

Predicting the Factors of a Humanitarian Supply Chain in the Malaysian Context: A Study Using Partial Least Square (PLS)

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To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v11-i9/11342> DOI:10.6007/IJARBSS/v11-i9/11342

Published Date: 14 September 2021

Abstract

Natural disasters are unpredictable and often unavoidable, and many relief situations are poorly planned and unprepared. In the event of a natural disaster, the government and private agencies commit themselves to providing relief aid to victims. However, poor planning and weak organization results in inefficient use of relief supplies. Thus, this study focuses on predicting information and identifying communication methods which will enhance the efficiency of humanitarian aid in a manner which ensures that relief directly reaches victims of disasters and meets their needs. A survey was conducted among 170 people who were victims of the flooding in Kelantan. The resulting data was analysed through Partial Least Square (PLS). Results revealed that information was a significant factor towards the humanitarian aid supply chain, while cooperation and communication were indicated to be less significant. This study solidifies the premise that the delivery of information is vital to the government, private agencies and also the victims involved. Quick and accurate information ensures the efficient delivery of relief aid and also keeps victims up to date in the supply chain activities.

Introduction

Humanitarian aid distribution is usually important in cases where natural disasters trigger immense physical danger or severe damage to the environment (Wan Ahmad, & Abdurahman, 2015). Many forms of disaster are difficult to predict and this has consequences towards the delivery of relief aid. Malaysia is not exempt from such situations. In 2010, extreme flooding occurred in the country, affecting several states and impacting the socioeconomic conditions of those areas. The average rainfall throughout the nation is estimated to be 2,500mm annually, making Malaysia one of the countries to experience the heaviest rainfall levels in the (Khalid & Shafiai, 2015). The state of Kelantan is especially

vulnerable to devastating floods, with the disaster in question being the 7-day long flood from December 26, 2014, to January 2, 2015 (Wan Ahmad & Abdurahman, 2015). Eight of the ten territories within Kelantan were impacted by this flood, which was triggered by heavy rainfall at the end of December 2014. This flood disaster resulted in the widespread decimation of the livelihoods of many Kelantanese communities (Wan Ahmad & Abdurahman, 2015). Kelantan regularly experiences flooding, and the damage caused by these disasters can be enormous.

Humanitarian aid functions to support victims in the short-term aftermath of the disaster. Disaster recovery usually takes up several months. During this period, humanitarian aid from governments and private agencies are vital to the survival of victims. However, these efforts are complicated by poorly planned action and absence of preparation. Actions taken by these parties typically occur after the disaster due to insufficient policies outlining early disaster preparation guidelines. These issues have also highlighted the deficiencies in aid distribution stemming from lack of information reaching the victims prior to, during and following the disaster.

Due to this, victims are unable to access the help they need. Flood victims who are not able to obtain timely and precise information consequently have less opportunity to effectively contact relief teams and communicate with those outside the affected areas. According to Irrera (2018), points out how vulnerable populations are often neglected in disaster situations, and emphasises the importance of a non-biased and fair approach in humanitarian aid. Access to clear and unprejudiced information must be available to all victims involved. Additional, Irrera (2018), explains fairness as help provided with no separation. As such, the current study carries the objective of predicting how the factors of information and communication impact the efficiency and effectiveness of humanitarian aid delivery practice in Malaysia.

Literature Review

Supply chain management refers to the handling of a flow of materials, information and resources (Sundram et al., 2018; Sundram, Prem, & Bahrin, 2020) which travels upstream or downstream (Sundram, Chandran & Bhatti, 2016 ; Sundram, Rajagopal, Bahrin & Subramaniam, 2018) and which generates value reflected in the final product or service (Mangan, Lalwani & Butcher, 2010; Mkumbo et al., 2019; Ali, Rajagopal, Sundram, Saihani & Norane, 2020). The supply chain does not function only in a business context (Muhammad et al., 2020; Selvaraju, Beleya, & Sundram, 2017) but is also important in terms of the supply chain of natural disaster management (John, Ramesh & Sridharan, 2012). The supply chain in this context is vital in ensuring the flow of information, physical aid resources, information and other services which function to minimize the consequences of the disaster for victims (John, Ramesh & Sridharan, 2012; Selvaraju et al., 2019).

Appropriately-timed aid and proper policies can have an instant impact on the survival of victims (Rivera & Miller, 2007). Humanitarian aid delivery involves a huge amount of resources, multiple processes and many different stakeholders. According to McLachlin, and Larson, (2011), assert that humanitarian supply chains, as a rule, will be vulnerable and prone to wastage as a result of military or political interference as well as the lack of coordination between authorities. The supply chain includes all processes which create a final product from its raw material stage, until it is delivered in its finished form to clients (Balcik, Beamon, Krejci & Muramatsu, Ramirez, 2010; Sundram, Bahrin, Zaid, Daud & Thirunavukkarasu, 2016). As such, information and communication are vital (Sundram, Bahrin & Chandran, 2016) in order

to ensure that the process of humanitarian aid distribution is as effective and efficient as possible (Mohd, Fathi & Harun, 2018).

Methodology

This study was conducted through quantitative research and utilized a survey in carrying out data collection. The survey was carried out among 170 individual members of a local community in Kelantan, Malaysia. The convenience sampling technique was applied to choose respondents who were victims of the flood disaster and were involved in the humanitarian supply chain distribution. The data collected was analysed through Partial Least Square (PLS) in order to predict the effect of communication and information as factors towards the efficiency and effectiveness of humanitarian aid distribution practices in the Malaysian context. The return rate of the survey was 92.9 per cent, meaning that 158 out of the 170 distributed surveys were collected again. The measurement model and the structural model are two stages of evaluation within PLS. The measurement model functions to examine whether the indicators and constructs show validity and reliability within the study (Sundram et.al, 2016). PLS will determine discriminant validity and convergent validity in order to verify that the indicators and constructs within this study are reliable. The structural model assesses the hypotheses, identifies the path coefficient, and verifies the predictive relevance of communication and information in the context of humanitarian aid distribution. The next sections will discuss the findings of the PLS analysis in greater depth

Result and Discussion

Demographic Analysis

This study was conducted among a local community in Kelantan. Among the respondents, the gender component was nearly equal with 78 male and 80 female respondents. In terms of age groups, 69 respondents were teenagers, 79 were adults and the elderly only accounted for 10 individuals out of the total number of respondents. A total of 95 respondents have between 1 and 5 members in their family, 53 respondents have 6 to 10 family members, while 10 respondents reported having over 11 family members. This finding shows that the community being studied has the norm of large families staying together.

Measurement Model Assessment

The measurement model evaluates reliability, convergent validity (CV) and discriminant validity in order to assess the indicators and constructs within the model. Reliability is assessed by the criteria of composite reliability (CR) whereby the threshold value must be higher than 0.7. The assessment for Average Variance Extracted (AVE) requires a threshold value of greater than 0.5. Table 1 illustrates how the model for the current study revealed acceptable values of AVE and reliability for the components of communication (CR= 0.772, AVE= 0.63), cooperation (0.76, AVE= 0.613), effectiveness (CR= 0.847, AVE= 0.529), and information (CR= 0.918, AVE= 0.654). These results proved that all the indicators and constructs were suitable to be applied to this study.

Table 1
Measurement Model

Constructs	Composite Reliability	Average Variance Extracted
Communication	0.772	0.630
Cooperation	0.760	0.613
Effectiveness	0.847	0.529
Information	0.918	0.654

Table 2 displays the results of the assessments of discriminant validity according to Fornell and Larcker (1981) specifications. The evaluation of discriminant validity is necessary to show that the construct within the model exhibits greater interaction levels with its indices compared to other constructs. The discriminant validity in this model was considered acceptable because the AVE value of each construct was greater than the variance between that construct and other constructs within the model. These results show that this model did not have any issues regarding discriminant validity.

Table 2
Discriminant Validity

Construct	1	2	3	4
Communication	0.794			
Cooperation	0.271	0.783		
Effectiveness	0.298	0.269	0.728	
Information	0.226	0.195	0.428	0.808

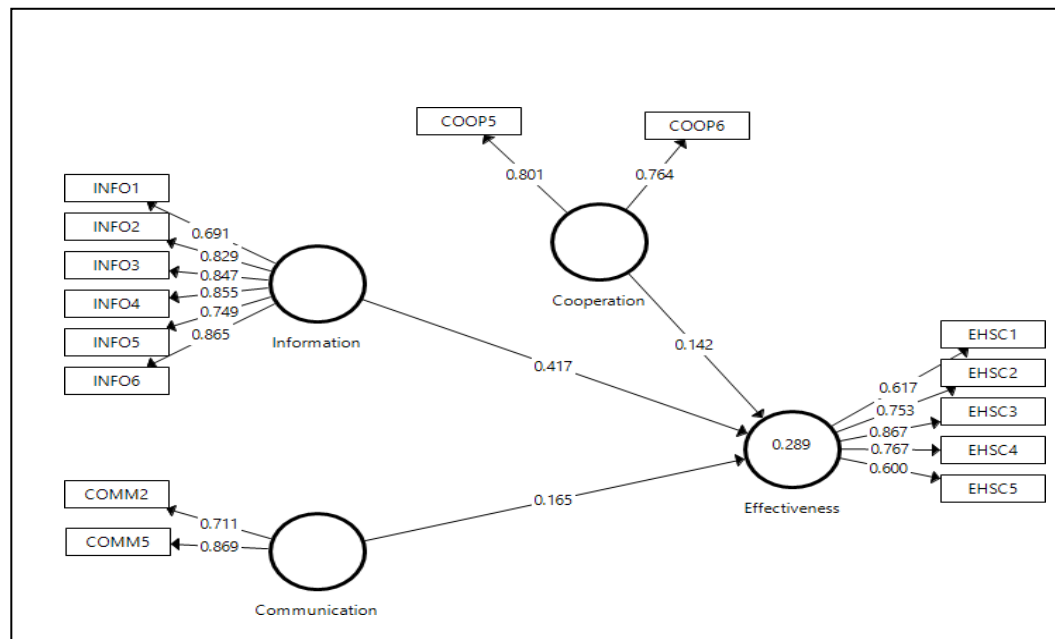


Figure 1. Measurement Model

Structural Model Assessment

In the assessment of the structural model, a bootstrap analysis is applied, whereby a large quantity of subsamples is gathered from the original data, and models are then predicted for each of those subsamples (Hair et.al, 2014). The results of bootstrapping revealed t-values which were evaluated in order to examine the significance of the path coefficients. Figure 1 illustrate the value of R^2 is 0.289. This confirms that all three constructs explain 28.9 per cent of the variance in humanitarian supply chain effectiveness. While, Table 3 shows that the value of Communication ($\beta=0.165$, $t = 1.992$, $p>0.05$), cooperation ($\beta=0.142$, $t=1.77$, $p>0.05$), and information ($\beta=0.417$, $t=5.945$, $p<0.05$) were all positively related to effectiveness of the humanitarian supply chain. However, communication and cooperation did not exhibit significant influence of effectiveness. Additionally, the blindfolding analysis was carried out in order to assess predictive relevance, which revealed the value of Q^2 at 0.139. Since this value is greater than zero, it indicated that the model showed acceptable predictive relevance. However, the range of this predictive relevance was considered small when compared to Cohen (1988) advised values for small, medium and large, at 0.02, 0.15 and 0.35 respectively.

Conclusion

The findings of this study indicate that local people must be given greater awareness of the conditions during and after disasters, especially regarding the forms of aid that are provided by the government and private agencies. Specific solutions can be obtained by properly and efficiently managing factors of communication, cooperation and information. These factors are emphasized because of their ability to ensure that local communities impacted by disasters will find it easier to seek out and receive aid. In this way, potential disaster victims can be in a constant state of preparedness in the face of a natural disaster.

Governments and private agencies must enhance communication to guarantee that information is delivered to the community accurately and quickly. Efficient dissemination of information and social interaction are vital to successful humanitarian relief efforts. All parties involved should exhibit consistency and cooperation. This coupled with a strong flow of information will collectively improve the functionality and efficiency of the humanitarian supply chain.

Acknowledgements

Our special thanks to Kementerian Pelajaran Malaysia and Institute of Research Management & Innovation, UiTM Shah Alam. This study draws from FRGS Research Grant awarded by the Kementerian Pelajaran Malaysia; Project code: FRGS/1/2019/SS01/UiTM/02/43 [600-IRMI/FRGS 5/3 (445/2019)].

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