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The Model of Sustainability Balanced Scorecard and Supply Chain in Port Management for Tourism

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Abstract: The development of ports for the sake of tourism is one of the key strategies in developing and strengthening a solid foundation in the tourism industry. The integration of a supply chain into port management for the purposes of tourism that is sustainable balanced can be used as a model for planning sustainable port development for tourism purposes. However, there are scarcely any studies on this topic, while plenty focus on the general concepts involved. To fill this gap, this article presents a model of a Sustainability Balanced Scorecard for ports. The author proposes a new approach to planning port development and supply chain management for tourism, particularity to provide recommendations and further our understandings of the relationships involved in the Sustainable Balanced Scorecard from the stakeholder perspective, the learning and growth perspective, the internal process perspective, the financial perspective and the environmental perspective. Using these five perspectives, the literature review identifies 56 indicators of 15 factors that can be used in the model. Therefore, this research helps to enhance and develop sustainable and efficient conditions in tourism while reducing future risks. Moreover, the research enables stakeholders to gain an understanding of and knowledge about the sustainable development and management of ports and for tourism. The insights can be applied in policy and strategy development according to the sustainable development goals (SDGs) to accommodate social movement, environmental risk and economic inequality.

Keywords: supply chain management; sustainable; balanced scorecard; port; tourism

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1. Introduction and Literature Review

Port development plays a crucial role in the growth of maritime transport and the economic development of coastal countries, leading to direct and indirect employment (Trozzi and Vaccar 2000). Ports are a vital part of the supply chain, being responsible for the coordination and delivery of goods and having a key role in managing the broader impacts of port activities on the supply chain, such as impacts on the environment, society and external economies. Moreover, ports also have a responsibility in balancing short-term and long-term focuses, including the interests of stakeholders as well as commercial and social goals (Roh et al. 2016). The implementation of a Sustainability Balanced Scorecard ("SBSC") as a tool for the sustainable management of organizational development incorporates a Balanced Scorecard ("BSC"), a concept developed by Kaplan and Norton. The practice balances the management of the public and private sectors to convey top-level strategies down to every unit in an organization, enabling the organization to promote clear objectives, strategies and goals to all of its members and ensuring the presence of common understandings and commitment that align with the directions of the organization. This practice allows an entity to efficiently achieve its goals while bringing a positive experience to staff and the organization in the long term (Kaplan and Norton 1996; Maltz et al. 2003).

Furthermore, the SBSC creates opportunities for both the management level and the working level of an organization to be aware of the importance of social and environmental sustainability in their operations. It fosters the creation of effective perspectives for decision-making and planning within the organization to allow it to develop and grow sustainably

and have positive impacts on society and the environment in the long term (Hansen and Schaltegger 2018). Implementing SBSC in an organization involves five perspectives: the financial perspective; the stakeholder perspective; the internal process perspective; the learning and growth perspective; and the environmental perspective (Hansen and Schaltegger 2018; Kalender and Vayvay 2016). The concept can function as a management tool and provides support for successful operations, particularly for the formation of a sustainable strategy by promoting strategic objectives and business strategies. By incorporating the SBSC into strategic planning, goals and indicators will be identified for each objective, creating a set of sustainability-focused indicators that are interconnected through causal relationships, enabling the organization to face challenges effectively as its strategies consider a form of sustainability that integrates environmental and social responsibilities (Figge et al. 2003).

The integration of sustainable development into the supply chain is crucial as it emphasizes connection and collaboration among logistics, the supply chain and sustainable development. This integration creates adaptability and mitigates issues faced by businesses within a rapid change of environment (He et al. 2018). The process requires commitment and collaborative efforts from multiple parties to build an efficient and sustainable business in the long term (Centobelli et al. 2018). During the process, obstacles related to the fundamental issues of sustainable development are identified due to there being more transparency in the supply chain. In developing countries, there may be an oversight or unawareness of the impacts of tourism on the environment and society in addition to insufficient compliance with existing regulations (Carter et al. 2015). While the process creates customer trust and value-added products or services, it also has functions in designing environmentally and socially friendly strategies and drafting a set of practices that can be used in supply chain operations to foster sustainable development. An emphasis on the importance of long-term sustainability in planning business strategies and government policy supports and promotes the growth of small- and medium-sized enterprises in the long run (Arsić et al. 2020). The Sustainable Supply Chain Management ("SSCM") not only helps to reduce the risks faced by businesses but builds customer trust and adds value to products or services. The concept is suitable for designing strategies and eco-friendly practices for use in supply chain operations, aiming to create sustainable development.

This study aims to reduce the risks from and impacts of port operations on sustainable tourism, inspired by the need for sustainable tourism as well as the efficient and effective conservation of environment and society in tourist areas. The study focuses on managing a sustainable supply chain that encompasses all of the perspectives within operations related to port in tourism, to effectively and sustainably mitigate potential risks and impacts. This research is supported by government agencies, entrepreneurs and stakeholders and underscores the importance of and demand for the development and improvement of port management in sustainable tourism. By utilizing to evaluate these operations, the results from this study will enable port managers to correctly and appropriately understand the factors affecting supply chain management and create sustainable and appropriate improvement plans in the long term.

Table 1 presents a literature review of 35 articles related to the Sustainability Balanced Scorecard for Ports ("SBSCP"). The author proposes a concept of SBSC, encompassing all five perspectives that are crucial in port development for sustainable tourism.

The data were collected through the snowball sampling method with reference to individuals and experts. A five-point Likert Scale was used to assess opinions. To analyze the data, descriptive and confirmatory analysis, exploratory factor analysis, factory analysis and a structural equation model were implemented as they can be effectively used to predict and analyze the relationships among various variables in quantitative studies.

Table 1. Literature reviews matrix.

Title	Perspectives in Supply Chain Management of Port for Sustainable Tourism					Ref.
	SP	LGP	EP	INP	FP	
"Reducing pollutant emissions from vessel maneuvering in port areas"	√		√	√	√	(Tai and Chang 2022)
"Vulnerability of coastal areas due to infrastructure: The case of Valencia port (Spain)"			√			(Chapapría and Peris 2021)
Creating innovation in achieving sustainability: Halal-friendly sustainable port	√		√		√	(Jaafar et al. 2021)
"Value creation for sustainability in port: Perspectives of analysis and future research directions."	√		√	√	√	(De Martino 2021)
"The Sustainable Port Classification Framework for Enhancing the Port Coordination System"				√		(Othman et al. 2019)
"Gender equality for sustainability in ports: Developing a framework"	√			√		(Barreiro-Gen et al. 2021)
"Small and medium-sized ports in the ten-t network and nexus of Europe's twin transition: The way towards sustainable and digital port service ecosystems"	√		√	√	√	(Gerlitz and Meyer 2021)
"Sustainable port management in Kuwait: Shuwaikh port system"	√		√			(AlRukaibi et al. 2020)
"Role of sustainability in global seaports"	√		√	√	√	(Hossain et al. 2021)
"Sustainable port-hinterland intermodal development: Opportunities and challenges for China and India"	√				√	(Gu et al. 2020)
"The method to decrease emissions from ships in port areas"	√		√			(Paulauskas et al. 2020)
"Seaports as nodal points of circular supply chains: Opportunities and challenges for secondary ports"	√	√	√	√		(Mańkowska et al. 2020)
"Sustainability assessment of the tanjung priok port cluster"			√	√	√	(Moeis et al. 2020)
"Integration of eco-centric views of sustainability in port planning"			√			(Wu et al. 2020)
"Selective adoption: How port authorities in Europe and West Africa engage with the globalizing "green port" idea"	√		√		√	(Lawer et al. 2019)
"Reviewing tools and technologies for sustainable ports: Does research enable decision making in ports?"			√			(Bjerkan and Seter 2019)
"Key performance indicators of sustainable port: Case study of the eastern economic corridor in Thailand"			√		√	(Muangpan and Suthiwartnarueput 2019)
"Framing stakeholder involvement in sustainable port planning"	√					(Ignaccolo et al. 2018)
"Challenges for European Tourist-City-Ports: Strategies for a Sustainable Coexistence in the Cruise Post-COVID Context"	√		√	√		(Andrade et al. 2021)
"Environmental analysis of the use of liquefied natural gas in maritime transport within the port environment"			√			(Gil-Lopez and Verdu-Vazquez 2021)
"Collection of waste from passenger ships and its impact on the functioning of tourist port city Swinouj'scie"	√		√	√		(Łapko et al. 2021)
"Proposed hybrid power system for short route ferries"			√		√	(Yehia et al. 2020)
"A sustainable framework for the analysis of port systems"	√		√	√		(Ignaccolo et al. 2020)
"New opportunities for cruise tourism: The case of Italian historic towns"	√		√	√	√	(Mangano and Ugolini 2020)
"Cruise tourism for sustainability: An exploration of value chain in Shenzhen Shekou Port"	√			√	√	(Liu et al. 2020)
"Port's role as a determinant of cruise destination socio economic sustainability"	√		√		√	(Santos et al. 2019)
"Cruise Passengers' Intention and Sustainable Management of Cruise Destinations"	√	√				(Fernández Gámez et al. 2019)
"The Antwerp marketplace for mobility: Partnering with private mobility service providers as a strategy to keep the region accessible"	√		√	√		(Kishchenko et al. 2019)
"Cruise industry in the Baltic Sea Region, the challenges for ports in the context of sustainable logistics and ecological aspects"		√	√	√		(Urbanyi-Popiołek 2019)
"Addressing the passenger transport and accessibility enablers for sustainable development"			√	√		(Sakib et al. 2018)
"Enhancing sustainable mobility: A business model for the Port of Volos"				√	√	(Manginas et al. 2017)
"Cruise Industry in the City of Gdynia, the Implications for Sustainable Logistic Services and Spatial Development"	√		√		√	(Urbanyi-Popiołek 2014)
"Towards Sustainable ASEAN Port Development: Challenges and Opportunities for Vietnamese Ports"	√		√	√	√	(Roh et al. 2016)
"Sustainable port cities with coupling coordination and environmental efficiency"	√		√		√	(Kong and Liu 2021)
"Sustainable Development Model for Nautical Tourism Ports"	√		√	√	√	(Jugović et al. 2011)
This study	√	√	√	√	√	

Note: Stakeholder Perspective (SP); Learning and Growth Perspective (LGP); Environment Perspective (EP); Internal Process Perspective (INP); Financial Perspective (FP).

To fill the academic gap, this research presents the SBSCP model, which is expected to support port development for sustainable tourism taking into all relevant perspectives. This article is structured as follows: the Section 1 introduces a literature review which is necessary for the formulation of our hypotheses. Section 2 describes the methodology, and then, Section 3 presents the results of the analysis. Section 4 discusses the management of the SBSCP and, finally, Section 5 summarizes the findings and mentions some limitations and prospectives for future work.

2. Research Methodology

2.1. Index of Item–Objective Congruence ("IOC")

To assess the alignment between the content and the objectives, the experts were asked to evaluate whether the questions accurately reflected the desired objectives. This method calculated the IOC by having a minimum of three experts score each item as follows: +1 if the question was aligned with the objective; 0 if the expert was unsure whether the question aligned with the objective; and −1 if the question did not align with the objective. After evaluating all questions, the IOC value was calculated by dividing the total scores by the number of experts. The acceptable IOC value ranged between 0.5 and 1.0. The questions with an IOC value below 0.5 were reconsidered or removed. In this study, all questions were found to have an IOC value ranging from 0.67 to 1.00 as defined by (Ansari and Khan 2023; Rovinelli and Hambleton 1977; Ismail and Zubairi 2021), through the assessment of the factors influencing activities related to SBSCP as shown in Table A1.

2.2. Structural Equation Model ("SEM")

The SEM analysis tests the construct's validity and performs confirmatory factor analysis of latent variables and assesses model fit with statistical data through exploratory factor analysis. The model fit can be assessed through the Absolute Fit Indexes, including CMIN/DF, RMSEA, GFI, AGFI and RMR, and the Incremental Fit Indexes, including NFI, TLI, CFI and IFI, to test the research hypotheses with the questionnaire. The data for the analysis were collected from a sample of government agencies, entrepreneurs and stakeholders using snowball sampling with a minimum sample size of 400, and was then analyzed using the AMOS program.

Next, model validity and reliability were assessed with the acceptable composite reliability ("C.R.") value with a minimum of 0.7. The convergent validity was checked by average variance extracted ("AVE"), which should not be less than 0.5. On the other hand, discriminant validity that assesses the unrelatedness of observed variables and latent variables was considered when AVE was greater than the maximum shared variance ("MSV"). Then, Cronbach's alpha, which is used to measure internal consistency by SPSS, was observed with the acceptable value over 0.7. Altogether, these results indicate a high level of reliability (Joseph et al. 2010).

3. Data Analysis and Results

3.1. Exploratory Factor Analysis ("EFA")

The use of EFA to assess the SBSCP revealed a Kaiser–Meyer–Olkin ("KMO") measure of 0.840, indicating that the data are suitable for factor analysis. Moreover, the Bartlett's Test of Sphericity showed a value of 0.000, confirming that the variables are interrelated for factor analysis. The factor analysis was then conducted with principal component analysis ("PCA") with a Promax rotation (Kassab et al. 2014) applied to all 15 variables. The results showed that all of the data are appropriate for grouping with the acceptable communalities above 1. The cumulative variance could also be explained by the presence of components with Eigenvalues greater than 1. The factor loading analysis was in line with the previous test with a value greater than 0.5, implying that the 15 factors can be categorized into the five perspectives, as shown in Table 2.

Table 2. CFA Factor Loading Statistics.

The Standardized Factor Loading (l_i)						Hypothesis Testing			
Factor	**LGP**	**SP**	**EP**	**INP**	**FP**	**Estimate**	**S.E.**	**C.r.**	***p***
LGP1	0.982					0.885	0.041	21.515	***
LGP2	0.900					1.132	0.052	21.515	***
SP1		0.639				1.628	0.199	7.337	***
SP2		0.684				0.872	0.050	17.507	***
SP3		0.934				0.614	0.075	8.178	***
SP4		0.860				0.70	0.047	14.903	***
EP1			0.929			1.098	0.080	13.731	***
EP2			0.772			0.911	0.066	13.731	***
EP3			0.922			0.974	0.063	15.460	***
INP1				0.884		1.293	0.154	8.401	***
INP2				0.857		0.863	0.124	6.969	***
INP3				0.885		0.773	0.092	8.401	***
INP4				0.587		1.128	0.133	8.464	***
FP1					0.871	0.810	0.087	9.322	***
FP2					0.955	1.235	0.132	9.322	***

Notes: standard error (S.E.); critical ratio (C.r.); unstandardized. $p < 0.001$ for all coefficients (***); SP: stakeholder perspective; LGP: learning and growth perspective; EP: environment perspective; INP: internal process perspective; FP: financial perspective.

3.2. Confirmatory Factor Analysis ("CFA")

The use of CFA of the SBSCP confirmed the structural relationships of the observed variables with latent variables related to the learning and growth perspective (LGP1-LGP2), the stakeholder perspective (SP1-SP4), the environmental perspective (EP1-EP3), the internal process perspective (INP1-INP4) and the financial perspective (FP1-FP2). The results aligned with the empirical data, as shown in Figure 1. In addition, the test for model fit revealed two points: First, the absolute fit index, including CMIN/DF of 1.793 (where a value not exceeding three indicates a good fit), which showed that the model fits well with the statistical data. Moreover, other values such as an RMSEA of 0.045 (where a value not exceeding 0.05 indicates a good fit), a GFI of 0.985 (where a value not less than 0.95 indicates a good fit), an AGFI of 0.931 (where the value not less than 0.90 indicates a good fit) and an RMR of 0.017 (a value closer to 0 is preferred to indicate a good fit) showed that the absolute fit index was at a good level. Second, the incremental fit index, including an NFI of 0.987 (where a value not less than 0.95 indicates good fit), a TLI of 0.977 (where a value not less than 0.95 indicates good fit), a CFI of 0.994 and an IFI of 0.994 (where a value not less than 0.90 indicates good fit) showed that the model fits well with the statistical data. Even though the *p*-value for the Chi-square test was 0.000, it was considered to be statistically insignificant due to the fact that the Chi-square value is dependent on sample size. As the Chi-square value increases in a large sample size, it is deemed to be inappropriate for indicating model fit. Therefore, Bollen's suggestion (Heebkhoksung et al. 2023) of examining a CMIN/DF less than three instead of the Chi-square value was used to test the model fit as shown in Table 3.

The validity of the research instrument developed for the data collected in this study, was assessed by C.R., with an acceptable C.R. value of no less than 0.70 being considered as a factor that indicates that there is a good internal consistency within questions or indicators. Convergent validity could also be assessed using AVE, which should not be less than 0.50 and the Cronbach's alpha should not be lower than 0.7, as shown in Table 4 and the structural model depicted in Figure 1.

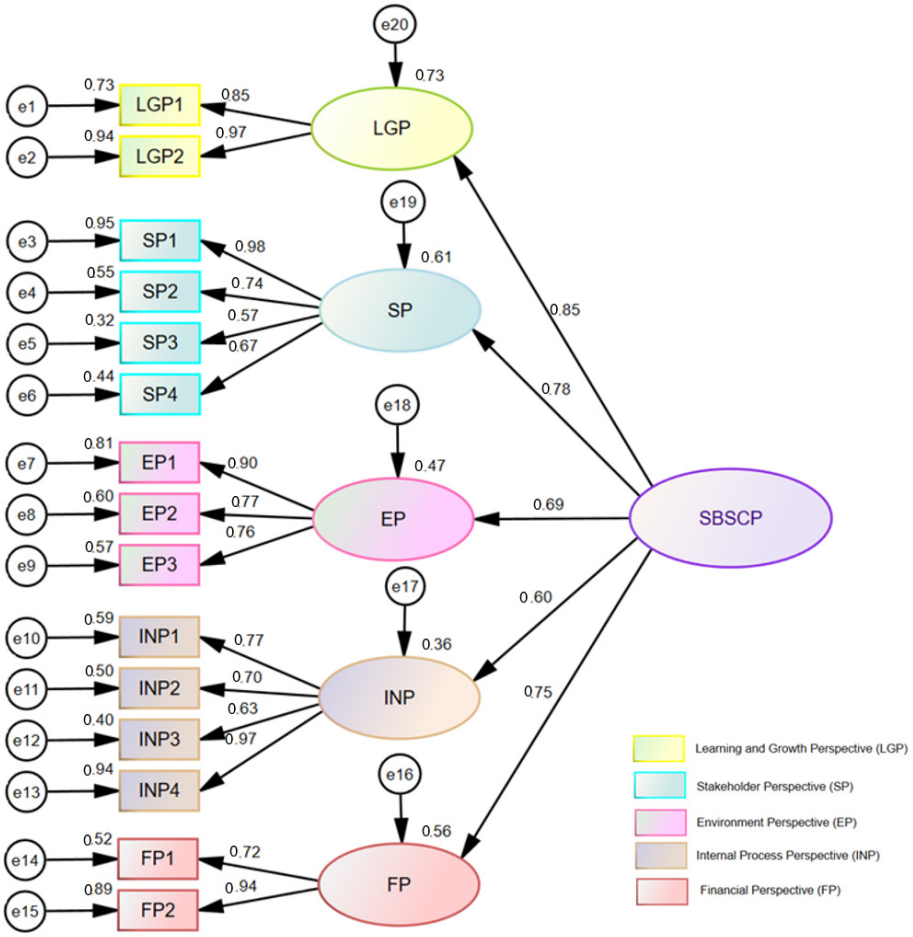

Figure 1. Structural model of SBSCP.

Table 3. Structural model index.

Index	Acceptance Criteria	Good	Estimated Value
CMIN/DF	≤5.0	≤3.0	1.793
RMSEA	≥0.05–0.08	≤0.05	0.045
GFI	≥0.90	≥0.95	0.985
AGFI	-	≥0.90	0.931
RMR	Close to 0		0.017

The tests on the structural equation model of the proposed Sustainability Balanced Scorecard for Ports model were conducted under the following hypothesis:

H1. *The proposed model for supply chain management of a port for sustainable tourism aligns with empirical data (accepted) due to the overall model fit. If all factors have components that align with the empirical data shown in Table 4, H1 is accepted.*

The discriminant validity of the observed variables found that the observed variables can be clearly distinguished from other latent variables when the AVE value is greater than MSV and the *p*-value indicates intercorrelations between all perspectives. As a result, all hypotheses are accepted, as shown in Table 5. The interrelations among the five perspectives are illustrated in Figure 2.

Table 4. The validity and reliability of the SBSCP.

Dimension		Factor	l_i	l_i^2	e_i	C.R.	AVE.	Cronbach's α
SBSCP	→	LGP	0.85	0.72	0.28	0.86 *	0.55 *	0.901 *
	→	SP	0.78	0.61	0.39			
	→	EP	0.69	0.48	0.52			
	→	INP	0.60	0.36	0.64			
	→	FP	0.75	0.56	0.44			
LGP	→	LGP1	0.85	0.72	0.28	0.91 *	0.83 *	0.907 *
	→	LGP2	0.97	0.94	0.06			
SP	→	SP1	0.98	0.96	0.04	0.84 *	0.57 *	0.863 *
	→	SP2	0.74	0.55	0.45			
	→	SP3	0.57	0.32	0.68			
	→	SP4	0.67	0.45	0.55			
EP	→	EP1	0.90	0.81	0.19	0.85 *	0.66 *	0.846 *
	→	EP2	0.77	0.59	0.41			
	→	EP3	0.76	0.58	0.42			
INP	→	INP1	0.77	0.59	0.41	0.86 *	0.61 *	0.848 *
	→	INP2	0.70	0.49	0.51			
	→	INP3	0.63	0.40	0.60			
	→	INP4	0.97	0.94	0.06			
FP	→	FP1	0.72	0.52	0.48	0.82 *	0.70 *	0.817 *
	→	FP2	0.94	0.88	012			

Note: the standardized factor loading (l_i); variance (l_i^2); the error variance (e_i); composite reliability (C.R.); average variance extracted (AVE); acceptable (*).

Table 5. The SBSCP validity test of the interrelated dimensions.

Relation between Dimensions			Cor.	MSV	S.E.	C.r.	p
LGP	↔	SP	0.68	0.46	0.036	11.088	***
LGP	↔	EP	0.49	0.24	0.033	8.326	***
LGP	↔	INP	0.46	0.21	0.034	8.186	***
LGP	↔	FP	0.41	0.17	0.027	6.824	***
SP	↔	EP	0.51	0.26	0.033	8.627	***
SP	↔	INP	0.41	0.17	0.032	7.435	***
SP	↔	FP	0.40	0.16	0.025	6.826	***
EP	↔	INP	0.44	0.19	0.033	7.641	***
EP	↔	FP	0.56	0.31	0.027	8.486	***
INP	↔	FP	0.43	0.18	0.026	7.255	***

Notes: correlations (Cor.); maximum shared variance (MSV); standard error (S.E.); critical ratio (C.r.); unstandardized. $p < 0.001$ for all significant coefficients (***).

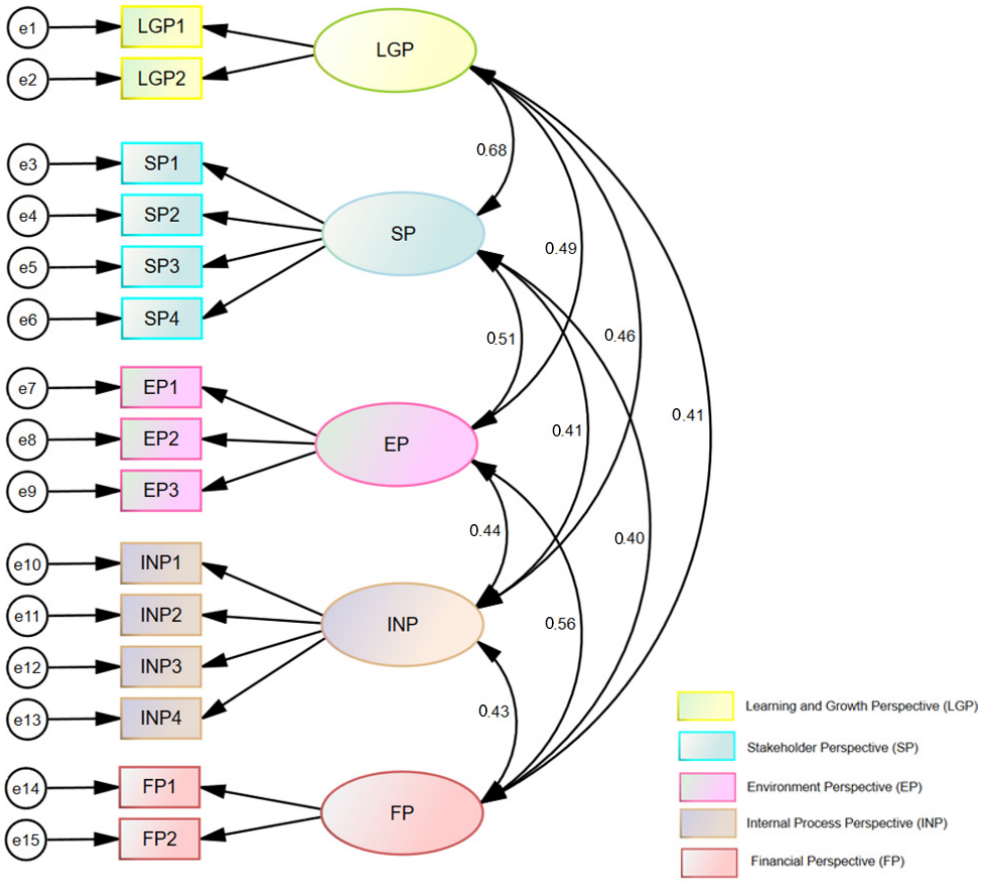

Figure 2. The interrelations among the five dimensions.

By testing the hypotheses related to the relationships between each perspective, the author was able to confirm the hypotheses shown in Table 6.

Table 6. Status of hypotheses.

No	Hypothesis	Status
H2	The learning and growth perspective correlates with the stakeholder perspective	Accepted
H3	The learning and growth perspective correlates with the environment perspective	Accepted
H4	The learning and growth perspective correlates with the internal process perspective	Accepted
H5	The learning and growth perspective correlates with the financial perspective	Accepted
H6	The stakeholder perspective correlates with the environment perspective	Accepted
H7	The stakeholder perspective correlates with the internal process perspective	Accepted
H8	The stakeholder perspective correlates with the financial perspective	Accepted
H9	The environment perspective correlates with the internal process perspective	Accepted
H10	The environment perspective correlates with the financial perspective	Accepted
H11	The internal process perspective correlates with the financial perspective	Accepted

The results indicate the acceptance of H1 through H11, which demonstrates that there are relationships and significant interrelations between each perspective (stakeholder perspective, learning and growth perspective, environment perspective, internal process perspective, financial perspective) in relation to the Sustainability Balanced Scorecard for Ports. The acceptance of the hypotheses clearly shows the importance of considering

sustainability along with other perspectives on the efficiency in the sustainable supply chain management of ports in tourism.

4. Discussion

This research presents a model that considers supply chain management in ports for sustainable tourism. Although previous research has not discussed the implementation of SBSC in the development of ports for tourism from all perspectives-the stakeholder perspective, the learning and growth perspective, the internal process perspective, the financial perspective, and the environment perspective this research incorporates views derived from both the expert consensus and the factor analysis. The model includes 56 indicators and 15 factors across five perspectives. The model fit, tested by SEM, shows that both the absolute fit index and the incremental fit index align with the empirical data. Subsequent validation and reliability checks confirm that the factors in all perspectives meet the preset criteria, and are in line with the expert consensus. The final step tested the hypotheses and found positive correlations among all five of the perspectives, indicating that a change in one perspective directly affects the others.

This study serves as a valuable resource for stakeholders by clarifying complex issues within supply chain management for ports involved in sustainable tourism through a detailed examination of influential factors, offering details not shown in existing research. The insights gained from this study can be used to adjust indicators to address the specific needs of an organization to prioritize the areas for improvement and strategies for supply chain management in ports for sustainable tourism. The findings from the five perspectives in the SBSC can promote efficient and eco-friendly operations as well as social responsibility in tourism. With projects and activities involving communities, an ecosystem will be formed, leading to technological development and innovation in port management to increase efficiency and reduce the impacts of sustainable tourism on the environment

5. Conclusions

Supply chain management for ports involved in sustainable tourism benefits both the public and private sectors as it builds opportunities for business growth due to the increase in the number of tourists in the area. This action generates income and creates valuable jobs for the state and local communities, not only in tourism but in related activities such as restaurants, accommodation and others, leading to an increase in tax revenue. Moreover, it enhances a positive image of the country or the area by adding value and attractiveness to the market, utilizing eco-friendly technology and supporting projects that benefit the local environment. Supply chain management in ports for the sake of sustainable tourism has a significant impact on promoting growth in both the public and private sectors. The results of the study are as follows:

First, supply chain management of ports for sustainable tourism greatly impacts the environmental perspective, which consists of three factors and eleven indicators, as port development for sustainable tourism may affect coastal communities and impose risks on the local environment. The effect includes waste disposal and pollution emissions in the nearby location as well as the destruction of coastal forests which affects biodiversity. Also, marine trash and pollution impacts marine life while the emission of greenhouse gases (CO_2) negatively affects climate and air quality in the area. As port management to reduce pollution can be a critical tool in controlling environmental impacts, there should be practices such as strict regulations for waste and pollution management as well as promotional plans for the implementation of new technology. The promotion plans include emission reduction and initiatives to increases collaboration among stakeholders such as local authorities, the private sector and communities to manage port tourism sustainably.

Second, from the financial perspective, which consists of two factors and eight indicators, supply chain management of ports for sustainable tourism generates higher income for tourism business. While the private sector, such as restaurants, related services and local communities, generates revenue, the public sector can also collect more taxes. Therefore,

sustainable management projects create a good image for the area and increase financial stability, attracting more investment opportunities and increasing the value of properties which may lead to further development and a better quality of the community's livelihood. This relationship can be applied in policy drafting to increase the capacity for the development of the local community by promoting tourism businesses and increasing the capacity for community management. As a result, sustainable management in tourism generates revenue and adds value to the private sector and communities in the long term.

Third, supply chain management of ports for sustainable tourism impacts the learning and growth perspective, which consists of two factors and six indicators. It creates opportunities for personnels in both the public and private sector to learn and develop related skills, enables them to work in the industry and offers education and training opportunities that increase their potential and capabilities. Moreover, the management of ports fosters a culture that focuses on supporting learning and growth for effective and sustainable organizations in the future, encouraging creativity and promoting problem-solving attitudes. As the perspective accommodates environmental challenges, aids the development of eco-friendly technology and manages tourism-related risks, knowledge and experience sharing should be promoted. Practically speaking, spaces for learning and skill development, such online and offline learning communities, increasing employee readiness and training employees un risk management in relation to disasters, should be provided.

Fourth, supply chain management in ports for sustainable tourism impacts the internal process perspective, consisting of four factors and sixteen indicators. The improvement of internal process improvement often starts with enhancing operational efficiency and feasibility with the improvement of the ship entry and exit process, management of port areas and collaboration with local authorities for port management. The management of human resources, finance and facilities helps to reduce costs and increase operational efficiency in parallel with monitoring and analysis to evaluate the effectiveness of such measures against the objectives of improving the processes involved in in port operations. Hence, continuous improvement of internal processes such as the implementation of an automated system and the identification of opportunities for further improvement based on data analysis should be promoted.

Lastly, supply chain management in ports used for sustainable tourism impacts the stakeholder perspective, consisting of four factors fifteen indicators. From the perspective of tourists and consumers, reliable and effective port management fulfills their expectations, increasing satisfaction and confidence in revisitation. It increases business opportunities and generates income for local businesses and the tourism industry such as hotels, restaurants, tour companies and other products or services. For the local community, it leads to employment opportunities and the creation of businesses in the area. At the same time, efficient and sustainable management also benefits the public sector by increasing tax revenue and promoting the effective allocation of shared community spaces. As a result, sustainable tourism should be promoted with excellent levels of facilities and services on accommodation with the presentation of interesting activities and local wisdoms from a cultural perspective.

In conclusion, the impacts of port development for sustainable tourism focus on promoting sustainability and cooperation both regionally and internationally for the development of a sustainable and efficient tourism industry. It does not only focus on short-term development but incorporates long-term planning and management with a focus on deploying sustainable and effective methods of studying and analyzing data to improve work plans in the future.

Limitations and Future Research Directions

While this research provides significant insights into supply chain management for ports involved in sustainable tourism, it still contains certain limitations.

First, the findings of this study are primarily based on the stakeholders in Thailand, limiting the generalizability of the study due to the unique context in operation. Future research efforts should aim to explore supply chain management in ports for sustainable tourism in other countries for a more comprehensive understanding.

Second, the use of the snowball sampling method in the sample selection introduces limitations in controlling demographics. Future research should specify population data and the expected sample group compositions to maintain research integrity.

Finally, future research should possibly aim to incorporate broader perspectives to enhance our understanding of supply chain management in ports for the sake of sustainable tourism from a more comprehensive standpoint.

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Appendix A

Table A1. Questionnaires.

Perspective	Factor		Indicators	
Internal Process Perspective	INP1	Tourism Port Policy	1.	Strategic planning and operational strategies as a framework for port development in tourism;
			2.	Revision and improvement of regulations and laws;
			3.	Policies for supply chain management;
			4.	Establishment of networks, coordination and operational standards to manage port capacity for users.
	INP2	Control, Monitoring, and Evaluation	5.	Establishment of standards for operational and service excellence;
			6.	Monitoring and evaluation of organizational performance (KPIs);
			7.	Plans for continuous correction, improvement and development;
			8.	Research and innovation;
			9.	Evaluation and adjustment of tourist demands to current situations.
	INP3	Infrastructure and Facilities	10.	Enhancement and provision of facilities for all tourists, including specific groups like the disabled and elderly, to meet national standards;
			11.	Readiness and sufficiency of qualified public transportation services;
			12.	Improvement in efficiency and convenience of transportation to integrate routes in tourism;
			13.	Diversification of products and goods for adding value.
	INP4	Safety	14.	Preventive measures for accidents and tourist assistance;
			15.	Risk assessment and mitigation plan for cruise ports;
			16.	Study and compilation of safety practices (e.g., ISPS) to establish safety policy.
Stakeholders Perspective	SP1	Quality of Onshore Facilities	17.	Elevation of the quality of accommodation to cater for cruise tourists.
			18.	Improvement of onshore facilities such as currency exchange shops.
			19.	Standards for hygiene in food preparation and cooking as well as service techniques.

Table A1. *Cont.*

Perspective	Factor		Indicators	
	SP2	Mechanisms and Tourism Partnerships	20.	Annual meeting to present, consult and solve the issues arising from cruise tourism with supply chain members;
			21.	Cooperation with shipping lines to develop cruise routes and onshore tourism products;
			22.	Collaboration with marketing networks to promote tourism both inside and outside the port;
			23.	Participation of supply chain members in information sharing and decision-making in relation to the port.
	SP3	Online Media, Branding, and Tourist Engagement	24.	Utilization of online media for advertising and public relations targeted at cruise tourism;
			25.	Improvement of accurate and timely information and news;
			26.	Tourist satisfaction survey;
			27.	Analysis of customer data for the development of tourist attractions.
	SP4	Collaboration with International Tourism Organization	28.	Establishment of partnerships across countries to develop tourist routes, building international logistics networks for shipping;
			29.	Cross-country cooperation in marketing and publicity;
			30.	Cross-country cooperation in developing service quality standards;
			31.	Establishment of networks for cruise tourism development to bargain negotiation power with shipping lines.
Financial Perspective	FP1	Investment Budget	32.	Comprehensive budgets for investment.
			33.	Evaluation and revision of annual budgets.
			34.	Expense control to align with the budget.
	FP2	Investment Risks	35.	Criteria for suitable budget allocations.
			36.	Risk management plans, risk assessment and implementation.
			37.	Implementation of plan with continuous records.
			38.	Risk prevention strategies with stakeholders in supply chain.
			39.	Investment in research to mitigate investment risks.
Learning and Growth Perspective	LGP1	Skills, Knowledge, and Potential of Service Providers	40.	Development of training programs and basic skills for cruise tourism service providers.
			41.	Training for service personnel and stakeholders to enhance skills and capabilities.
			42.	Awareness raising in professional skill and promotion the compliance with standards in cruise tourism.
	LGP2	Skills, Knowledge, and Potential of Relevant Agencies	43.	Knowledge exchange between institutions and supply chain members;
			44.	Education of communities;
			45.	Development and training for agency personnel in various areas.
Environment Perspective	EP1	Environmental Management	46.	Sustainability reports such as environmental impact analyses and environmental risk analyses;
			47.	Controls and mechanisms for oil spills;
			48.	Monitoring of air quality (SO_2, NO_2, PM 2.5, etc.) and reduction in gas emissions;
			49.	Monitor and inspection of water quality and aquatic environments;
			50.	Noise monitor and controls.
	EP2	Operations on Environmental Responsibility	51.	Renewable energy such as wind and solar;
			52.	Eco-friendly and energy-saving technologies or the use of alternative energy.
			53.	Installation of devices to reduce pollution and waste (e.g., disposals).
	EP3	Environmental Cooperation	54.	Collaboration with stakeholders in eco-design.
			55.	Cooperation for cleaner production such as port design to reduce energy usage.
			56.	Response from related agencies to ecological system- related suggestions from stakeholders.

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