The key factors for the application of blockchain into ocean Freight Forwarders.: An Industry Perspective

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Abstract

Blockchain is an emergent technology concept that enables the decentralized and immutable storage of verified data and is often considered to be applied to help the maritime industry to manage innovation. This study subdivided the four dimensions into 20 appropriate evaluation indicators. The indicators of key factors based on the results are as follows: 1. 「The application of blockchain will reduce intermediary costs and increase revenue when switching transportation vehicles.」 2. 「Using blockchain will save a lot of manpower and correspondence in the traditional model, and build trust, and fully secure information.」 Ocean freight forwarders can explore the standard service model as a reference to build competitive advantages and ensure sustainable business decisions.

Keywords: Blockchain, Ocean Freight Forwarders, AHP

1. Introduction

The economy of Taiwan is oriented mainly towards import and export trade. Taiwan has achieved good results in the global shipping industry due to the utilization of government resources in cooperation with private enterprises. According to Taiwan's Ministry of Finance and WTO, Taiwan's total trade value in 2020 ranked 17th in the world, and in terms of export and import value, it ranks 15th and 18th, respectively. Whether these import and export trades can effectively achieve international distribution tasks is mainly achieved through Ocean Freight Forwarder－the main shipping assistants of container carriers. In the 21st century, the transportation industry has gradually set off a wave of electronized, mobilized and ubiquitous industrial revolutions to promote smart transportation systems. The non-temperable, traceable, and decentralized features of the blockchain have also begun to receive extensive attention from the international shipping industry. However, the development of blockchain in shipping is still in its infancy. There is no news about the development of the ocean freight forwarders to blockchain[1]. Currently, in the face of high competition and uncertainty in the post-epidemic era, if the use of blockchain can be introduced to enhance the convenience, loyalty and satisfaction of cargo owners in the orientation of profit and high technology can be applied to enhance competitiveness and move towards the era of knowledge economy, continuous support from the shipper can be obtained, which will improve the operating performance, investment profits, and

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sustainable development of the enterprise in the ocean freight forwarder industry[2]. Since the blockchain is a key factor for the future trend of the ocean freight forwarder industry to save costs and increase convenience, the SAVE marketing structure is used as the main aspect of this study. According to the basic characteristics of the ocean freight forwarder industry and the relevant elements of the blockchain, 20 suitable evaluation indicators are constructed to prepare expert questionnaires. The results of this study will be used as a reference for the ocean freight forwarder industry to improve the direction of future blockchain applications and to find out the key factors for success to plan the future introduction of management strategies.

2. Literature Review

2.1 *Blockchain*

Even though the development of blockchain technology has existed for a long time, there is very little research on the use of blockchain in transportation and supply chain fields. Blockchain technology is likely to change the operation of the logistics and supply chain industries and improve business models to provide more reliable and convenient services to the transportation industry[3]. Blockchain has the following characteristics namely: 1. Decentralization, 2. Openness, 3. Independence, 4. Security, and 5. anonymity. These experiences enable shipping companies to introduce blockchain in transportation services, which will effectively improve operational efficiency and transaction security and promote the competitiveness of shipping companies in the digital age[4].

2.2 *SAVE Model of Marketing Architecture*

In the modern transportation market, there are many types of business to business (B2B) transactions. Since McCarthy founded the 4Ps (product, price, promotion, and place) marketing theory[5], scholars at home and abroad have since been based on this.

Table 1. The evaluation aspects and references of the key factors affecting the use of blockchain in the ocean freight forwarder industry.

Dimensions	No.	Indicators
SOLUTIONS	A1	It can prevent counterfeiting of bills of lading and solve the problem of counterfeiting during the transfer bills of lading.
	A2	Blockchain technology can be used as the guarantee of credit for both sides of international trade transactions.
	A3	The transparency and unforgeability of blockchain records will lead to trust in the context of decentralization.
	A4	The encryption and decryption mechanism by using blockchain technology can protect information security and privacy, which can effectively reduce theft or mistaking of goods.
	A5	Integrating the exchange of information between supply chain participants can save time and simplify paperwork related to cross-border international trade processes.
ACCESS	B1	Participants in the supply chain can quickly track and understand the current status of goods conveniently in real time.
	B2	By using blockchain traceability technology, participants can realize cross-border union into shared trust under the influence of smart contracts.
	B3	Customers can instantly and conveniently inquire logistics-related costs, freight prices and integrated quotation services.
	B4	Customers can immediately and conveniently understand the full-stage logistics arrangement, which is known as intermodal service, and let the participants in the supply chain know the current status at any time.
	B5	Customers can keep abreast of the current shipping space status and container information, which is convenient for participants to dispatch and respond to the dispatching needs of transportation vehicles at any time.
VALUE	C1	The application of blockchain will reduce intermediary costs and increase revenue when switching transportation vehicles.
	C2	It can be more efficient and reliable to make cargo transportation safer and more professional.
	C3	C3 Blockchain technology tracking can improve the efficiency of customer logistics, thereby attracting customers to use the company's service and creating service differentiation.
	C4	The success of invoking blockchain technology will attract customer support and greater confidence in the company's goodwill and financial position.
	C4	Using blockchain will save a lot of manpower and correspondence in the traditional model, build trust, and fully secure information.
EDUCATIONS	D1	Blockchain can provide customers with relevant market business information on time.
	D2	Blockchain can automatically update the special cases and solutions in the transportation process for customers' reference.
	D3	The introduction of blockchain enables employees to respond quickly to customer needs for improvement.
	D4	Blockchain makes the continuing professional education, training of operators, and sales easier.
	D5	Blockchain makes it easier to share international trade customs regulations and maritime knowledge online.

With the rise of the Internet, the use of Internet information and multimedia functions to provide a large number of opportunities for exposure has also begun to change the way of marketing. In response to market changes, Ettenson et al. proposed a SAVE (solution, access, value, and education) marketing architecture based on past marketing theories. From SAVE's solutions to education, everything is customer-centric, which is lacking in McCarthy's 4Ps. The SAVE marketing model is not only customer-centric, but all customers can work together to achieve their goals[6]. This concept just coincides with all participants in the blockchain. Through decentralized accounting and storage, each node achieves self-verification, transmission and management of information in a concerted manner.

The ocean freight forwarder industry has five important functions for cargo owners, including consultation, cost reduction, time saving, convenient transportation and improvement of product competitiveness, which indicates that the ocean freight forwarder industry is in the position of guiding, providing consulting services and arranging and coordinating processing during the transportation process[7]. Finally, in this article, the successful elements of the blockchain introduced into the ocean freight forwarder industry are summarized as solution, access, value, and education. The SAVE model almost includes all the success factors required in the current business model. The better the performance of these four dimensions, the better the relationship between the company and its customers will be established. Combining the SAVE architecture of solutions, market access, professional value and education proposed by Ettenson et al., in accordance with the evaluation objectives, dimensions and criteria, an evaluation framework for the influencing factors of the ocean freight forwarder industry to choose the import of the blockchain has been constructed, as shown in Table 1.

3. Research Methods

As a decision-making method systematizing complex problems, AHP decomposes complex problems into dimensions and factors and concludes the weights of all factors after integrating experts' opinions. AHP is mostly used in uncertain situations and multi-attribute decision-making problems.[8]: In evaluating the decision maker's judgment or measuring the overall hierarchical structure, Saaty suggested that the consistency ratio shall not be greater than 0.1 to ensure consistency. [9]

In this study, the hierarchical structure is constructed by the analytic hierarchy process, the questionnaire of "The key factors for the application of blockchain into ocean Freight Forwarders.: An Industry Perspective" is designed, a pairwise comparison matrix is adopted to analyze hierarchical factors such as effects and evaluation indicators, and a quantitative evaluation scale is used (1 to 9 scores). Furthermore, the weights of evaluation criteria are pairwisely compared on a scale from 1 to 9. As pairwise comparison is one of the most effective methods in making judgments, this study establishes a pairwise comparison matrix and calculates the eigenvalue and eigenvector. Finally, the consistency test is carried out with the maximum eigenvalue to obtain the relative weights of the evaluation criteria.

After questionnaires are collected, "Expert Choice11" is applied to calculate the weights and the relevance of layers and indicators. In addition, a consistency test is carried out to select valid samples with CR $\leqq$ 0.1, and then the weights of valid samples are sorted and analyzed. A consistency test must be carried out for the weights of indicators to ensure that the respondents think the same way before and after the pairwise comparison. Then, the weights of indicators in layers are calculated according to the results to identify the key factors for the application of blockchain into ocean Freight Forwarders.

4. Empirical Analysis

The AHP questionnaire consists of 3 parts: the first part includes the basic data of respondents, including title, job seniority and company and department; the second part includes answer examples and descriptions of dimensions and criteria; while the third part evaluates the relative importance of the key factors for the application of blockchain into ocean Freight Forwarders.

In this study, questionnaires are issued to managers who have decision-making rights and management from top companies in the ocean freight forwarding industry, based on Taiwan's top 500 service companies recorded by Common Wealth Magazine. Particularly, the key factors for the application of blockchain into ocean Freight Forwarders. are explored from the perspective of large or well-known ocean freight forwarders in Taiwan. In this study, a total of 9 questionnaires are issued, 8 are collected, 8 are valid, and respondents of valid questionnaires meet the standard consistency ratio, that is, not greater than 0.1. They have at least 15 years of experience in the shipping industry, and most of them are managers with more than 20 years of experience. According to the results calculated by "Expert Choice

11", the weights of dimensions of service quality are as follows: (1) the weight of "SOLUTIONS" is 0.346, (2) the weight of "ACCESS" is 0.176, (3) the weight of "VALUE" is 0.397, (4) the weight of "EDUCATIONS" is 0.081. Among them, "VALUE" is the most important, while "EDUCATIONS" is the least important. A C.I. of 0.02<0.1 indicates that it passes the consistency test, indicates that the matrix consistency is satisfactory.

It will be evaluated according to four system quality dimensions. From the experimental results, we can see the importance of the major dimensions. Overall, experts attach great importance is the application of blockchain will reduce intermediary costs and increase revenue when switching transportation vehicles and using blockchain will save a lot of manpower and correspondence in the traditional model, and build trust, and fully secure information.

5.   Conclusion

In this study, indicators are mainly obtained from the judgment on the weights of applicable indicators by "AHP", the four dimensions of SAVE marketing are developed through research to construct the key factors for the application of blockchain into ocean Freight Forwarders, while the weights of all measurement factors are ranked. The process of this study is as follows:

(1) The last 20 appropriate measurement factors are developed by literature review and expert interviews.

(2) In this paper, AHP is used to demonstrate that the top 2 factors with the largest weights are 1. 「The application of blockchain will reduce intermediary costs and increase revenue when switching transportation vehicles.」 2. 「Using blockchain will save a lot of manpower and correspondence in the traditional model, and build trust, and fully secure information.」 The suggestions can build and enhance their own value and resources, actively strengthen service quality and core competitiveness, so as to improve customer support and satisfaction, and achieve sustainable corporate business.

References

1. T.-C. Ho, C.-L. Hsu. An Analysis of Analysis of Key Factors Influencing Integration of Blockchanin into Shipping Companies in Taiwan. *Journal of Marine Science and Technology,* **28**(4), 2020, pp. 229-236.
2. H.-Lin, C.-C Chung, C.-H Huang. Benfits of Applying Blockchain Technology to Maritime Container Transportation Operations. *Journal of Marine Technology*, **4**, 2020, pp. 27-40.
3. J.-L. Zhao, S.-K. Fan, J. Yan. Overview of business innovations and research opportunities in blockchain and introduction to the special issue. *Financ Innov*, **28**(2) 2016, pp. 1-7.
4. H.-L. Tsai, T-R, Lin, C.-C., Chang. The Application of Innovative Technologies in Shipping and Port Operations. *Maritime Quarterly,***28**(2) ,2019 pp. 75–96.
5. McCarthy, E. J., Basic Marketing: A Managerial Approach, Homewood, Illinois, 1960.
6. Ettenson, Richard, E. Conrado, J. Knowles, Rethinking the 4Ps, Harvard Business Review, January-February 2013.
7. J.-P. Zeng, L.-Z. Liao, Theory and Practice of Ocean Freight Forwarding, Wunan Culture Enterprise, Taipei. 2010.
8. G.-S. Liang, J.-F. Ding, S.-M. Wang, Quantitative Research Methods: Theory and Applications. 1th(ed), Kee-lung. 2021.
9. T. L. Saaty, The Analytic Hierarchy Process. McGraw-Hill, New York, 1980.
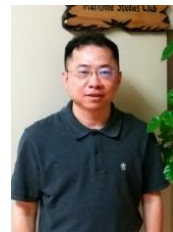
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