2019). It is important to join the available resources with the upcoming possibilities, carefully watch out for and resolve the current issues, and prepare for new challenges ahead so that rural communities in Sabah can enjoy more equal and accessible service and connection in the days to come.

3.2 TOWS Matrix (Strategic Action Plan)

Internal Factors → External Factors ↓	**Strengths (S)** (S1) Existing basic road networks provide foundational access to rural communities (Ladin et al., 2019). (S2) Community engagement in maintaining local paths and informal transport systems (Ariyanti et al., 2020). (S3) Government commitment to rural infrastructure development through policies and funding (Ismail et al., 2021).	**Weaknesses (W)** (W1) Poor road conditions causing frequent accessibility disruptions (Ladin et al., 2019). (W2) Limited public transportation options, leading to reliance on costly private vehicles (Rahman et al., 2021). (W3) Insufficient maintenance and lack of sustainable funding models for rural infrastructure (Ismail et al., 2021). (W4) Geographical challenges such as mountainous terrain and seasonal flooding impeding connectivity (Nguyen & Lee, 2019).
Opportunities (O) (O1) Expansion of digital infrastructure to enable smart transport solutions (Nordin et al., 2020).	**SO Strategies (Maximize Strengths + Opportunities)** **SO1:** Leverage the existing basic road networks (S1) and	**WO Strategies (Minimize Weaknesses + Opportunities)** **WO1:** Address poor road conditions (W1) and

(O2) Increased public-private partnerships to finance rural connectivity projects (Rahman et al., 2021). (O3) Integration of multimodal transport systems combining road, river, and alternative pathways (Ariyanti et al., 2020). (O4) Leveraging community-based transport initiatives to enhance local access (Nguyen & Lee, 2019).	government commitment (S3) to expand digital infrastructure (O1) for implementing smart rural transport solutions such as GPS-enabled logistics and mobile app services (S4). **SO2:** Utilize community engagement (S2) to integrate multimodal transport systems (O3), combining roads, rivers, and local pathways, enhancing connectivity in hard-to-reach areas. **SO3:** Use emerging technologies (S4) alongside government policies (S3) to foster public-private partnerships (O2) for sustainable rural transport financing. **SO4:** Empower community-based transport initiatives (O4) by building on the existing local path maintenance (S2), encouraging local ownership and sustainability.	insufficient maintenance (W3) by mobilizing public-private partnerships (O2) to secure sustainable funding and technical support. **WO2:** Mitigate limited public transport options (W2) by adopting digital platforms and mobile apps (O1, S4) to coordinate shared rides and informal transport systems. **WO3:** Counter geographical challenges (W4) through multimodal integration (O3), enabling alternative routes such as river transport where road access is limited. **WO4:** Enhance local access (O4) to reduce reliance on costly private vehicles (W2) by formalizing community transport initiatives with government backing (S3).
Threats (T) (T1) Climate change causing extreme weather events that damage rural roads (Ladin et al., 2019). (T2) Urban migration reducing rural populations and weakening justification for investment (Ismail et al., 2021). (T3) Policy inconsistency and fragmented governance	**ST Strategies (Leverage Strengths to Counter Threats)** **ST1:** Utilize government commitment (S3) and emerging technologies (S4) to implement climate-resilient infrastructure and real-time monitoring systems to respond to extreme weather (T1). **ST2:** Counter urban migration (T2) by	**WT Strategies (Defensive Actions)** **WT1:** Develop contingency plans and improve road maintenance (W1, W3) to reduce vulnerability to climate change impacts (T1), especially in flood-prone and mountainous areas (W4). **WT2:** Address funding and governance gaps (W3, T3, T4) by advocating for policy reforms that prioritize rural

leading to inefficient project implementation (Rahman et al., 2021). (T4) Economic constraints limiting funds available for infrastructure upgrades (Nguyen & Lee, 2019).	strengthening rural connectivity (S1) and community engagement (S2) to improve quality of life and economic opportunities in rural areas. **ST3:** Use existing policy frameworks and government support (S3) to improve governance coordination and reduce fragmented implementation (T3). **ST4:** Leverage community participation (S2) and technology (S4) to optimize limited financial resources (T4) through cost-effective, locally managed transport solutions.	transport infrastructure and transparent project management. **WT3:** Counteract limited public transport and high private vehicle reliance (W2) by incentivizing community-based transport models and subsidized shared mobility services. **WT4:** Mitigate the effects of urban migration (T2) by enhancing rural connectivity (W4) and improving access to services to retain rural populations.

Table 1: SWOT Analysis

The problem of poor connectivity in rural areas of Sabah can be handled by working with the region's strengths and at the same time managing its weaknesses through clever approaches. While building digital infrastructure (O1) for better smart transport (S4), solid networks (S1) and strong government policies and funding (S3) play a key role and make it easier to apply advanced solutions such as GPS in logistics and new applications on mobile devices. Moreover, with the participation of local communities in fixing and maintaining rural pathways (S2), there is a special chance to include various kinds of transportation such as roads, boats, and other pathways, which are all under O3, resulting in much better access for people in tough areas of the country.

On top of this, publicly supported and privately operated partnerships, called O2, along with new technological developments and suitable policies, give an effective choice to maintain financial support for rural transport projects. To fix the road deterioration highlighted as W1 as well as poor maintenance practices indicated in W3, it is useful to activate public-private partnerships recommended in O2, resulting in the collection of funds and technical assistance needed for improvement.

Mainly, the use of digital systems and handy mobile apps, represented as O1, encourages the development of shared and flexible transport services, fixing challenges caused by shortages of public transportation, identified as W2. Integrating several means of transport solves the geographical problems and supports use of the smaller rivers to make traveling easier. Encouraging community members to set up their own transport system, which is O4, and ensuring government assistance as shown in S3, helps people in the community depend less on

private vehicles, saving costs, and obtain greater access to basic resources and services.

Whenever outside threats to the country arise, the faithful S3 and its use of advanced technology, S4, ensure that the country and its people are protected and that any consequences of natural disasters, T1, are quickly tackled by the use of modern monitoring systems. S1, which means boosting rural connectivity, and S2, which refers to getting communities actively involved, can tackle the challenge of urban migration T2 by giving rural people more economic opportunities. Besides, the goal of enhancing how governance groups cooperate, termed S3, should help resolve the challenge of policy fragmentation, termed T3, while the involvement of locals, mentioned as S2, together with using modern technology, underscored as S4, provides another way to make use of scarce funds, called T4.

In order to keep systems risk-free in the face of changes in climate, organizations should develop backup plans and boost maintenance activities, as listed as W1 and W3. Still essential for progress in rural connectivity are efforts to support government efforts in T3 and T4 and achieve reforms that better allocate and distribute funds as stated in W3. In addition, offering incentives for community transport solves the barrier created by reduced public transport, as shown in W2 and at the same time helps overcome the negatives of migration to cities, as highlighted in W4 and T2. All in all, these connected methods have the ability to greatly enhance rural internet access in Sabah, helping to advance sustainable growth in the whole region.

3.3 The AHP Analysis

BIL	CRITERIA	PRIORITY	RANK	(+)	(-)
1	**SO1:** Leverage the existing basic road networks (S1) and government commitment (S3) to expand digital infrastructure (O1) for implementing smart rural transport solutions such as GPS-enabled logistics and mobile app services (S4).	17.3%	1	11.9%	11.9%
2	**SO2:** Utilize community engagement (S2) to integrate multimodal transport systems (O3), combining roads, rivers, and local pathways, enhancing connectivity in hard-to-reach areas.	17.1%	2	10.9%	10.9%

3	**SO3:** Use emerging technologies (S4) alongside government policies (S3) to foster public-private partnerships (O2) for sustainable rural transport financing.	15.1%	3	9.3%	9.3%
4	**SO4:** Empower community-based transport initiatives (O4) by building on the existing local path maintenance (S2), encouraging local ownership and sustainability.	5.9%	7	2.7%	2.7%
5	**WO1:** Address poor road conditions (W1) and insufficient maintenance (W3) by mobilizing public-private partnerships (O2) to secure sustainable funding and technical support.	7.3%	4	4.3%	4.3%
6	**WO2:** Mitigate limited public transport options (W2) by adopting digital platforms and mobile apps (O1, S4) to coordinate shared rides and informal transport systems.	6.1%	6	2.7%	2.7%
7	**WO3:** Counter geographical challenges (W4) through multimodal integration (O3), enabling alternative routes such as river transport where road access is limited.	6.9%	5	3.3%	3.3%
8	**WO4:** Enhance local access (O4) to reduce reliance on costly private vehicles (W2) by formalizing community	5.1%	9	2.1%	2.1%
	transport initiatives with government backing (S3).				

9	**ST1:** Utilize government commitment (S3) and emerging technologies (S4) to implement climate-resilient infrastructure and real-time monitoring systems to respond to extreme weather (T1).	4.8%	10	3.0%	3.0%
10	**ST2:** Counter urban migration (T2) by strengthening rural connectivity (S1) and community engagement (S2) to improve quality of life and economic opportunities in rural areas.	5.4%	8	2.5%	2.5%
11	**ST3:** Use existing policy frameworks and government support (S3) to improve governance coordination and reduce fragmented implementation (T3).	1.5%	14	0.6%	0.6%
12	**ST4:** Leverage community participation (S2) and technology (S4) to optimize limited financial resources (T4) through cost-effective, locally managed transport solutions.	1.6%	13	0.9%	0.9%
13	**WT1:** Develop contingency plans and improve road maintenance (W1, W3) to reduce vulnerability to climate change impacts (T1), especially in flood-prone and mountainous areas (W4).	1.7%	12	0.9%	0.9%
14	**WT2:** Address funding and governance gaps (W3, T3, T4) by advocating for policy	1.8%	11	1.0%	1.0%

	reforms that prioritize rural transport infrastructure and transparent project management.				
15	**WT3:** Counteract limited public transport and high private vehicle reliance (W2) by incentivizing community-based transport models and subsidized shared mobility services.	1.4%	15	0.7%	0.7%
16	**WT4:** Mitigate the effects of urban migration (T2) by enhancing rural connectivity (W4) and improving access to services to retain rural populations.	1.0%	16	0.4%	0.4%

Table 2: TOWS Analysis

The conclusions reached with the Analytic Hierarchy Process (AHP) help in arranging various strategic actions for improving rural connectivity by using a process based on carefully comparing established criteria. The priority action, getting a total of 17.3% of the funding, revolves around using existing main roads more effectively, an aim that can only be reached when governments equally play their part (SO1). The approach that stresses the role of local communities in integrating different transport systems by 17.1% stands in second, after community engagement (H54), with the focus on showing how vital community participation is in making rural areas better connected.

Subject to a further study, the use of new technologies with help from public-private partnerships (SO3) came third in priority, as it scored 15.1% on the scale, confirming the sheer importance of employing advanced technology and cooperative strategies to tackle rural connectivity issues. On the other hand, although using local transport models (SO4) is acknowledged, it has only been ranked 5.9% as a priority, pointing out that it should be strengthened before it can have a broader impact in rural transportation.

To overcome problems caused by road problems and insufficient upkeep, the approach relying on public-private agreements to improve infrastructure has been prioritized and receives a score of 7.3%. Besides, strategies focusing on overcoming issues with public transport through digital services (WO2) and meeting geographic difficulties using different types of transport (WO3) have been rated with the priorities of 6.1% and 6.9% to highlight their importance in the entire strategy. In addition, steps taken to improve local access and encourage people to use alternatives to private cars (WO4) have scored the lowest and been given a priority of 5.1%.

Strategies concentrating on climate-resilient structures and equipment using government help and advanced technologies (ST1) received a scoring of 4.8%, while the idea to reduce

migration to cities by assisting connections and community participation has been assigned a 5.4% priority rank, pointing out their value in the general plan. At the same time, both policy coordination (ST3) and Sustainability Through Participation (ST4) have received low priority ratings, which shows that people see them as less pressing than other issues for now.

Actions focused on protecting and maintaining assets (WT1, WT2), and community transport (WT3) as well as tackling urban migration (WT4) have been seen as not important by the participants, with scores from 1.0% to 1.8%. The decision matrix that includes 120 pairwise comparisons, shows that the consistency ratio is 9.2%, proving that the judgments made within this framework can be relied on. Besides, with a main eigenvalue of 18.201 being calculated and the iteration process reaching convergence in eight tries, these results confirm that the effort is best placed on infrastructure, connecting the community, and introducing advanced technology for a real difference in providing sustainable rural connectivity in the region, as reflected in the priority ranking.

4. Critical Analysis and Strategic Interpretation of Sabah's Limited Rural Connectivity SWOT/TOWS-AHP Findings

In accordance with the key outcomes from AHP analysis combined with the TOWS framework, the full analysis reveals that using existing infrastructure and having a dedicated partnership with the government (SO1) plays the main role in improving rural connectivity. This fact shows just how vital important roads and suitable policies are for future development programs. Also, when community participation (SO2) is prioritized to the same degree, it means including locals in planning and giving them a role in actions, which makes rural transportation solutions more effective and encourages the population to feel concerned and invested in the community’s environment.

Giving high importance to technology adoption and joining public-private partnerships suggests that the region is switching to a strategy that embraces innovation and work with others to fix financial and geography matters it faces. Even so, the lack of resources and attention to grassroots transport projects (classified as SO4) hints that while their value is great, they will likely not greatly affect people until they are better included in larger infrastructural and policy frameworks.

Those strategies addressing issues related to roads and maintenance (WO1) show that the serious problems with infrastructures hamper the proper connections within these regions. The choice of multimodal transport integration (WO3) and the creation of digital platforms for organizing public transport (WO2) is a practical method to deal with the complicated geography and limits in transport Sabah has. The purpose of these approaches is to resolve the issues of cost and distance in rural areas by making good use of modern technologies and innovative systems.

Enhancing the city’s ability to cope with climate change (ST1) and checking the flow of migrants to urban regions (ST2) are considered important, but less urgent compared to other needs in the city’s development, showing that both threats are known and taken into account, but considered as less pressing for now. Although it is important to have defensive strategies in place, they have been put on the back burner. This might be a result of resource issues or the authorities’ preference for planning ongoing activities instead of reacting to them.

A strategic response derived from these findings should involve strengthening main infrastructure, establishing adequate policies, and at the same time encouraging people and new technologies in the community. As a result of this plan, Sabah can address its current needs for internet access as well as seek out solutions that are beneficial to the environment and the economy. Nevertheless, policymakers should not forget how important governance and maintenance reforms really are, since they support and sustain all the planned actions in this key framework.

5. Implementation Recommendations for Sustainable Limited Rural Connectivity in Sabah

For rural communities in Sabah to experience steady growth in connectivity, it's important to use a wide approach that addresses several areas related to this topic. In the beginning, governmental entities should make sure existing basic roads are maintained and boosted by their reliable support, since all further projects depend on this. For this reason, we need to concentrate on improving important infrastructure and set up regular maintenance schedules to guarantee area reliability in places where flooding is common and the land is challenging. Also, promoting public-private partnerships is necessary, since this way, the right resources and important knowledge can be obtained for managing and maintaining rural roads. At the same time, embracing and using modern solutions such as GPS, apps for mobile devices, and digital platforms greatly benefits transport services, routes, and makes traveling in remote places easier. It is also important that people from the community are closely involved in every part of the implementation process, since this can help them feel responsible, answer to their needs more quickly, and promote the project's stability. Providing training and developing abilities for people should come first, as it will help them handle and support transport projects for many years. To face Sabah's special geographical issues effectively, a transport system should connect roads, rivers, and alternate ways, granting easy navigation and solutions suitable for the various rural parts of the area. Because of this, all infrastructure plans should include practices that improve climate resilience, especially to guard rural regions against future complications from harsh weather. When looking at governance, it matters to ensure that various government bodies cooperate well so that policies do not conflict and everyday work gets more efficient. It is also important to build transparent systems for monitoring and checking results, since these help find progress, spot forthcoming problems, and allow flexible solutions. One more step is to promote economic growth in rural areas, and this task can be achieved by developing access to important markets, schools, and health clinics. All the recommendations included in this plan blend together to make sure there is equal, sustainable, and dependable internet in Sabah's rural areas, leading to everyone's development and raising life standards.

6. Conclusion.

It is necessary to put together a detailed and effective plan so that rural areas in Sabah have better connections by integrating infrastructure upgrades, innovations in technology, and close involvement by people living there. It is vital to give attention to road maintenance, work closely with different levels of government, and establish positive partnerships with companies, as these factors play a central role in progress that lasts in the region. Also, making sure to develop innovative multimodal plans and focus on climate resilience can help rural areas deal with their varying and regular environmental problems. To make sure these initiatives work well and adapt to new circumstances, solid rules for governance and regular checking must always be

applied and quickly changed when required. When basic services, infrastructure, and job chances are all enhanced, these dedicated actions can help reverse mass migrations from the rural areas and encourage development across the whole country. All in all, this joint approach works to improve living standards in these rural areas and to help these communities stay safe from damage in the future. Through involvement in these initiatives, it is believed that more people in the area will live in fairness and prosperity in the future.

Reference

Aratin, N. A., Rahman, N. F., & Ramli, Y. M. (2023). Issues and challenges of the minority Muslim community in the Kadazandusun ethnic village area in Sabah. International Journal of Academic Research in Business and Social Sciences, 13(9). https://doi.org/10.6007/IJARBSS/v13-i9/17558

Ariyanti, F., Nugroho, A. S., & Putra, A. A. P. (2020). Community participation in rural transportation development: A case study in Indonesia. International Journal of Sustainable Transportation, 14(6), 463–472. https://doi.org/10.1007/978-981-10-3208-0_10

David, F. R. (2017). Strategic management: Concepts and cases (16th ed.). Pearson Education.
Gruidl, J., Merrett, C. D., & Connelly, D. (2007). You can't get there from here: Issues in rural passenger transportation. Retrieved from https://trid.trb.org/view/840707

Harker, P. T., & Vargas, L. G. (1987). The theory of ratio scale estimation: Saaty's analytic hierarchy process. Management Science, 33(11), 1383–1403. https://doi.org/10.1287/mnsc.33.11.1383

Humphrey, A. S. (2005). SWOT analysis for management consulting. SRI Alumni Newsletter.
Ismail, A., Zakaria, Z., & Aziz, M. (2021). Challenges and opportunities in rural transportation infrastructure development in Malaysia. Transportation Research Procedia, 54, 193–201.

Karppinen, P., Bandaranayake, S., Haukipuro, L., Elmistikawy, Y., & Saarnisaari, H. (2024). Gaps in value-driven connectivity: A case study on connectivity challenges in Northern Europe. Proceedings of IEEE PIMRC 2024, 1–6. https://doi.org/10.1109/PIMRC59610.2024.10817270

Lada, S., Chekima, B., Ansar, R., Lim, M. F., Bouteraa, M., Abdul Adis, A.-A., Abd Karim, M. R., & Yong, K. (2024). Strategic alternatives for Muslim-friendly homestay in Sabah Malaysia: A SWOT/TOWS analysis. Journal of Islamic Marketing, 15(6), 1534–1559. https://doi.org/10.1108/JIMA-07-2022-0218

Ladin, M. A., Idris, S., Taha, N. A., Gungat, L., & Mirasa, A. K. (2019). Study on the transportation system in the East Coast of Sabah. International Journal of Recent Technology and Engineering, 8(3), 564–571.

Neelima, N., Reddy, C. P. R., Krishnaiah, V. V. J. R., Aalam, S. S., & Suresh, K. (2024). Evaluating the potential of mesh networks in enhancing rural connectivity based on Internet of Things. 24(2), 178–186. https://doi.org/10.54216/JISIOT.120213

Nguyen, T. T., & Lee, S. (2019). Overcoming rural connectivity challenges: Policy and planning approaches in mountainous regions. Journal of Transport Geography, 75, 71–81.

Nordin, N., Rahman, M. N. A., & Hisham, H. (2020). Mobile applications and rural transport service improvement: A case study in Malaysian rural areas. Journal of Advanced Transportation, 2020, Article ID 8871403.

Ovchinnikova, N. G., & Asanova, N. A. (2023). Sustainable development of territories as a basis for the integrated management of urban development for the effective use of the territory of municipalities. E3S Web of Conferences, 389, 04020. https://doi.org/10.1051/e3sconf/202338904020

Panagiotou, G. (2003). Bringing SWOT into focus. Business Strategy Review, 14(2), 8–10. https://doi.org/10.1111/1467-8616.00253

Pickton, D. W., & Wright, S. (1998). What's SWOT in strategic analysis? Strategic Change, 7(2), 101–109. https://doi.org/10.1002/(SICI)1099-1697(199803/04)7:2<101::AID-JSC332>3.0.CO;2-6

Quium, A. S. M. A. (2019). Transport corridors for wider socio-economic development. Sustainability, 11(19), 5248. https://doi.org/10.3390/su11195248

Rahman, M. M., Ahmed, S., & Islam, M. T. (2021). Public-private partnerships and rural transport development: Evidence from developing countries. Transport Policy, 101, 49–58.

Saaty, T. L. (1980). The analytic hierarchy process: Planning, priority setting, resource allocation. McGraw-Hill.

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. International Journal of Services Sciences, 1(1), 83–98. https://doi.org/10.1504/IJSSCI.2008.017590

Sarbatly, R., Lahin, F. A., & Chiam, C.-K. (2023). The outlook of rural water supply in developing country: Review on Sabah, Malaysia. Borneo Science Journal, 41(1). https://doi.org/10.51200/bsj.v41i1.4442

Weihrich, H. (1982). The TOWS matrix: A tool for situational analysis. Long Range Planning, 15(2), 54–66. https://doi.org/10.1016/0024-6301(82)90120-0

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FACTORS INFLUENCING INTENTION TO USE E-COMMERCE AFTER COVID-19: THE CASE OF BRUNEI DARUSSALAM

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ABSTRACT

This study sought to identify the variables affecting Bruneian consumers' propensity to adopt e-commerce in the wake of the COVID-19 outbreak. The research looked at two important variables: perceived utility and perceived usability. The dependent variable, the intention to use e-commerce, was contrasted with these components. Based on the Technology Acceptance Model, the study aimed to forecast and comprehend the factors that will encourage Bruneians to embrace online shopping in the aftermath of the COVID-19 pandemic. Brunei Darussalam provided data for the study's analysis. On the data, this study applied Structural Equation Modeling (SEM) using Partial Least Squares (PLS). Given the study's recent appearance in the e-commerce scene, its conclusions might be useful to the government of Brunei as well as companies aiming to increase e-commerce acceptance and user base in the nation. Additionally, this study advances the field of e-commerce studies by offering new insights on the decision to embrace e-commerce during the COVID-19 epidemic, which was accompanied by a substantial shift in worldwide consumer behavior toward online shopping.

Keywords: covid19, e-commerce, intention to use, perceived ease of use, perceived usefulness,

INTRODUCTION

As the World Health Organization officially declares an end to the global health emergency posed by COVID-19 (United Nations, 2023), nations worldwide continue to grapple with the aftermath of this unparalleled crisis. One significant aftermath has been the notable shift in consumer behavior toward e-commerce. According to Statista (2022), global retail e commerce sales surged from USD 2,982 billion in 2018 to USD 5,211 billion in 2021, marking an increase of USD 2,229 billion. Projections indicated a further rise to USD 8,148 billion by 2026. E-commerce had already been a channel for purchasing goods and services, but the pandemic significantly accelerated its adoption among consumers, including in Brunei Darussalam.

This widespread adoption presents a unique opportunity for businesses and governments to understand how consumers perceive e-commerce post-pandemic and how it influences their intentions to utilize it. This understanding is particularly crucial for Brunei, where e-commerce adoption is still in its early stages. By investigating Bruneian consumers' intentions to use e-commerce, this study aims to shed light on this evolving landscape. The findings could serve as valuable insights, guiding efforts to enhance e-commerce usage in Brunei. Such efforts are pivotal for supporting local businesses and shaping the nation's future economic trajectory.

Due to the pandemic, consumers consumptions have shifted towards e-commerce. According to The Authority for Info-communications Technology Industry of Brunei Darussalam (AITI) of E-commerce Survey for Consumers in Brunei Darussalam 2018 Report, about 76 percent of Bruneians are already using e-commerce. On the other hand, nearly 24 percent of respondents said they would never engage in e-commerce because of worries about things like credit and debit card fraud, preferring to do business directly with physical establishments, and worries about when their orders will arrive. Prior to the onset of the pandemic, it can be presumed that consumers engaged in e-commerce willingly. However, owing to the pandemic, consumers might be compelled to resort to e-commerce involuntarily, as it represents the sole available option for purchasing goods and necessities. In light of the fact that certain consumers may find themselves reluctantly embracing e-commerce, an opportunity arises to gain insights into their perceptions regarding its utility and user-friendliness. Nevertheless, findings on Bruneians' adoption of e-commerce following the

COVID-19 epidemic are scarce as the pandemic altered the country's consumers' intentions to embrace and be forced to utilize e-commerce. Furthermore, according to data furnished by AITI, a noteworthy segment of the transactions involved sellers based outside of Brunei. In particular, eBay was cited as the main platform by 47 percent of respondents, followed by Zalora (36 percent), Amazon (18percent), and Zalora (37 percent). This data emphasizes how domestic e-commerce has a small consumer base and is still in its infancy as a local industry. Thus, the purpose of this article is to examine the factors that led Bruneians to adopt online shopping following the COVID-19 outbreak.

LITERATURE REVIEW

Technology Acceptance Model

The Technology Acceptance Model (TAM) has been used as the theoretical foundation in this investigation. Perceived usefulness (PU) and perceived ease of use (PEOU) are key elements within the TAM and are known for having an impact on users' intentions to adopt new technologies (Van et al., 2021; Cheung et al., 2008; Davis, 1989;). According to Davis (1989), PU stands for a person's conviction that using a specific information system would improve their ability to execute their work, whereas PEOU stands for a person's view that using the same system would require little effort. In Figure 1, the theoretical model is illustrated graphically.

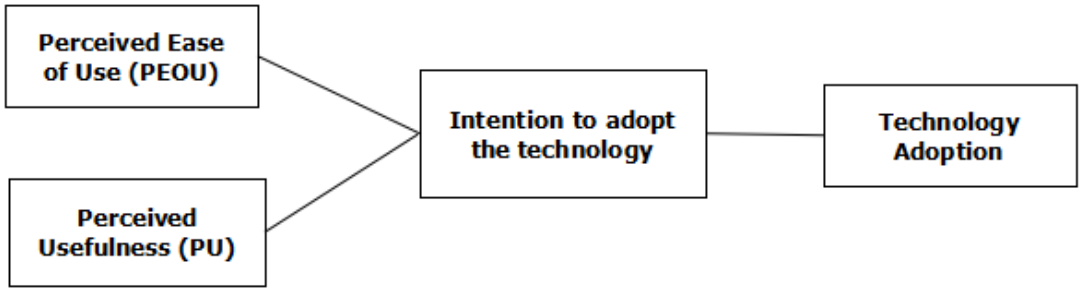

Figure 1 Technology Acceptance Model
Source : Fayad and Paper (2015)

This study used TAM because it aimed to explore the factors influencing Bruneian consumers' adoption of e-commerce following COVID 19, which was comparable to TAM's goal of researching technology adoption behavior (Davis 1989). According to Bui et al. (2020),

the Technology Acceptance Model (TAM) has been widely used in numerous research to evaluate the factors impacting e-commerce. According to Qiu et al. (2008), its clarity and simplicity improve the effectiveness of research on the adoption of information technology (IT), making it easier to aggregate findings from various contexts. According to Lee et al. (2003) and King et al. (2006), the model has been shown to be effective in a number of empirical investigations, making it one of the most widely used tools for assessing consumers' acceptance of technology.

TAM's primary predecessor is the Theory of Reasoned Action, which makes TAM an adaptation theory for the model (Ajzen et al., 1980; Fishbein et al., 1975). Davis (1989) developed the TAM, a theoretical framework derived from the TRA, to examine technology adoption behaviour. Davis (1989) then created a belief set for embracing technology in line with the guidance given by Fishbein et al. in 1975. To be relevant to the particular behaviour being researched, the TRA requires salient thoughts about one's attitude toward a particular activity to be triggered each time the behaviour occurs (Fishbein et al. 1975). This theory posits that social behavior is driven by an individual's attitude, specifically formulated to forecast the utilization of information systems (Lin, 2007).

As a result, perceived usefulness refers to how much a consumer believes that using e-commerce will improve their decision-making process and overall experience, while perceived ease of use refers to how much a consumer perceives the ease and simplicity of using e-commerce. This study's goal is to determine what influences Bruneian consumers' propensity to use online shopping in the post-COVID-19 period.

Intention To Adopt E-commerce

This paper's desire to implement e-commerce following COVID 19 is its main focus. The phrase "intention to use e-commerce" describes a person's or a customer's deliberate propensity to engage in online commercial activity. It denotes a deliberate decision and readiness to employ electronic platforms, such as websites or mobile applications, for activities such as product exploration, making purchases, and conducting financial transactions via the internet.

According to studies by Dionysiou et al. (2021) and Bazi et al. (2022), the COVID-19 pandemic and its effects on public health, society, and the economy are causing a change in consumer spending habits across multiple sectors. Notably, a notable result of this pandemic situation has been the growing adoption of e-commerce. This phenomenon has become a primary solution embraced by consumers to procure goods and services, even among those who traditionally abstain from online acquisitions, as evidenced in research conducted by Nicewicz and Bilska (2021) and Kawasaki et al. (2022).

E-commerce has been distinguished by its convenience and significance, particularly in the post-COVID-19 era. Kawasaki et al. (2022) demonstrated that consumers swiftly acknowledged the importance of e-commerce in the aftermath of the pandemic, and this recognition remained stable over time. Their research indicated that consumers consistently perceived e-commerce as highly important, and individuals who recognized its utility were inclined to persist in its usage. Conversely, those who diminished the importance of e-commerce did so primarily to mitigate the risk of infection, rather than weighing its benefits. Consequently, these individuals displayed a decreased likelihood of continuing to use e-commerce post the pandemic period.

Numerous research endeavors have sought to ascertain the principal determinants influencing consumers' adoption of e-commerce. In the study conducted by Higueras-Castillo et al. (2023), it was discerned that behavioral attributes primarily hold sway over the inclination to engage in e-commerce and its ramifications for traditional commercial transactions, when compared to socio-demographic factors. The investigation revealed that habitual patterns, trust, and expectations of effort exertion significantly influence the intention of Spanish consumers to partake in e-commerce, while factors such as switching costs and perceived risks act as deterrents, prompting them to persist with brick-and-mortar establishments. Conversely, Portuguese consumers' intention to embrace e-commerce is found to be driven by habit, trust, enabling circumstances, and the influence of social groups, whereas concerns related to privacy, technological apprehension, and gender considerations impede their transition to e-commerce and prompt their continued patronage of physical retail outlets.

Warganegara and Babolian Hendijani (2022) have contended that factors such as ease of use, usefulness, attitude, and reference group exerted statistically significant influence on

the intention and actual utilization of e-commerce for grocery purchases in Indonesia during the COVID-19 pandemic. Interestingly, their study revealed that neither health risk nor price exhibited significant correlations with respondents' purchasing intent. This finding diverges from research conducted in developed countries, where studies by Frank et al. (2020), Andersen et al. (2015), and Chiang et al. (2003) emphasized the importance of price, and studies by Kim et al. (2016), Yang et al. (2017), Eriksson et al. (2022), and Honey-Roses et al. (2020) highlighted the significance of perceived health risk in customers' decision-making processes regarding online grocery shopping.

Perceive Usefulness

Perceived Usefulness (PU), as articulated by Davis (1989), denotes an individual's degree of confidence in the ability of a specific information system to enhance their occupational proficiency (p. 320). Succinctly put, perceived usefulness essentially encapsulates how individuals perceive the consequences arising from their interactions (Nguyen-Viet et al., 2017) (p. 104). Additionally, it is possible to define the perceived usefulness of online buying as the degree to which it benefits consumers relative to offline purchasing (Gefen & Straub, 2000; Jullie, 2017). This comes down to the fact that online shopping provides various benefits that enhance the efficiency of the entire digital purchasing process. It allows customers to compare prices from different retailers, seek out product details, make orders, complete transactions, track shipments, and evaluate customer service quality (Bauerová & Klepek, 2018; Celik & Yılmaz, 2011; Jullie, 2017).

The majority of empirical studies offer compelling evidence indicating that Perceived Usefulness (PU) significantly and directly impacts users' intentions to adopt new technologies, as demonstrated in research by Pham et al. (2023), Elwalda et al. (2016), and Liang et al. (2013). Notably, Davis (1989) carried out a groundbreaking study that empirically supported the relationship between perceived usefulness and the propensity to use online retail platforms for purchases. Gefen et al., 2003, carried out a separate investigation that underscored the importance of the favorable connection between the perceived value of a service and the inclination to employ online platforms for shopping purposes. Correspondingly, Alagoz and Hekimoglu, 2012, demonstrated that there exists a constructive correlation between how beneficial a service is perceived to be and the desire to engage with e-commerce websites for

shopping. Research delving into consumer behavior has revealed that customers' intention to make online purchases is influenced by their perception of the practicality of an online store (Gefen et al., 2003; Lim & Ting, 2012).

The findings of the study by Warganegara & Babolian Hendijani (2022) on the factors influencing real grocery purchases made through online shopping platforms in Indonesia during the COVID-19 pandemic highlight the positive relationship between perceived utility and the intention to use. The study shows that since most customers value online grocery platforms, a positive opinion of utility has a considerable impact on the desire to purchase goods online. The survey also shows that those who think favorably of online meal delivery services are more inclined to use them in the future. Furthermore, a study about the elements influencing the adoption of electronic commerce was carried out in Tanzania by Makame et al. (2014). Their research showed a strong correlation between e-commerce's perceived utility and propensity to use it. This implies that people are more likely to accept something when they see its benefits.

Perceived Ease of Use

According to Davis (1989), perceived ease of use (PEOU) refers to a person's opinion of how simple it will be for them to use a certain information system without having to put in a lot of effort (p. 320). To reiterate, perceived ease of use constitutes perceptual constructs that revolve around the procedural path leading to eventual accomplishment (Nguyen-Viet et al., 2017) (p. 104). According to Nguyen-Viet et al. (2017) and Gefen et al. (2003), the advantageous characteristics connected to perceived ease of use in the context of electronic commerce include the seamless facilitation of order placement, free from temporal or geographic restrictions, the perception of ease in information retrieval, and an overall perception of comprehensive user-friendliness.

Davis proposed that Perceived Ease of Use (PEOU) primarily influences intended use through Perceived Usefulness (PU) in the original Technology Acceptance Model (TAM). However, later studies by other academics, such those by Gefen et al. (2000), have suggested that PEOU might have a direct impact on the adoption of information technology (IT), particularly when the task is integral to the IT system. It is shown that there is a strong

correlation between perceived ease of use and the propensity to engage in e-commerce activities in Makame et al.'s (2014) scholarly investigation into the factors influencing the adoption of electronic commerce within developing countries, particularly Tanzania. This finding supports the idea that when people perceive e-commerce to be simple to use and require little effort, they indicate a desire to engage in it.

As per the research conducted by Yoon (2009) investigating the impacts of national cultural values on consumer reception of e-commerce within China, the validation emerged that the consumer acceptance framework devised by researchers from more developed nations is transferable and pertinent for application not only in advanced countries but also in developing nations. This assertion underscores the significance of Perceived Ease of Use (PEOU) as a pivotal factor influencing the acceptance of e-commerce among consumers.

METHODOLOGY

Sample and Data Collection

The analytical facet of this study concentrated on individual Bruneian consumers as subjects. A convenience sampling technique was employed within the non-probability sampling framework due to the absence of precise information regarding the entire target population, as elucidated by Sekaran and Bougie (2013). This method entails screening potential candidates within the population to pinpoint the most appropriate individuals for inclusion as samples or respondents, as outlined in the methodology by Sekaran and Bougie (2013).

For this research, the determination of factors influencing the intention to use e-commerce post-Covid-19 among Bruneian consumers necessitated the utilization of G*Power 3.1 software (Faul et al., 2009) to compute an adequate sample size. The effect size derived from G*Power was established at 0.15, denoting a medium effect size as defined by Hair et al. (2014). A significance level (alpha, α) of 0.05 was set, alongside a minimum statistical power ($1-\beta$) of 0.80, accounting for two predictors. The sample size analysis indicated that a minimum of 68 participants was required. Consequently, 68 participants drawn from the Bruneian consumer population were deemed an appropriate and acceptable sample size for this study.

Measurement Insturements

The research instrument utilized in this inquiry was quantitative and took the form of a survey questionnaire. The questionnaires used in this study consisted of two main sections: one aimed at collecting demographic information about the respondents, and the other designed to assess the factors influencing their intention to use e-commerce, further divided into Sections A, B, and C. In Section A, respondents encountered a series of queries related to the perceived usefulness of e-commerce, while Section B explored the perceived ease of use of e-commerce, both adapted and refined from the research conducted by Makame, Kang, and Park (2014). Meanwhile, Section C was dedicated to evaluating respondents' intent to utilize e-commerce, drawing inspiration and modifications from the works of Makame, Kang, Park (2014), as well as Anuar, Ravintharan, Rosli, and Ng (2023). Each item in the questionnaire employed a five-point Likert Scale, providing respondents with the opportunity to express their agreement or disagreement on a scale ranging from 1 (strongly disagree) to 5 (strongly agree).

RESULTS

Respondents Profile

Based on the demographic details gathered from the questionnaires among the respondents, 40 individuals (39.6 percent) were male, while 61 individuals (60.4 percent) were female. In terms of age distribution, the majority, 61 respondents (60.4 percent), fell within the 20 to 29 years range, with 21 respondents (20.8 percent) aged between 30 to 39 years. Subsequently, 10 respondents (9.9 percent) were in the 40-49 years age group, and the remaining 9 respondents (8.9 percent) fell within the 50-59 years category.

Regarding marital status, a significant portion of the respondents were single (58.4 percent), while the remaining 41.6 percent were married; none of the participants were reported to be separated or divorced. Ethnically, 95 percent of the respondents identified as Malay, 4 percent as Chinese, and the remaining 1 percent belonged to other ethnicities.

The data also revealed information about the respondents' job circumstances. The majority (30.7%) worked in the private sector, while students made up the same proportion. 19.8% of the workforce worked in the public sector, 7.9% were jobless, and 6.9% were self-

employed. In addition, 2.9% of respondents had a PhD, 6.9% had a master's degree, 24.8% had a bachelor's degree, 29.7% had a 'A' level or diploma, and 30.7% had passed the 'O' Level exam.

Model Assessment Using PLS-SEM

This study employed the Partial Least Square Structural Equation Modeling (PLS-SEM) methodology, utilizing the SmartPLS 3.0 software for scrutinizing the research model. The research process adhered to a two-stage approach, involving the assessment of both the measurement model and the structural model, as outlined in the methodology proposed by Anderson and Gerbing (1988). The choice of PLS-SEM was based on its suitability for exploratory research or studies aiming to predict relevant constructs, and its effectiveness as an analytical tool for studying numerous indicators and constructs, as highlighted by Hair et al. (2011) and Urbach and Ahleman (2010), factors particularly relevant to the objectives of this study.

In the initial phase of PLS-SEM data analysis, the focus was on evaluating the measurement model to ensure the alignment of indicators or questions with the theoretically established latent variable (Ramayah, 2014; Urbach and Ahleman, 2010; Chin, 2010; Anderson and Gerbing, 1988). The second phase concentrated on examining the structural model, which entails exploring connections between latent constructs and testing hypotheses, aligning with the SEM data analysis recommendations by Hair et al. (2014), Ramayah (2014), Urbach and Ahleman (2010), and Anderson and Gerbing (1988). To determine the significance of the path coefficients and loadings, a bootstrapping method with 101 resamples was employed, following the methodology proposed by Hair et al. (2011).

Assessment of The Measurement Model

As previously indicated in studies by Hair et al. (2014), Lewis et al. (2005), and Straub et al. (2004), the assessment of reflective measurement models involves several crucial dimensions, such as internal consistency reliability, indicator reliability, convergent validity, and discriminant validity. A comprehensive depiction of the evaluation of the measurement model is illustrated in Table 1.

The Table 1 reveals that all indicator loadings exceed 0.70, signifying the effective measurement of their respective constructs. The Average Variance Extracted (AVE) values exhibit variability, ranging from 0.635 to 0.683, indicating that the corresponding constructs capture a significant amount of variance in the observed indicators. Furthermore, the composite reliabilities for all constructs vary, with values ranging from 0.874 to 0.896, reflecting good internal consistency and reliability, as outlined by Hair et al. (2014). Based on these findings, the measurement model demonstrates acceptable convergent validity.

Table 1 : Loadings, Average Variance Extracted (Ave) And Composite Reliability (CR) Extracted

Construct	Measurement Item	Loadings	AVE	CR
Intention to adopt the technology	IE1	0.806	0.642	0.877
	IE2	0.797		
	IE3	0.835		
	IE4	0.765		
Perceived Ease of Use (PEOU)	PEOU1	0.873	0.683	0.896
	PEOU2	0.844		
	PEOU3	0.803		
	PEOU4	0.782		
Perceived Usefulness (PU)	PU1	0.818	0.635	0.874
	PU2	0.834		
	PU3	0.816		
	PU4	0.713		

Table 2 : Discriminant Validity of Measurement Model

No.	Latent	1	2
1.	**Intention to Use E-commerce**		
2.	**Perceived Usefulness**	**0.534**	
3.	**Perceived Ease of Use**	0.625	**0.675**

Following the advice of Hair et al. (2014), discriminant validity was employed to examine the extent to which a certain construct effectively distinguishes itself from other constructs in the study. The correlations between the latent components were consistently outperformed by the square root values of the Average Variance Extracted (AVE), as shown

in Table 2. According to the findings, which are consistent with the guidelines provided by Fornell and Larcker (1981), sufficient discriminant validity has been effectively established.

Assessment of The Structural Model

The second part of the data analysis process centers on scrutinizing the structural model which entails a comprehensive exploration of the connections between latent constructs and the rigorous testing of the hypotheses established earlier, drawing upon the research conducted by Hair et al. (2014), Ramayah (2014), Urbach and Ahleman (2010), and Anderson and Gerbing (1988). The significance of path coefficients, the extent of R^2 values, the effect size (f^2), and the predictive relevance value known as Q^2 are the main criteria for evaluating the structural model, according to study by Soto-Acosta et al. (2015) and Hair et al. (2014). Table 3 displays the results of the structural model analysis.

In this study utilized the bootstrapping procedure, encompassing all 101 subsamples derived from the original 101 cases. The path coefficients indicate that the intention to use e-commerce was directly and positively influenced by both hypotheses, namely perceived usefulness ($\beta = 0.375$, $t = 4.363$, $p < 0.01$) and perceived ease of use ($\beta = 0.252$, $t = 2.785$, $p < 0.01$).

The R-squared (R^2) values of the study model expounded on 0.31 percent of the overall variance in the intention to use e-commerce. This implies that the collective impact of the exogenous factors elucidated 0.31 percent of the variation in the desire of consumers from Brunei to engage in e-commerce.

The effect size, denoted as f^2, offers a means to assess the influence of an exogenous construct on the R-squared (R^2) value of an endogenous latent variable, as detailed by Hair et al. (2016) and consistent with Cohen's (1998) recommendations. Perceived usefulness ($f^2 = 0.062$) and perceived ease of use ($f^2 = 0.18$) exhibit the most substantial effect sizes on the intention to utilize e-commerce. Both exogenous latent variables fall into the category of having a small effect on the intention to use e-commerce, adhering to the criteria set forth by Cohen (1988).

Table 3 : Significance Testing Results of the Structural Model Path Coefficients (Direct relationship)

Hypothesis	Relationship	Std Beta	Std Error	t-value	Decision	F^2	R^2
H1	PU > IE	0.375	0.085	**4.363****	**Supported**	0.062	0.31
H2	PEOU > IE	0.252	0.089	**2.785****	**Supported**	0.138	

DISCUSSION

The purpose of this study was to identify the elements influencing Bruneian consumers' propensity to embrace online shopping in the wake of the COVID-19 outbreak. The study found that customer perceptions of e-commerce's usefulness and user-friendliness had a significant impact on Bruneian consumers' propensity to adopt it.

Firstly, the results in Table 3 show a strong association between perceived usefulness and customers' intentions to use e-commerce in Brunei which are in consonance with previous studies findings (Pham et al., 2023; Elwalda et al., 2016; Liang et al., 2013; Davis, 1989; Gefen et al., 2003; Alagoz and Hekimoglu, 2012; Lim & Ting, 2012; Warganegara & Babolian Hendijani, 2022; Makame et al., 2014).

Secondly, the findings also support H2, indicating a significant relationship between perceived ease of use and willingness to embrace e-commerce among Bruneian customers which consistent with previous research studies (Gefen et al., 2000; Makame et al., 2014; Yoon, 2009) that investigated the relationship between perceived ease of use and e-commerce intent. This study can deduce that the perceived usefulness and perceived ease of use is a pivotal determinant affecting the inclination to engage in e-commerce among Bruneian consumers post the COVID-19 pandemic.

References

Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Prentice Hall.

Alagoz, S. M., & Hekimoglu, H. (2012). A study on TAM: Analysis of customer attitudes in online food ordering system. Procedia - Social and Behavioral Sciences, 62, 1138-1143. https://doi.org/10.1016/j.sbspro.2012.09.195

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin, 103(3), 411-423. https://doi.org/10.1037/0033-2909.103.3.411

Anuar, A., Ravintharan, T., Rosli, N. A., & Ng, C. K. (2023). Factors influencing the intention to use e-commerce among Generation Y in Kota Bharu (Final year project thesis). Universiti Malaysia Kelantan.

Authority for Info-Communications Technology Industry of Brunei Darussalam. (2018). E-commerce survey for consumers.

Bauerová, R., & Klepek, M. (2018). Technology acceptance as a determinant of online grocery shopping adoption. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 66(3), 737-746. https://doi.org/10.11118/actaun201866030737

Bazi, S., Filieri, R., & Gorton, M. (2022). Investigating the impact of situational influences and social support on social commerce during the COVID-19 pandemic. Journal of Theoretical and Applied Electronic Commerce Research, 17(1), 104-121. https://doi.org/10.3390/jtaer17010006

Bougie, R., & Sekaran, U. (2013). Research methods for business: A skill-building approach (6th ed.). John Wiley & Sons.

Bui, N., Nguyen, H. H., Le, T. T., & Nguyen, T. L. (2020). Intention to use mobile commerce. International Journal of Enterprise Information Systems, 16(1), 1-30. https://doi.org/10.4018/IJEIS.2020010101

Celik, H. E., & Yılmaz, V. (2011). Extending the technology acceptance model for adoption of e-shopping by consumers in Turkey. Journal of Electronic Commerce Research, 12(2), 152-164.

Cheung, C. M. K., Lee, M. K. O., & Rabjohn, N. (2008). The impact of electronic word-of-mouth: The adoption of online opinions in online customer communities. Internet Research, 18(3), 229-247. https://doi.org/10.1108/10662240810883290

Chevalier, S. (2022, September 21). Global retail e-commerce market size 2014-2021. Statista. https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/

Chin, W. W. (2010). How to write up and report PLS analyses. In V. E. Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds.), Handbook of partial least squares: Concepts, methods and applications in marketing and related fields (pp. 655-690). Springer.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319-340. https://doi.org/10.2307/249008

Dionysiou, G., Tsoumakas, G., & Vassiliadis, C. (2021). The impact of COVID-19 in e-commerce: Effects on consumer purchase behavior. In Strategic innovative marketing and tourism in the COVID-19 era (pp. 199-210). Springer. https://doi.org/10.1007/978-3-030-66154-0_22

Elwalda, A., Lü, K., & Ali, M. (2016). Perceived derived attributes of online customer reviews. Computers in Human Behavior, 56, 306-319. https://doi.org/10.1016/j.chb.2015.11.051

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 41(4), 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

Fayad, R., & Paper, D. (2015). The technology acceptance model e-commerce extension: A conceptual framework. Procedia Economics and Finance, 26, 1000-1006. https://doi.org/10.1016/S2212-5671(15)00922-3

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention, and behavior: An introduction to theory and research. Addison-Wesley.

Gefen, D., & Straub, D. W. (2000). The relative importance of perceived ease of use in IS adoption: A study of e-commerce adoption. Journal of the Association for Information Systems, 1(1), 1-30. https://doi.org/10.17705/1JAIS.00008

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. MIS Quarterly, 27(1), 51-90. https://doi.org/10.2307/30036519

Gefen, D., Straub, D., & Boudreau, M. C. (2000). Structural equation modeling and regression: Guidelines for research practice. Communications of the Association for Information Systems, 4(7), 1-77. https://doi.org/10.17705/1CAIS.00407

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2016). Multivariate data analysis (7th ed.). Pearson.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2014). A primer on partial least squares structural equation modeling (PLS-SEM). Sage.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. Journal of Marketing Theory and Practice, 19(2), 139-152. https://doi.org/10.2753/MTP1069-6679190202

Higueras-Castillo, E., Liébana-Cabanillas, F. J., Muñoz-Leiva, F., & Molinillo, S. (2023). Intention to use e-commerce vs physical shopping: Difference between consumers in the post-COVID era. Journal of Business Research, 157, Article 113622. https://doi.org/10.1016/j.jbusres.2022.113622

Jullie. (2017). Behavioral intention to use e-tax service system: An application of technology acceptance model. European Research Studies Journal, 20(2A), 48-64. https://doi.org/10.35808/ersj/628

Kawasaki, T., Wakashima, K., & Shibasaki, R. (2022). The use of e-commerce and the COVID-19 outbreak: A panel data analysis in Japan. Transport Policy, 115, 88-100. https://doi.org/10.1016/j.tranpol.2021.10.023

King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. Information & Management, 43(6), 740-755. https://doi.org/10.1016/j.im.2006.05.003

Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The technology acceptance model: Past, present, and future. Communications of the Association for Information Systems, 12(50), 752-780. https://doi.org/10.17705/1CAIS.01250

Liang, S. W. J., Ekinci, Y., Occhiocupo, N., & Whyatt, G. (2013). Antecedents of travellers' electronic word-of-mouth communication. Journal of Marketing Management, 29(5-6), 584-606. https://doi.org/10.1080/0267257X.2013.771204

Lim, W. M., & Ting, D. H. (2012). E-shopping: An analysis of the technology acceptance model. Modern Applied Science, 6(4), 49-62. https://doi.org/10.5539/mas.v6n4p49

Lin, H. F. (2007). Predicting consumer intentions to shop online: An empirical test of competing theories. Electronic Commerce Research and Applications, 6(4), 433-442. https://doi.org/10.1016/j.elerap.2007.02.002

Makame, W. H., Kang, J., & Park, S. (2014). Factors influencing electronic commerce adoption in developing countries: The case of Tanzania. South African Journal of Business Management, 45(2), 83-96. https://doi.org/10.4102/sajbm.v45i2.126

Nguyen-Viet, H., Tuyet-Hanh, T. T., Unger, F., Dang-Xuan, S., & Grace, D. (2017). Food safety in Vietnam: Where we are at and what we can learn from international experiences. Infectious Diseases of Poverty, 6(39), 1-6. https://doi.org/10.1186/s40249-017-0249-7

Nicewicz, R., & Bilska, B. (2021). Analysis of changes in shopping habits and causes of food waste among consumers before and during the COVID-19 pandemic in Poland. Environmental Protection and Natural Resources, 32(3), 8-19. https://doi.org/10.2478/oszn-2021-0010

Pham, L., Lim, D. H., & Hwang, Y. (2023). Factors influencing intention to use online consumer reviews. Journal of Global Information Management, 31(1), 1-22. https://doi.org/10.4018/JGIM.321642

Qiu, L., & Li, D. (2008). Applying TAM in B2C e-commerce research: An extended model. Tsinghua Science and Technology, 13(3), 265-272. https://doi.org/10.1016/S1007-0214(08)70043-9

Ramayah, T. (2014). SmartPLS 2.0. Institute of Postgraduate Studies, Universiti Sains Malaysia.

Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. Journal of Information Technology Theory and Application, 11(2), 5-40.

Van, H. N., Nguyen, N., Nguyen, T. T. H., & Tran, T. V. (2021). Explaining intention to use mobile banking: Integrating perceived risk and trust into the technology acceptance model. International Journal of Applied Decision Sciences, 14(1), 55-79. https://doi.org/10.1504/IJADS.2021.112933

Warganegara, D. L., & Hendijani, R. B. (2022). Factors that drive actual purchasing of groceries through e-commerce platforms during COVID-19 in Indonesia. Sustainability, 14(6), Article 3235. https://doi.org/10.3390/su14063235

Yoon, C. (2009). The effects of national culture values on consumer acceptance of e-commerce: Online shoppers in China. Information & Management, 46(5), 294-301. https://doi.org/10.1016/j.im.2009.06.001

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STRATEGIC ANALYSIS OF MALAYSIA'S FILM INDUSTRY USING SWOT/TOWS AND AHP APPROACH

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ABSTRACT

This study explores the strategic positioning of Malaysia's film industry by integrating SWOT/TOWS analysis with the Analytic Hierarchy Process (AHP). Given the film sector's role in cultural expression and economic growth, this research identifies and prioritizes key strategic factors to guide industry development. The SWOT framework is used to categorize internal strengths and weaknesses and external opportunities and threats. AHP then quantifies the importance of each factor through expert-based pairwise comparisons. The outcome is a ranked prioritization of strategic elements, enabling evidence-based decision-making. TOWS strategies are formulated from this prioritization to propose realistic interventions for sustainable industry growth. Key findings reveal that government support and cultural diversity rank highest in strengths, while censorship and funding constraints dominate weaknesses. Streaming platforms and regional collaboration present the most promising opportunities, whereas piracy and foreign dominance remain critical threats. This hybrid methodology enhances strategy formulation for Malaysia's creative economy.

Keywords: Malaysian Film Industry, SWOT Analysis, TOWS Matrix, Analytic Hierarchy Process (AHP), Strategic Management

1.0 INTRODUCTION

The Malaysian film industry plays a critical role in shaping cultural identity, enhancing national pride, and contributing to the country's creative economy. With its roots dating back to the 1930s, the industry has undergone significant transformation through post-colonial shifts, regional collaborations, and government-led reforms. Today, it stands as a vibrant yet challenging sector within the broader entertainment landscape.

Economically, the creative industry contributes approximately 1.9% to Malaysia's GDP, and the film sector is a strategic subset of this ecosystem (DOSM, 2024). According to the National Film Development Corporation Malaysia (FINAS), local film production output has been steadily increasing, with over 70 local feature films produced annually in recent years (FINAS, 2023). Moreover, successful films such as Mat Kilau: Kebangkitan Pahlawan (2022) demonstrated the potential of domestic content by grossing over RM90 million - a record for local cinema (The Star, 2023).

However, the industry also faces significant headwinds. These include restrictive censorship policies, talent migration, market fragmentation due to language segmentation, and persistent piracy. The COVID-19 pandemic further disrupted film distribution, closed cinemas, and forced a pivot toward digital streaming platforms like Netflix, Viu, and Disney+ (Google Malaysia, 2023).

In response to these challenges, government bodies such as FINAS have introduced various incentives — notably the Film in Malaysia Incentive (FIMI), which offers a 30% cash rebate for qualifying productions (FINAS, 2022). The 2023 national budget also allocated RM102 million to the creative sector, with a strong emphasis on digital content development and co-production treaties (Bernama, 2023).

Given the complex and dynamic nature of the Malaysian film industry, a structured strategic approach is essential to identify key drivers of success and areas for improvement. This paper employs a hybrid SWOT-TOWS and Analytic Hierarchy Process (AHP) framework to prioritize critical internal and external factors and formulate viable strategies. Through this methodology, the study aims to provide stakeholders with actionable insights to guide the industry's sustainable growth and global competitiveness.

2.0 METHODOLOGY

2.1 RESEARCH DESIGN

This study utilizes a mixed-methods strategic analysis approach, combining qualitative tools (SWOT and TOWS) with a quantitative framework (AHP – Analytic Hierarchy Process). This hybrid methodology ensures that both subjective insights and measurable priorities are integrated to formulate a holistic strategy for Malaysia's filming industry. The design is particularly suitable given the complexity and dynamic nature of the entertainment sector (Gürel & Tat, 2017; Vaidya & Kumar, 2006).

2.2 DATA COLLECTION SOURCES

Data were obtained from a variety of primary and secondary sources:

- Government publications: FINAS Annual Reports, National Budget 2023 (Bernama, 2023), Film in Malaysia Incentive (FIMI) policy briefs
- Academic literature: Peer-reviewed studies on Malaysian creative industries

(Hashim, 2019; Rahim, 2021)

- Industry reports: MDEC Digital Content Roadmap (2023), UNESCO screen sector insights. Media coverage: The Star, Malay Mail, New Straits Times, Variety
- Expert inputs: Selected responses from industry professionals and film academics were interpreted and reflected in the pairwise comparisons for AHP weighting.

2.3 SWOT ANALYSIS PROCESS

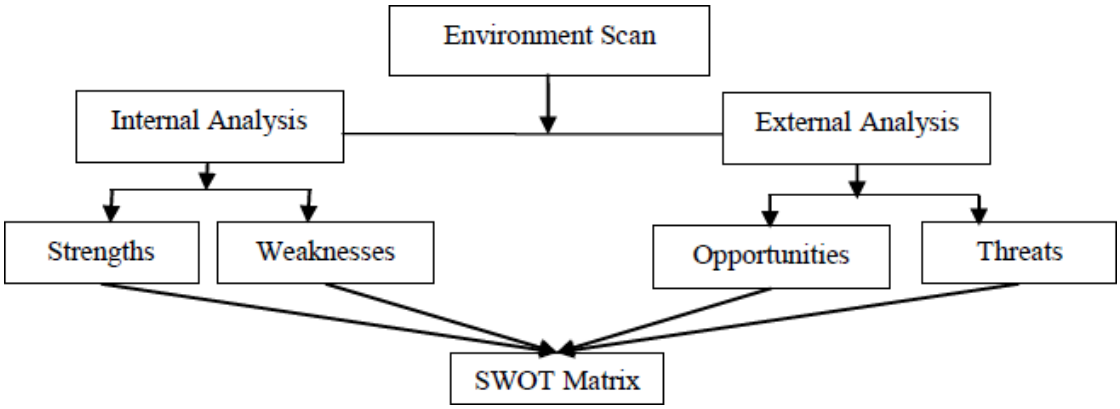


Figure 1: Framework of SWOT Analysis

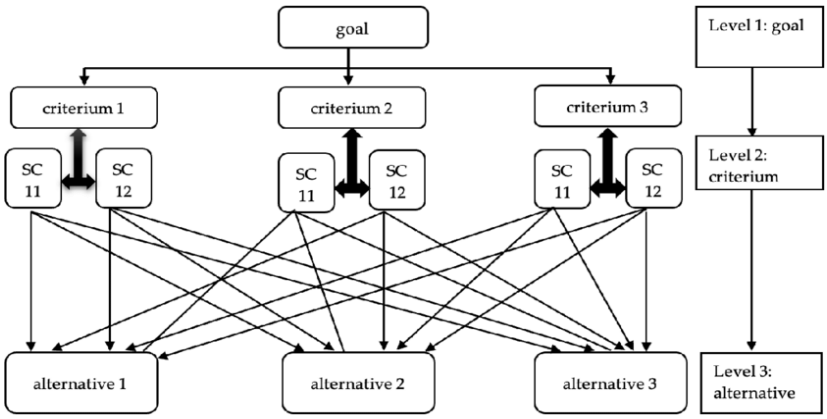
SWOT analysis is a widely recognized tool in strategic management used to identify a firm's internal strengths and weaknesses as well as external opportunities and threats (Gürel & Tat, 2017). In the context of this study, SWOT factors were derived from:

- official reports by the National Film Development Corporation Malaysia (FINAS),
- economic data from the Department of Statistics Malaysia (DOSM),
- academic literature focused on the Malaysian creative sector (Hashim, 2019; Rahim, 2021).

Each of the four SWOT components consists of five carefully selected factors that reflect the unique realities of Malaysia's film ecosystem, including funding availability, regulatory climate, audience behavior and technological innovation.

2.4 ANALYTIC HIERARCHY PROCESS (AHP)

Figure 2: Analytic Hierarchy Process (AHP)



The Analytic Hierarchy Process (AHP), developed by Thomas L. Saaty (1980), is a structured technique for organizing and analyzing complex decisions. It uses pairwise comparisons and eigenvalue calculations to assign priority weights to decision criteria. AHP is particularly effective in cases involving subjective assessments, such as comparing different strategic factors in a creative industry (Vaidya & Kumar, 2006).

The AHP process followed in this study includes the following steps:

1. **Stage 1: Hierarchy Structuring**

   The overall goal (i.e., strengthening Malaysia's film industry) is broken down into four SWOT categories, each containing five specific factors.

2. **Stage 2: Pairwise Comparison**

   Factors are rated against each other using a 1-to-9 scale to reflect their relative importance (Saaty, 1980).

3. **Stage 3: Weight Derivation**

   Eigenvalue-based calculations are used to extract normalized weights.

4. **Stage 4: Consistency Check**

A consistency ratio (CR) below 0.10 is accepted as reliable. The CR ensures the logical validity of expert comparisons (Mu & Pereyra-Rojas, 2017).

Data for the pairwise comparisons were synthesized through expert opinion, drawing from interviews and literature sources that include FINAS, the Malaysian Digital Economy Corporation (MDEC), and cultural policy reports (MDEC, 2023; Penang Institute, 2023).

2.5 TOWS MATRIX FORMULATION ANALYTIC

While SWOT identifies and categorizes factors, the **TOWS matrix** goes further by helping formulate strategies based on the interaction of internal and external elements (Weihrich, 1982). This matrix generates four strategic categories:

- **SO (Strengths–Opportunities):** Use strengths to maximize opportunities.
- **ST (Strengths–Threats):** Use strengths to counter external threats.
- **WO (Weaknesses–Opportunities):** Overcome weaknesses by leveraging opportunities.
- **WT (Weaknesses–Threats):** Minimize both weaknesses and threats simultaneously.

Strategies derived through TOWS are informed by the AHP-prioritized SWOT factors, ensuring that the most influential elements receive the highest attention during formulation.

3.0 SWOT ANALYSIS OF MALAYSIA'S FILM INDUSTRY

This section outlines the internal strengths and weaknesses, along with the external opportunities and threats (SWOT), impacting the strategic development of Malaysia's film industry. Each factor is selected based on government reports, economic data, media

coverage, and academic research to ensure relevance and credibility.

Table 1: SWOT Analysis of internal strengths and weaknesses, along with the external opportunities and threats (SWOT), impacting the strategic development of Malaysia's film industry.

Strengths (S)	Weaknesses (W)
S1. Government support & incentives (FINAS, 2023). S2. Cultural and ethnic diversity (Lim, 2022). S3. Emerging global recognition (The Star, 2023).	W1. Restrictive censorship policies (Penang Institute, 2023). W2. Fragmented domestic market (Rahim, 2021). W3. Low private sector investment (FINAS, 2023).
S4. Growing domestic audience support (FINAS, 2022). S5. Modern production infrastructure (Malay Mail, 2024).	W4. Talent migration abroad (NST, 2024). W5. Limited foreign distribution channels (UNESCO, 2023).
Opportunities (O)	**Threats (T)**
O1. Growth of streaming platforms (Google Malaysia, 2023). O2. Regional co-production in ASEAN (Variety, 2024). O3. Global demand for diverse stories (Variety, 2024). O4. Digital innovation & tech access (MDEC, 2023). O5. Policy reforms & flexible regulation (Bernama, 2024)	T1. Rampant digital piracy (MyIPO, 2023). T2. Foreign content dominance (FINAS, 2022). T3. Economic instability (DOSM, 2024). T4. Shifting youth media preferences (Google Malaysia, 2023). T5. Sociopolitical backlash on films (FMT, 2024)

3.1 STRENGTHS

1. **Strong Government Support and Incentives**

   Malaysia offers generous support to film production via initiatives such as the Film in Malaysia Incentive (FIMI), which provides a 30% cash rebate on qualifying local and foreign productions. This policy enhances international competitiveness and reduces production costs (FINAS, 2023).

2. **Cultural and Ethnic Diversity**

   The country's multiracial composition allows for rich storytelling opportunities. Malaysian filmmakers can draw from Malay, Chinese, Indian, and indigenous cultures, giving them unique market positioning regionally and globally (Lim, 2022).

3. **Emerging Global Recognition**

   Malaysian films are beginning to receive international attention. Notably, Tiger Stripes (2023) won the Grand Prize at Cannes Critics' Week, while actress Michelle Yeoh's Oscar win in 2023 brought global attention to Southeast Asian cinema (The Star,

2023).

4. **Growing Domestic Audience Engagement**

   The success of Mat Kilau (2022), which grossed over RM90 million, demonstrates that Malaysian audiences are increasingly supportive of local narratives (FINAS, 2022).

5. **Modern Production Infrastructure**

   Facilities such as Iskandar Malaysia Studios offer soundstages, post-production labs, and international-standard equipment. These helps attract co-productions and elevate local production quality (Malay Mail, 2024).

3.2 WEAKNESSES

1. **Restrictive Censorship Framework**

   Malaysia's conservative censorship laws restrict filmmakers from exploring sensitive or controversial themes, limiting artistic freedom and international competitiveness (Penang Institute, 2023).

2. **Fragmented Local Market**

   Language segmentation between Malay, Mandarin, Tamil, and English audiences leads to divided box office returns and hinders the development of a unified national film identity (Rahim, 2021).

3. **Insufficient Private Sector Investment**

   Most funding comes from government grants, with low involvement from venture capital or corporate sponsorships. This over-reliance on public funding stifles innovation and scalability (FINAS, 2023).

4. **Talent Drain to Foreign Markets**

   Many skilled professionals including editors, cinematographers, and animators — migrate to more lucrative international markets due to limited career growth and pay in Malaysia (NST, 2024).

5. **Weak International Distribution Channels**

   Malaysian films face barriers in entering foreign markets due to lack of global distributors and promotional infrastructure (UNESCO, 2023).

3.3 OPPORTUNITIES

1. **Rise of Streaming Platforms**

   Platforms like Netflix, Viu, iQIYI, and Disney+ offer alternative distribution models that bypass censorship boards and open new international markets (Google Malaysia, 2023).

2. **ASEAN Regional Collaboration**

   Cultural and linguistic similarities across Southeast Asia present opportunities for co-productions, content exchange, and expanded audience reach (Variety, 2024)

3. **Increasing Global Demand for Diverse Content**

   There is growing demand for non-Western perspectives in film, especially those highlighting indigenous, Muslim, and Southeast Asian identities (Variety, 2024).

4. **Technology-Driven Innovation**

   Advances in affordable digital cameras, editing software, and virtual production make filmmaking more accessible and cost-effective (MDEC, 2023).

5. **Policy Reforms in Progress**

   Recent initiatives by FINAS include flexible classification systems, co-production treaties, and funding diversification programs — signaling a more open regulatory approach (Bernama, 2024).

3.4 THREATS

1. **Rampant Digital Piracy**

   Malaysia suffers an estimated RM3 billion loss annually from illegal downloads and unauthorized streaming, undercutting box office and digital revenues (MyIPO, 2023).

2. **Dominance of Foreign Content**

   Hollywood, Bollywood, Korean dramas, and Chinese blockbusters dominate Malaysian screens and streaming platforms, limiting local exposure (FINAS, 2022).

3. **Economic Instability**

   Currency fluctuations, inflation, and recession risks can reduce government budgets and consumer discretionary spending on entertainment (DOSM, 2024).

4. **Shifting Audience Preferences**

   Younger viewers are gravitating toward short-form content on TikTok, YouTube, and Reels, reducing attention span for traditional film formats (Google Malaysia, 2023).

5. **Sociopolitical Sensitivities**

   Filmmakers who address race, religion, or politics risk backlash, bans, or delays — even if initially approved by censorship boards (FMT, 2024).

4.0 RESULTS 0F TOWS MATRIX: STRATEGIC OPTIONS FOR MALAYSIA'S FILM INDUSTRY

The TOWS matrix below presents strategic responses based on the interaction between internal (Strengths and Weaknesses) and external (Opportunities and Threats) factors. These strategies are prioritized based on the AHP results and backed by evidence from credible sources.

Table 2: TOWS Matrix presents strategic responses based on the interaction between internal (Strengths and Weaknesses) and external (Opportunities and Threats) factors.

Internal Factors / **External Factors**	**STRENGTHS (S)** **S1. Government support & incentives.** **S2. Cultural and ethnic diversity.** **S3. Emerging global recognition.** **S4. Growing domestic audience support.** **S5. Modern production infrastructure.**	**WEAKNESSES (W)** **W1. Restrictive censorship policies.** **W2. Fragmented domestic market.** **W3. Low private sector investment.** **W4. Talent migration abroad.** **W5. Limited foreign distribution channels.**
OPPORTUNITIES (O) **O1. Growth of streaming platforms.** **O2. Regional co-production in ASEAN (ASEAN Secretariat, 2023).** **O3. Global demand for diverse stories.** **O4. Digital innovation & tech access.** **O5. Policy reforms & flexible regulation.**	**S-O Strategies** (Strengths + Opportunities) **[SO1]** Use FIMI and studio facilities to produce multilingual content for ASEAN streaming (ASEAN Secretariat, 2023). (S1, S5, O1) **[SO2]** Market Malaysian films globally by leveraging cultural diversity (Variety, 2024). (S2, S3, O3) **[SO3]** Attract foreign producers via cost advantage and incentives (MDEC, 2023). (S1, S5, O2, O5) **[SO4]** Highlight heritage/folklore in high-production films (FINAS, 2022). (S2, S4, O3)	**W-O Strategies** (Weaknesses + Opportunities) **[WO1]** Encourage private investment via international co-productions (Bernama, 2024). (W3, O2) **[WO2]** Reach fragmented audiences through targeted streaming (Google Malaysia, 2023). (W2, O1, O4) **[WO3]** Push flexible classification system reforms (Penang Institute, 2023). (W1, O5) **[WO4]** Retain talent via competitive funding & global exposure (NST, 2024). (W4, O5, O3)

THREATS (T)	S-T Strategies (Strengths + Threats)	W-T Strategies (Weaknesses + Threats)
T1. Rampant digital piracy. **T2. Foreign content dominance.**	**[ST1]** Launch national anti-piracy campaigns (MyIPO, 2023). (S1, T1)	**[WT1]** Set up Film Resilience Fund to mitigate economic risk (DOSM, 2024). (W3, T3)
T3. Economic instability.	**[ST2]** Improve content quality via FINAS training schemes (FINAS, 2023). (S1, S5, T2)	**[WT2]** Implement expert script evaluation panels (FINAS, 2023). (W1, T5)
T4. Shifting youth media preferences.	**[ST3]** Differentiate local content through national identity themes (Lim, 2022). (S2, S4, T2)	**[WT3]** Campaigns to build youth support for local films (Penang Institute, 2023). (W2, T4)
T5. Sociopolitical backlash on films.	**[ST4]** Promote local cinema successes to counter foreign dominance (The Star, 2023). (S3. S4. T2)	**[WT4]** Form diplomatic panels to handle censorship backlash (FMT, 2024). (W1, T5)

4.1 SO STRATEGIES (STRENGTHS–OPPORTUNITIES)

SO strategies aim to leverage Malaysia's internal strengths (e.g. government support, cultural richness, audience size) to capitalize on external opportunities (e.g. streaming growth, ASEAN regional market).

1. **SO1:** Malaysia should maximize the Film in Malaysia Incentive (FIMI) and utilize production infrastructure such as Iskandar Studios to produce multilingual content aimed at ASEAN streaming audiences. This will position Malaysia as a regional content hub (Variety, 2024).

2. **SO2:** Local filmmakers can take advantage of Malaysia's cultural and ethnic diversity to create stories that are appealing to global audiences. This aligns with the rising demand for non-Western narratives on platforms like Netflix and Disney+ (Variety, 2024).
3. **SO3:** By combining cost-effective production, advanced facilities, and state support, Malaysia can attract international co-productions. These projects bring in foreign direct investment and transfer of skills (MDEC, 2023).
4. **SO4:** Heritage-based films, like Mat Kilau, should be further developed using high production values. These films can function as cultural exports while building national pride (FINAS, 2022).

4.2 ST STRATEGIES (STRENGTHS–THREATS)

ST strategies focus on using Malaysia's strengths to neutralize or minimize threats (e.g. piracy, foreign film dominance, sociopolitical backlash).

1. **ST1:** Government agencies can lead public education and enforcement campaigns to combat digital piracy, which costs the industry RM3 billion annually (MyIPO, 2023).
2. **ST2:** FINAS can expand technical training programs and script labs to help filmmakers

improve storytelling and compete against big-budget foreign films (FINAS, 2023).

3. **ST3:** Films that center on national identity, local folklore, and language can serve as differentiators in a saturated market dominated by K-Dramas and Hollywood content (Lim, 2022).
4. **ST4:** Promoting Malaysian cinema success stories like award-winning Tiger Stripes or Michelle Yeoh's Oscar win can help build local confidence and international recognition (The Star, 2023).

4.3 WO STRATEGIES (WEAKNESSES–OPPORTUNITIES)

WO strategies address internal weaknesses (e.g. limited investment, talent drain) by seizing external opportunities (e.g. streaming platforms, policy reform).

1. **WO1:** The government should attract international investors via co-production treaties to reduce reliance on grants and address funding gaps (Bernama, 2024).
2. **WO2:** Fragmented audiences across language groups can be better served through streaming platforms that allow for customized, language-specific releases (Google Malaysia, 2023).
3. **WO3:** Ongoing reforms in FINAS should be accelerated to implement a more flexible film classification system. This could reduce censorship issues and promote creative freedom (Penang Institute, 2023).
4. **WO4:** Competitive talent grants, co-production exposure, and regional collaborations can help retain Malaysian creatives who might otherwise seek opportunities abroad (NST, 2024).

4.4 WT STRATEGIES (WEAKNESSES–THREATS)

WT strategies are defensive and aim to minimize both weaknesses and threats (e.g. market instability, sociopolitical sensitivity, piracy).

1. **WT1:** A national film resilience fund could protect productions from sudden market downturns, inflation, or pandemic-style disruptions (DOSM, 2024).
2. **WT2:** Script review panels involving industry experts can improve content quality and reduce the risk of public or political backlash (FINAS, 2023).
3. **WT3:** Campaigns that promote appreciation of Malaysian content in schools and youth programs can strengthen audience loyalty (Penang Institute, 2023).
4. **WT4:** FINAS and the Ministry of Communications can establish a diplomatic advisory panel to manage international co-productions involving culturally sensitive material (FMT, 2024).

4.5 RESULTS OF TOWS-AHP

Table 3: Pairwise comparison of TOWS factors

TOWS	SO	ST	WO	WT	Degree of Group
Strengths Opportunities (SO)	**1.00**	**5.00**	**7.00**	**9.00**	**0.643**
Strengths- Threats (ST)	**0.20**	**1.00**	**3.00**	**5.00**	**0.208**
Weaknesses- Opportunities (WO)	**0.14**	**0.33**	**1.00**	**3.00**	**0.101**
Weaknesses- Threats (WT)	**0.11**	**0.20**	**0.33**	**1.00**	**0.048**
CR = 0.06					

The results show that the SO strategy group holds the highest importance weight (0.643), indicating that strategies leveraging internal strengths to seize external opportunities (such as government incentives, modern production facilities and ASEAN streaming demand) are the most effective and should be prioritized. The ST strategies ranked second with a weight of (0.208), highlighting the need to utilize national strengths to counter threats like piracy, foreign content dominance, and sociopolitical backlash.

Table 3presents the pairwise comparison of the four TOWS strategic groups: Strengths-Opportunities (SO), Strengths-Threats (ST), Weaknesses-Opportunities (WO), and Weaknesses-Threats (WT) based on the Analytic Hierarchy Process (AHP). The matrix was constructed using expert judgment, reflecting the relative importance of each strategic group in the context of Malaysia's film industry.

In contrast, **WO strategies (0.101)** and **WT strategies (0.048)** received lower weights. This suggests that although addressing internal weaknesses is important especially through policy reforms or co-production opportunities it is comparatively less urgent than leveraging existing strengths. The **Consistency Ratio (CR)** was calculated at **0.06**, which is well below the acceptable threshold of 0.10. This indicates that the judgments used in the pairwise comparisons were logically consistent and reliable for decision-making.

Table 4: Strengths-Opportunities (SO) Strategy Group

Strengths-Opportunities (SO)	**SO1**	**SO2**	**SO3**	**SO4**	**Importance Degrees**
(SO1)	1.00	4.00	6.00	9.00	0.594
(SO2)	0.25	1.00	4.00	7.00	0.263
(SO3)	0.17	0.25	1.00	3.00	0.099
(SO4)	0.11	0.14	0.33	1.00	0.044
CR = 0.07 (7%)					

Table 4 presents the pairwise comparison matrix for the Strengths–Opportunities (SO) strategy group using the Analytic Hierarchy Process (AHP), specifically tailored for the Malaysian film industry. This group focuses on strategies that leverage internal strengths to capitalize on external opportunities, such as regional streaming growth, cultural appeal, and international co-productions.

Based on the pairwise comparison, **SO1** (Leverage government support and incentives to produce multilingual content for ASEAN streaming platforms) received the highest importance degree of **0.594**, signifying that this strategy is the most crucial within the group. This reflects the substantial role of government funding, grants, and infrastructure in empowering local content to penetrate regional markets.

SO2 (Market Malaysian films globally by leveraging cultural diversity) follows with a weight of **0.263**, emphasizing the country's unique multicultural identity as a soft power asset. **SO3** (Attract foreign producers via cost advantage and incentives) scored **0.099**, indicating moderate significance, particularly in terms of industry sustainability and global linkages. Meanwhile, **SO4** (Highlight heritage and

folklore in high-production films) registered the lowest importance at **0.044**, suggesting that while thematically rich, its impact is comparatively less strategic in the current industry climate. These weights were derived through consistent pairwise judgments, and their aggregation represents a reliable prioritization of the most effective SO strategies. The prioritization supports the industry's direction to strengthen its competitive edge by building on what Malaysia already does well, offering production-ready infrastructure, government facilitation, and diverse cultural narratives.

The Consistency Ratio (CR) for this comparison was calculated at **0.07**, which is below the acceptable threshold of 0.10. This indicates that the judgments made in the pairwise comparison were consistent and reliable. Therefore, the prioritization derived from this matrix can be confidently used to guide strategic decisions in leveraging the strengths of Malaysia's film industry.

Table 5: Strengths-Threats (ST) Strategy Group

Strengths-Threats (ST)	ST1	ST2	ST3	ST4	Importance Degrees
(ST1)	1.00	4.00	9.00	9.00	0.617
(ST2)	0.25	1.00	5.00	7.00	0.258
(ST3)	0.11	0.20	1.00	3.00	0.082
(ST4)	0.11	0.14	0.33	1.00	0.043
CR = 0.086 (8.6%)					

Table 5 presents the pairwise comparison matrix for the Strengths–Threats (ST) strategy group based on the AHP framework, focusing on how internal strengths of Malaysia's film industry can be leveraged to counter external threats. This includes issues such as digital piracy, foreign content dominance, and sociopolitical backlash that threaten the sustainability and cultural identity of local cinema.

The results show that **ST1** (Launch a national anti-piracy campaign) received the highest importance degree of **0.617**, indicating that protecting intellectual property is the most critical strategic response to current industry threats. This is followed by **ST2** (Improve content quality through FINAS training and script development labs) with a priority weight of **0.258**, highlighting the importance of improving production standards to remain competitive against foreign media.

ST3 (Differentiate local content through national identity themes) was assigned a moderate weight of **0.082**, while **ST4** (Promote local cinema successes to counter foreign dominance) had the lowest priority at **0.043**. These two strategies, while valuable, are seen as complementary rather than primary solutions to the industry's external challenges.

The **Consistency Ratio (CR)** for this comparison is **0.086**, which is below the acceptable threshold of 0.10. This confirms that the judgments made in the pairwise comparison process are internally consistent and suitable for guiding strategic decision-making within this group.

Table 6: Weaknesses-Opportunities (WO) Strategy Group

Weaknesses-Opportunities (WO)	WO1	WO2	WO3	WO4	Importance Degrees
(WO1)	1.00	6.00	8.00	1.00	0.443
(WO2)	0.17	1.00	3.00	0.20	0.097
(WO3)	0.12	0.33	1.00	0.14	0.051
(WO4)	1.00	5.00	7.00	1.00	0.409
CR = 0.025 (2.5%)					

Table 6 presents the pairwise comparison matrix for the Weaknesses–Opportunities (WO) strategy group, designed to address internal limitations of Malaysia's film industry while capitalizing on external opportunities. These include financial constraints, talent migration, and industry fragmentation — all within the context of rising regional demand for diverse screen content.

The results indicate that **WO1** (Attract international investors through co-production incentives) holds the highest importance degree at **0.443**, making it the top strategic option within the WO group. This reflects the urgency of bringing in external funding and partnerships to reduce overdependence on government grants. Close behind is **WO4** (Retain local talent via grants and international exposure) with a weight of **0.409**, emphasizing the need to reverse brain drain and foster long-term industry capacity.

Meanwhile, **WO2** (Reform regulatory bottlenecks for faster production approval) and **WO3** (Upskill creative workers through short-term certifications) scored **0.097** and **0.051**, respectively. While still relevant, these strategies are viewed as supportive rather than core in addressing weaknesses.

The **Consistency Ratio (CR)** for this matrix is **0.025**, well below the acceptable threshold of 0.10. This reflects a high level of internal consistency in the judgment process, validating the credibility of the AHP-derived priorities within this strategic group.

Table 7: Weaknesses-Threats (WT) Strategy G

Weaknesses-Threats (WT)	WT1	WT2	WT3	WT4	Importance Degrees
(WT1)	1.00	3.00	6.00	8.00	0.567
(WT2)	0.33	1.00	4.00	6.00	0.279
(WT3)	0.17	0.25	1.00	3.00	0.104
(WT4)	0.13	0.17	0.33	1.00	0.051
CR = 0.062 (6.2%)					

Table 7 displays the pairwise comparison matrix for the Weaknesses–Threats (WT) strategy group, which evaluates how Malaysia's film industry can minimize its internal weaknesses while addressing external threats. This group focuses on defensive strategies such as policy reform, stakeholder collaboration, and funding protection.

Among the strategies compared, WT1 (Strengthen industry-specific policies to safeguard funding and curb monopolies) holds the highest importance degree of 0.567, suggesting that building a robust regulatory framework is the most critical defence against external instability and industry control by dominant players. This aligns with growing concerns over limited transparency and unequal access to production resources.

WT2 (Encourage multi-agency cooperation to streamline film approval and censorship) follows with an importance weight of 0.279, reflecting the need to address bureaucratic red tape that continues to hinder film production timelines. WT3 (Offer digital incentives for filmmakers in rural areas) and WT4 (Monitor online platforms to curb illegal streaming) were assigned lower weights of 0.104 and 0.051, respectively. While still relevant, these strategies are perceived as less impactful in the short term.

The Consistency Ratio (CR) for this matrix is 0.062, which confirms an acceptable level of consistency in expert judgments. This ensures the reliability of the derived priorities for formulating resilient, threat-mitigating strategies within the Malaysian film sector.

Table 8: The Overall Priority Scores of SWOT Factors

TOWS Group	Group Priority	TOWS Factors	Factor Priority within the Groups	Overall Priority of Factor
Strengths-Opportunities (SO)	0.643	**[SO1]** Use FIMI and studio facilities to produce multilingual content for ASEAN streaming (Variety, 2024). (S1, S5, O1)	0.594	0.382
		[SO2] Market Malaysian films globally by leveraging cultural diversity (Variety, 2024). (S2, S3, O3)	0.263	0.169
		[SO3] Attract foreign producers via cost advantage and incentives (MDEC, 2023). (S1, S5, O2, O5)	0.099	0.064

		[SO4] Highlight heritage/folklore in high-production films (FINAS, 2022). (S2, S4, O3)	0.044	0.028
Strengths -Threats (ST)	0.208	**[ST1]** Launch national anti-piracy campaigns (MyIPO, 2023). (S1, T1)	0.617	0.128
		[ST2] Improve content quality via FINAS training schemes (FINAS, 2023). (S1, S5, T2)	0.258	0.054
		[ST3] Differentiate local content through national identity themes (Lim, 2022). (S2, S4, T2)	0.082	0.017
		[ST4] Promote local cinema successes to counter foreign	0.043	0.009
		dominance (The Star, 2023). (S3. S4. T2)		
Weaknesses - Opportunities (WO)	0.101	**[WO1]** Encourage private investment via international co-productions (Bernama, 2024). (W3, O2)	0.443	0.045
		[WO2] Reach fragmented audiences through targeted streaming (Google Malaysia, 2023). (W2, O1, O4)	0.097	0.01
		[WO3] Push flexible classification system reforms (Penang Institute, 2023). (W1, O5)	0.051	0.005
		[WO4] Retain talent via competitive funding & global exposure (NST, 2024). (W4, O5, O3)	0.409	0.041
		[WT1] Set up Film Resilience Fund to mitigate economic risk (DOSM, 2024). (W3, T3)	0.567	0.027

Weaknesses-Threats (WT)	0.048	**[WT2]** Implement expert script evaluation panels (FINAS, 2023). (W1, T5)	0.279	0.013
		[WT3] Campaigns to build youth support for local films (Penang Institute, 2023). (W2, T4)	0.104	0.005
		[WT4] Form diplomatic panels to handle censorship backlash (FMT, 2024). (W1, T5)	0.051	0.002

Table 8 summarizes the overall priority scores of the proposed TOWS strategies for Malaysia's film industry, combining both the group-level weights and the factor-level importance derived from the Analytic Hierarchy Process (AHP). The results provide a comprehensive ranking of strategic actions based on their perceived impact and urgency across all four TOWS categories: Strengths–Opportunities (SO), Strengths–Threats (ST), Weaknesses–Opportunities (WO), and Weaknesses–Threats (WT).

Among the strategies evaluated, SO1 — Leverage government incentives for multilingual ASEAN streaming content — achieved the highest overall priority score of 0.382, reflecting a strong emphasis on utilizing existing government support and incentives to penetrate regional digital platforms. This is followed by SO2 (Promote Malaysian films globally by leveraging cultural diversity) with a priority of 0.169, highlighting the value of cultural capital in capturing global demand for diverse content.

In the ST category, ST1 (Launch national anti-piracy campaigns) emerged as the top threat-mitigating strategy with an overall weight of 0.128, signaling widespread concern about revenue loss and intellectual property protection. Meanwhile, strategies under WO — particularly WO1 (Attract international investors through co-productions, (0.045) and WO4 (Retain local talent through grants and exposure, 0.041) — underscore the industry's internal need to address funding gaps and reverse talent drain through strategic collaborations.

In the WT group, WT1 (Strengthen industry policies to safeguard funding and reduce monopolies) ranked highest within its category with an overall weight of 0.027, supporting the notion that policy-level protection is essential in minimizing external economic risks.

Collectively, these findings indicate a strategic preference towards SO-oriented growth strategies, particularly those that maximize Malaysia's strengths (e.g., government support, infrastructure, cultural identity) to take advantage of regional streaming and co-production opportunities. The relatively lower scores in the WT quadrant suggest that while threat mitigation remains important, proactive strategies that exploit strengths and opportunities are seen as more transformative for the future

of Malaysia's film industry.

These priority rankings provide valuable input for policymakers, agencies like FINAS, and industry stakeholders in formulating strategic action plans to ensure the sustainable growth, competitiveness, and global visibility of Malaysian cinema.

5.0 CONCLUSION

The Malaysian film industry stands at a pivotal crossroads where the convergence of strong governmental support, rich cultural diversity, and rapid technological change offers a strategic opportunity for national and regional leadership in the creative economy. This study applied an integrated SWOT-TOWS framework with the Analytic Hierarchy Process (AHP) to systematically identify, prioritize, and align strategic responses to both internal and external challenges in the sector.

The SWOT analysis revealed that Malaysia's key strengths lie in government incentives (e.g., FIMI), emerging global recognition, and infrastructure development. However, the industry continues to grapple with deep-rooted weaknesses such as censorship constraints, fragmented market segments, and limited private investment. Meanwhile, digital platforms and ASEAN collaborations offer promising growth avenues, even as piracy, foreign dominance, and socio-political sensitivities remain persistent threats.

The TOWS matrix provided a roadmap for converting these analytical insights into actionable strategies. Particularly, SO strategies that capitalize on existing strengths to seize external opportunities were ranked as the most impactful. The top priority strategy leveraging government support and studio facilities to produce multilingual content for ASEAN streaming audiences reflects the regional demand for culturally diverse narratives (Variety, 2024). ST strategies, such as launching anti-piracy campaigns and enhancing content quality through training, were also critical in neutralizing threats like digital piracy and foreign content saturation (MyIPO, 2023; FINAS, 2023).

The AHP model added quantitative rigor by prioritizing strategic alternatives based on expert judgment. It confirmed that proactive SO strategies outweigh reactive threat-mitigation strategies in terms of their potential to reshape the industry's trajectory. Notably, SO1 and SO2 collectively accounted for more than 50% of the strategic weight, indicating a clear preference for content-driven, culturally-rooted growth anchored in regional collaboration and digital platforms.

Overall, this research underscores the importance of an integrated strategic approach that combines institutional support, market innovation, and creative capacity-building to drive sustainable transformation in Malaysia's film industry. The findings provide actionable insights for FINAS, MDEC, and other stakeholders to design policies and initiatives that nurture domestic talent, strengthen industry resilience, and elevate Malaysia's cinematic presence both regionally and globally.

6.0 REFERENCES

Bull, J. W., Jobstvogt, N., Böhnke-Henrichs, A., Mascarenhas, A., Sitas, N., Baulcomb, C., Lambini, C., Rawlins, M., Baral, H., Zähringer, J., Carter-Silk, E., Balzan, M., Kenter, J. O., & Hockley, N. (2016). Strengths, weaknesses, opportunities and threats: A SWOT analysis of the ecosystem services framework. Ecosystem Services, 17, 99-111. https://doi.org/10.1016/j.ecoser.2015.11.012

Caves, R. E. (2000). Creative industries: Contracts between art and commerce. Harvard University Press.

Chang, H. H., & Huang, W. C. (2006). Application of a quantification SWOT analytical method. Mathematical and Computer Modelling, 43(1-2), 158-169. https://doi.org/10.1016/j.mcm.2005.08.016

Cunningham, S., & Craig, D. (2019). Social media entertainment: The new intersection of Hollywood and Silicon Valley. New York University Press.

Flew, T. (2012). The creative industries: Culture and policy. Sage Publications.

Gürel, E., & Tat, M. (2017). SWOT analysis: A theoretical review. The Journal of International Social Research, 10(51), 994-1006.

Helms, M. M., & Nixon, J. (2010). Exploring SWOT analysis, where are we now? A review of academic research from the last decade. Journal of Strategy and Management, 3(3), 215-251. https://doi.org/10.1108/17554251011064837

Hesmondhalgh, D. (2019). The cultural industries (4th ed.). Sage Publications.
Hill, T., & Westbrook, R. (1997). SWOT analysis: It's time for a product recall. Long Range Planning, 30(1), 46-52. https://doi.org/10.1016/S0024-6301(96)00095-7

Kurttila, M., Pesonen, M., Kangas, J., & Kajanus, M. (2000). Utilizing the analytic hierarchy process in SWOT analysis: A hybrid method and its application to a forest-certification case. Forest Policy and Economics, 1(1), 41-52. https://doi.org/10.1016/S1389-9341(99)00004-0

Malaysia Digital Economy Corporation (MDEC). (2023). Digital content roadmap: Empowering creative content for the digital age. https://mdec.my/digital-content-roadmap-2023

Mu, E., & Pereyra-Rojas, M. (2017). Practical decision making: An introduction to the analytic hierarchy process (AHP) using Super Decisions V2. Springer. https://doi.org/10.1007/978-3-319-68369-0

MyIPO. (2023). Annual report on intellectual property and anti-piracy enforcement in Malaysia. Intellectual Property Corporation of Malaysia. https://www.myipo.gov.my/

Penang Institute. (2023). Censorship and the creative economy in Malaysia: Constraints on freedom of expression. https://penanginstitute.org/

Porter, M. E. (2008). The five competitive forces that shape strategy. Harvard Business Review, 86(1), 78-93.

Rahim, M. R. (2021). Local content and globalization: An analysis of Malaysian cinema. Asian Journal of Communication, 31(1), 90-102. https://doi.org/10.1080/01292986.2020.1851898

Saaty, T. L. (1980). The analytic hierarchy process: Planning, priority setting, resource allocation. McGraw-Hill.

UNESCO. (2022). Creative economy outlook: Trends in the global screen sector. United Nations Educational, Scientific and Cultural Organization. https://www.unesco.org/

United Nations Conference on Trade and Development. (2022). Creative economy outlook 2022.

Vaidya, O. S., & Kumar, S. (2006). Analytic hierarchy process: An overview of applications. European Journal of Operational Research, 169(1), 1-29. https://doi.org/10.1016/j.ejor.2004.04.028

Weihrich, H. (1982). The TOWS matrix: A tool for situational analysis. Long Range Planning, 15(2), 54-66. https://doi.org/10.1016/0024-6301(82)90120-0

Yüksel, İ., & Dağdeviren, M. (2007). Using the analytic network process in a SWOT analysis: A case study for a textile firm. Information Sciences, 177(16), 3364-3382. https://doi.org/10.1016/j.ins.2007.01.001