

THE RELATIVE EFFECTS OF LOGISTICS, COORDINATION AND HUMAN RESOURCE ON HUMANITARIAN AID AND DISASTER RELIEF MISSION PERFORMANCE

Aida Idris

University of Malaya
aida_idris@um.edu.my

Saiful Nizam Che Soh

University of Malaya
saiful_5786@yahoo.com.my

Most studies on humanitarian aid and disaster relief (HADR) missions suggest that the quality of logistics, coordination and human resource management will affect their performance. However, studies in developing countries are mainly conceptual and lack the necessary empirical evidence to support these contentions. The current paper thereby aimed to fill this knowledge gap by statistically examining the effects of the abovementioned factors on such missions. Focusing on the Malaysian army due to its extensive experience in HADR operations, the paper opted for a quantitative approach to allow for a more objective analysis of the issues. The results show that there are other potential determinants of mission success which deserve due attention in future studies. They also suggest that human resource is not easily measured as a construct, and that this limitation in methodology must be overcome to derive more accurate conclusions regarding its effect on HADR mission performance.

Abstract



Keywords: HADR mission performance, military organisation, logistics, coordination, human resource, Malaysia.

When a disaster hits, humanitarian aid and disaster relief (HADR) teams will typically be called in to observe the physical results of the catastrophe and the major risk factors for human casualties (David *et al.*, 2008; Legates and Biddle, 1999; Phillips *et al.*, 2008). These teams also investigate victim and survivor perceptions of an outage risk, and individual or family reaction

to the menace. Ultimately, they will be involved in rescuing victims, providing immediate necessities especially food, water and medical assistance, as well as more long-term reconstruction exercises.

For military organisations, HADR operations require different sets of preparations because they are remarkably diverse from the conventional insur-

agency warfare (Azmeed Ahmad, 2001; Mertens and Mees, 2006). In such operations, tasks must be executed very rapidly, reinforcement teams have to run off on an extremely short notice, and there is a critical need for proper coordination with other agencies in order to save as many human lives as possible. Providing assistance to civil authorities is now a secondary yet common task of the army today (Thompson, 2010), and the job involves many external agencies from both government and non-government organisations. As such its success would also depend on a comprehensive understanding of the responsibilities and limitations of other participating agencies. Since these duties would be a departure from the traditional conventional war-fighting, they are categorised as military operations other than war (MOOTW) as well as in a variety of development programmes within individual countries. These newer roles and tasks are demanded by a more open and democratic society in which the army of today is expected to become more engaged and be seen as an integral component of the overall nation-building effort.

In the context of the Malaysian army, HADR operations are a part of MOOTW which require it to assist the government in maintaining law and order during times of non-military crisis and disasters (Azmeed Ahmad, 2001; Military Doctrine MD 3.0 TD, 2005; PPB MAL 4, 2009). The army will usually play a leadership role in HADR operations in collaboration with other government and non-government agencies such as the police, fire-fighting and medical units, the media, volunteer groups, et cetera.

The entire organisation is empowered by various national legal statutes and the National Security Council Directives (1997). On its part, the army establishes its ad-hoc organisation to fulfil the role and tasks in HADR such as providing manpower for the mission, mobilising resources through land, air and waterborne transportation, supplying and operating related equipment and facilities, and providing skilled specialists including demolition/bomb experts, engineers, communications and medical personnel as shown in Figure 1.

A review of existing literature (Andrew *et al.*, 2011; David *et al.*, 2008; Jessica, 2010; Moe and Pathranakul, 2006; Peerbolte and Collins, 2013; Subramaniam *et al.*, 2010) suggests that major success factors in HADR missions comprise logistics, coordination and human resource inputs. Unfortunately, there is insufficient empirical data to support these contentions especially from the perspective of developing countries. The current paper aimed to fill this knowledge gap via a quantitative approach due to its objectivity in analysing data (Kothari, 2004). While analysis of covariance identified differences among groups of respondents, correlation and multiple regressions analysis measured the relative effects of human resource, logistics and coordination factors on operations performance.

Furthermore, due to the army's leadership role in Malaysian HADR teams, it is important to investigate the topic from their perspective. Thus the current study focuses on a sample of military respondents with prior experience in HADR missions. Findings of

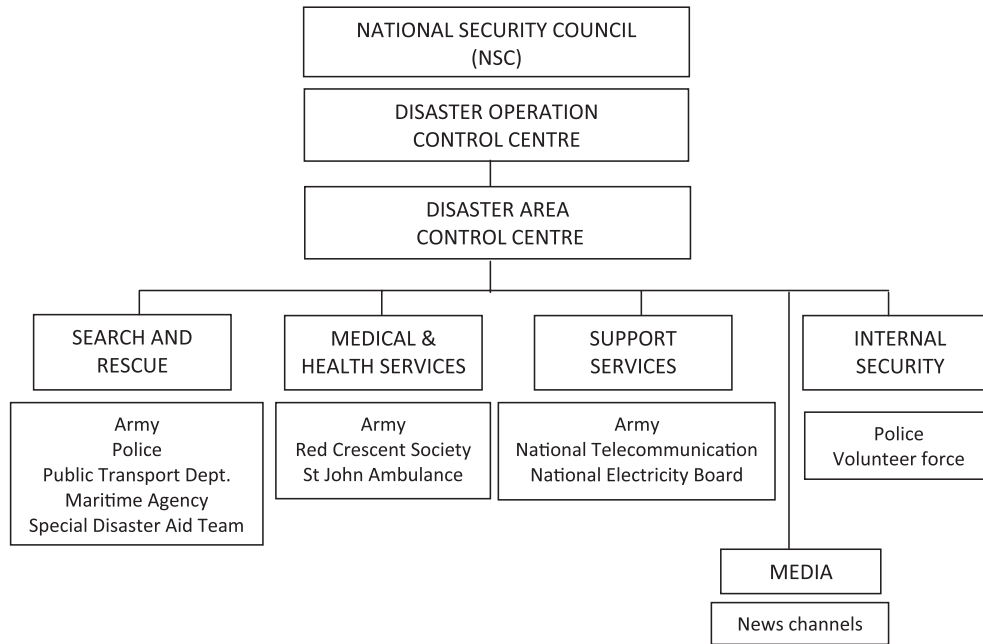


Figure 1. Organisation Chart of HADR Team in Malaysia

the study are expected to have significant implications and facilitate better management of HADR missions by the Malaysian army, not only at home but also abroad. Among the areas of HADR operations that will potentially benefit from the study are training, international and cross-cultural management, communication and interpersonal relations, and information technology.

LITERATURE REVIEW

A disaster can be defined as a tragic incident that occurs unexpectedly as a result of natural forces or human and technical errors; it often culminates in the loss of lives and damages to properties or the environment, as well as affecting the daily activities of local communities (Hassan *et al.*, 2011; Susman *et al.*, 1983; Telford and Cosgrave). In Malaysia, responding to the Highland Towers Condominium landslide in Kuala Lumpur, the government established the National Security

Council in 1994 as a mechanism for disaster management (Subramaniam *et al.*, 2010). The council has since then exercised its role through management of periodic disasters in flood-prone areas as well as the unexpected 2004 tsunami which claimed thirty-seven lives in Peninsular Malaysia. To implement its policies, Disaster Relief and Management Committees have been formed at federal, state and district levels as coordinators of various HADR units such as the police, fire department, hospitals and the armed forces.

The success of HADR missions is usually measured in terms of efficient and effective delivery of aid and services to disaster victims, taking into consideration factors such as time and cost as well as the appropriateness of items delivered (Beamon and Balcik, 2008; Paul and Leven, 2002; Paul, 2006). The perception of success can be analysed from either the victims' or the organisation's point of view; unfortu-

nately, scales measuring mission performance are difficult to standardise because of variations in the disaster-stricken environments. Nevertheless, some common indicators of performance of HADR missions will usually include locating and rescuing victims, constructing temporary shelters, providing food, treated water and medical assistance, reopening transportation and communication systems, and protecting the safety and security of victims (Andrew *et al.*, 2011; David *et al.*, 2008; Jessica, 2010; Peerbolte and Collins, 2013; Subramaniam *et al.*, 2010).

From the viewpoint of the Malaysian army, the success of military operations is defined as an operational concept that describes the execution of command by combat forces in battle and MOOTW (Military Doctrine MD 3.0 TD, 2005). The concept articulates the fundamentals of operations visualization to facilitate future research, experimentation and training efforts in all related areas. These efforts will then be integrated to provide the commander with the doctrinal, training, organizational, leadership, material and other means to clearly see and understand the operations from the initiation stage right through to the successful achievement of the desired organisational goals. The concept places special emphasis on the role of the commander, while integrating information-age technology to provide commanders with a comprehensive view of the area of operation; a view which reduces uncertainty, minimise risk, promotes clear and rapid transmission of intent and orders, and facilitates the decisive employment of combat power.

Insofar as determinants of success are concerned, scholars (Andrew *et al.*, 2011; David *et al.*, 2008; Jessica, 2010; Moe and Pathranakul, 2006; Peerbolte and Collins, 2013; Subramaniam *et al.*, 2010) have suggested multiple frameworks which capture the importance of proper allocation, distribution and coordination of human and other types of resources. The definitions and indicators of logistics, coordination and human resource as key success factors in HADR missions are summarised in Table 1, and elaborated further in the following paragraphs.

Logistics

Logistics is normally defined as the process of planning, organising and controlling the efficient, cost-effective flow and storage of goods and information, from point of origin to point of consumption (Wassenhove, 2005; US Joint Publications 1-02, 2012). Thus logistics operations have to be designed in such a manner that the distribution and allocation of resources reach all victims in the disaster area on time despite huge limitations faced in the operational environment (Kelly, 1995). It follows then that logistics functions rely not only on planning, organising and controlling, but also technological advancements in inventory management, transportation and information.

The main challenge for logistics planning authorities lies in the sudden eruption of large demands. To cope with it, Lin (2010) suggests that distribution-supply delivery units utilise a number of temporary depots as intermediate agencies in the disaster-affected area. In such situations, demand points can be served either directly by the central

Table 1. Key Success Factors in HADR Missions: Summary of Literature Review

Success Factors	Definition	Sources	
Logistics	<ul style="list-style-type: none"> • Process of planning, organising and controlling the efficient, cost-effective flow and storage of goods and information, from point of origin to point of consumption. • Indicators: equipment and supplies, transportation system, resource planning and distribution. 	Andrew <i>et al.</i> (2011), Cantillo (2008); Hunt (2008); Jessica (2010); Kelly (1995); Wassenhove (2005).	
Coordination	<ul style="list-style-type: none"> • Compatible and aligned strategies and actions of various departments or organisations which enable them to meet a shared objective. • Indicators: information and resource sharing, task assignment, reduced overlapping/duplication of function. 	Czajkowski (2007); McEntire (2002); Stephenson (2005); Telford and Cosgrave (2007).	
Human Resource	<ul style="list-style-type: none"> • Personnel-related factors such as recruitment criteria, employee skills and experience, job motivation, work ethics, training, performance evaluation and compensation, et cetera. • Indicators: training and professional development, morale, motivation and job satisfaction, etc. 	Chang (2005); Hearn and Deeny (2007); McCall and Salama (1999); Peerbolte and Collins (2013).	
Others	<ul style="list-style-type: none"> • Physical infrastructure • Formal HADR authority • Public relations and education 	<ul style="list-style-type: none"> • Communication and warning systems. • Establishment of HADR organisations, their responsibilities and accountability. • Programs to enhance public awareness and support. 	Moe and Pathranakul (2006); Hassan <i>et al.</i> (2011); Thompson (2010).

depot or locally by temporary depots, depending on who can fulfil demands more efficiently. Logistics planners are therefore responsible for identifying appropriate temporary depots and allocating each depot to serve the right number of demand points.

Cantillo (2008) reveals that HADR logistics personnel not only face difficulty to meet the quantity of demands, but also specific needs of victims. For instance, patients with allergies require special treatments not commonly available at disaster sites. In those circumstances, solutions are usually found through resourcefulness and the ability to adapt quickly to the immediate surroundings. This is affirmed by Hunt (2008) who emphasises the importance for medical personnel to contextualise clinical knowledge and training when there are severe

constraints on available diagnostic, transfer and intrusion options. It may therefore be proposed that:

H_1 : The success of HADR missions is positively affected by logistics management.

Coordination

Czajkowski (2007) summarises that coordination occurs when a group of organisations consider that the overall goal they want to achieve is the same, so they can work together on their separate, yet compatible, missions. Coordination efforts do not encroach upon the authority of individual organisations; yet they comprise a form of central command that can either enhance or add difficulty to the decision-making process (McEntire, 2002; Telford and Cosgrave, 2007). In short, coordination can be defined as compatible and aligned strategies and actions of

various departments or organisations which enable them to meet a shared objective.

Since organisations which make up a typical HADR team (such as the military, police, fire-fighters and hospitals) have different core competencies, they need one another to make up for their internal shortages. According to Stephenson (2005), this need is fulfilled not just through formal top-down control, but also trust and social networking among different organisations within the HADR team. Stephenson and Schnitzer (2009) argue that polycentricism might potentially help in reconceptualising the implementation of HADR operations. A polycentric organisation is composed of several independent units which utilise decentralised decision-making processes and conflict management strategies. Where a single command and control authority is unavailable, this concept has been proposed as the solution to current coordination problems experienced in the field.

Although human beings cannot always precisely forecast the timing and location of natural disasters, with proper coordination organisations participating in HADR missions can become better informed and equipped to minimise subsequent losses (Brodie et al., 2006; United Nations, 2012). Post-disaster assistance delivered unilaterally may lead to duplications, wastes and liabilities. In foreign missions, the issue becomes even more complex whereby cooperation with the host country is vital to address political, diplomatic, immigration and legal constraints which can hinder smooth conduct of HADR operations. Thus,

coordination of relief efforts is necessary to maximise benefits, reduce duplications, ensure effective pooling of resources and overcome specific constraints in the local environment. Hence the second hypothesis is forwarded below as:

H₂: The success of HADR missions is positively affected by the level of coordination among participating organisations.

Human Resource

Human resource comprises personnel-related factors such as recruitment criteria, employee skills and experience, job motivation, training, performance evaluation and compensation, et cetera. Because most employees of HADR organisations are not primarily driven by financial benefits, issues relating to moral and technical support often take a great priority in HADR missions (Chang, 2005; McCall and Salama, 1999). Human resource support structures include pre-departure briefing, in-field facilities, and post-mission debriefing. Lack of support will lead to feelings of disappointment, reduced self-esteem and lower job satisfaction (Hearns and Deeny, 2007), worsening the already high rate of staff turnover often observed among HADR personnel.

At the same time, successful handling of disasters requires the contribution of various parties that have the relevant skills and capabilities in areas such as distribution, engineering, health, security, et cetera (Hunt, 2008). Training is therefore a critical component in human resource management of HADR organisations. Given the unpredictability of disasters, shorter and more intensive training periods

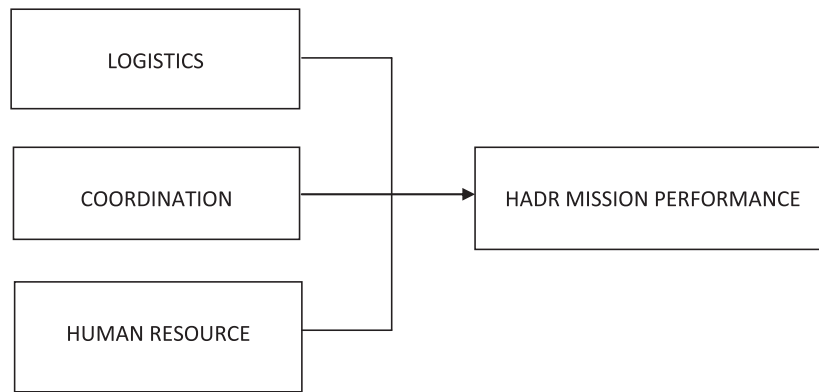


Figure 2. Research Framework

are particularly encouraged (Cantillo, 2008). However, simply reducing training time is not enough to ensure the long-term success of HADR missions. Since local residents have very urgent needs in disaster circumstances, relief teams often work extremely long shifts and are vulnerable to overwork and fatigue (Hilhorst and Schmie-mann, 2002). Working in such environments tends to raise complications in professional ethics, and limit their capacity to meet the best standards of service. Job stress also results in high staff turnover among HADR organisations (Loquercio et al., 2007), which impedes strategic human resource planning. Hence, the future success of HADR organisations appears to depend too on their ability to recruit and train a wide pool of local experts who can be readily called upon as temporary or part-time staff (Peerbolte and Collins, 2013).

Besides training, Cantillo (2008) also suggests performance measurement as another human resource factor affecting HADR success. Appropriate performance measures and evaluation methods for different employees and teams, which can be derived from an understanding of the logic of each HADR operation, will help the or-

ganisations to select accurate and effective operational strategies. In turn, the level of individual and team performance should determine other outcomes including rewards and career development. Thus, the third and final hypothesis is proposed as follows:

H₃: The success of HADR missions is positively affected by human resource inputs.

The conceptual framework summarizing the three propositions of this study is shown in Figure 2.

RESEARCH METHOD

To enable an empirical examination of success factors of Malaysian HADR missions, the current study adopted a quantitative approach. The investigation of the effects of logistics, coordination and human resource (independent variables) on mission success (dependent variable) was guided by the three hypotheses forwarded earlier. The following describes procedures and results of the quantitative analysis.

Based on the definitions and indicators of logistics, coordination, human resources and HADR mission success compiled from the literature review, a questionnaire was self-developed and

Table 2. Measures of Independent and Dependent Variables

Construct and Items
<p>Independent Variables</p> <p><i>Logistics</i></p> <p>In previous HADR missions I participated, I found that our teams...</p> <ol style="list-style-type: none"> 1. were allocated with adequate funding. 2. mobilised resources and manpower in a timely manner. 3. had the necessary equipment and supplies to execute our tasks. 4. utilised available resources and manpower well to cope with constraints. 5. carried out initial planning and assessment of needs satisfactorily. 6. had adequate transportation to deliver equipment and supplies immediately. <p><i>Coordination</i></p> <p>In previous HADR missions I participated, I found that our teams...</p> <ol style="list-style-type: none"> 1. shared necessary resources and information with other relevant agencies. 2. were continuously in communication with the command centre. 3. established effective broadcasting systems for public announcements. 4. had taken efforts to synchronise and reduce discrepancies in operating procedures. 5. assigned and understood tasks capably. <p><i>Human resource</i></p> <p>In previous HADR missions I participated, I found that our teams...</p> <ol style="list-style-type: none"> 1. were well trained in their respective fields. 2. have been briefed adequately with on-site information. 3. are familiar with the various operating procedures. 4. received good moral support and counselling from relevant agencies. 5. set high standards of performance for ourselves. 6. were motivated to continually improve our performance. 7. demonstrated professionalism and ethical conduct.
<p>Dependent Variable</p> <p><i>Mission success</i></p> <p>In previous HADR missions I participated, I found that our teams managed to accomplish the following efficiently and effectively...</p> <ol style="list-style-type: none"> 1. locate and rescue victims. 2. construct temporary shelters. 3. provide food, treated water and medical assistance. 4. reopen transportation and communication systems. 5. protect the safety and security of victims.

subsequently administered on a sample of personnel with HADR experience. Items measuring each variable are shown in Table 2.

Although the items were initially self-formulated using broad definitions of the variables, they were later adapted to suit specific organisational characteristics and goals of the Malaysian army, as well as the HADR missions they have previously led. Prior to administration, the questionnaire was put through a face validity test by engaging the expert advice of two team commanders. Several minor modifications to the questionnaire were made following their recommendations which pertained to military terminologies such as appropriate job titles or ranks

and departments. The reliability of the survey instrument was assured through Cronbach's alpha tests while data normality was also tested as preliminary analysis. Since all Cronbach's alpha values exceed 0.7, the reliability of independent and dependent scales is affirmed. Likewise, based on skewness and kurtosis values which fall within the range of +/-2, data are considered normally distributed. Cronbach alpha, skewness and kurtosis values for each instrument are shown in Table 3.

Specifically, the quantitative analysis aimed to determine statistical significance of the effects of human resource, logistics and coordination on mission success. The questionnaire consisted of three parts. Part A included discrete

Table 3. Results of Reliability and Normality Tests

Variable	No of Items (N)	Cronbach's Alpha	Skewness	Kurtosis
Human Resource	7	0.774	-0.147	-1.057
Logistics	6	0.702	0.498	-0.186
Coordination	5	0.781	0.428	0.284
Mission Success	5	0.797	-0.453	-0.709

items on respondent's background namely age, gender, marital status, level of education, rank, departments, terms of service, and location of missions. Part B and Part C measured the independent and dependent variables respectively, using a five point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree, with 3 being the neutral point.

A total of 300 questionnaires were distributed to seven designated units throughout Peninsular Malaysia. Ultimately, 217 questionnaires were returned, giving a response rate of 72.33%. Data were coded and entered into the Statistical Package for the Social Sciences (SPSS) version 20 for statistical analysis. Besides frequency tests to generate a profile of respondents, tests of differences and relationships between variables were implemented through ANOVA, correlation and multiple regressions.

The profile of respondents can be described as follows. Out of the total number of respondents, more than half were between 35 and 44 years old (54.8%), and occupied the rank of Lieutenant Colonel/Colonel (50.2%). The largest group comprised field operations (40.1%), followed by logistics (35.5%), medical (12.4%), and administration/others (12.0%). A majority of the respondents (68.2%) had served between 11 to 20 years, indicating that experience is a key requirement for HADR personnel. The importance

of practical training over academic qualifications is evident in the military given that a clear majority (87.1%) did not receive tertiary education. Finally, in terms of location of mission, most (65.5%) had been retained only for local operations, suggesting a lack of exposure to more challenging HADR situations abroad.

RESULTS AND DISCUSSION

One-way ANOVA

To test demographic differences in the success of HADR missions based on the respondent's age, rank, academic qualification, length of service, department and location of the mission, one-way ANOVA tests were performed. Results show that significant differences exist only in two demographic categories, namely department and location of mission.

In terms of department, respondents were divided into five groups (Group 1: administration; Group 2: field operations; Group 3: logistics; Group 4: medical; Group 5: others). The p value of < 0.05 indicates significant differences exist at 95% confidence level between field operations and other departments in terms of their mission success [$F=18.602$, $p=.00$]. Inspection of mean values shows that field operations personnel scored the highest rate of success (22.3908), followed by those in administration (20.1875), and logistics (19.7403). Medical and other teams were the lowest scorers.

Table 4. Results of Correlation Test

Variable	Human Resource	Logistics	Coordination	Mission Success
Human Resources	1			
Logistics		1		
Coordination			1	
Mission Success	0.509**	0.573**	0.638**	1

** Correlation is significant at the 0.01 level (2 – tailed)

The high rate of success of field operators is possibly due to their focus on typical military functions of maintaining peace and order, unlike the other departments which are concerned with more specialised tasks such as managing supplies and treating injuries.

For location of mission, respondents were divided into three groups (Group 1: local; Group 2: abroad; Group 3: both). Significant differences were observed between local and international operations at 95% confidence level [$F=3.978$, $p=.02$]. Based on the mean values, it may be deduced that teams conducting local missions (20.9296) stand the highest chance of being successful, while those involved in both local and international missions come a close second (20.5667). Teams which have participated only in foreign operations scored the lowest rate of success. This finding is particularly interesting as it underlines challenges operating in foreign environments such as communication and cultural gaps, diverse standard operating procedures and local infrastructure (Chang, 2005; Telford and Cosgrave, 2007).

Correlation

Correlation tests were conducted to determine direct individual relationships between logistics coordination and human resource, and the success of HADR missions. Prior to the tests, preliminary analyses were performed

and showed no violation of the assumptions of normality, linearity and homoscedasticity. Results of the correlation tests are tabulated in Table 4.

Based on Table 4 above, all three independent variables have a positive significant relationship with the success of HADR missions. Coordination has the strongest positive correlation with mission success (r value=.638, $p < .01$), followed by logistics (r value=.573, $p < .01$) and finally human resource (r value=.509, $p < .01$). These results provide initial evidence supporting all three hypotheses forwarded earlier. However, the varying degrees of strength of the relationships suggest that the three independent variables do not share equal importance in determining mission success. More interestingly, it is evident that coordination and logistics outweigh human resource as success factors.

However, this does not mean that human resource is an unimportant factor altogether. The results may be interpreted such that although human resource does influence the success of HADR missions, its effect is weaker than those of coordination and logistics possibly due to the complex nature of human resource management. In most organisations, the human resource factor includes a range of specific sub-functions such as recruitment, training and professional development, discipline and work ethics,

Table 5. Results of Regression Analysis

Model	R	R Square	Adjusted R Square		Std. Error of the Estimate	
1	.661 ^a	.436	0.428		2.15029	
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	762.197	3	254.066	54.948	0.000 ^a
	Residual	984.863	213	4.624		
	Total	1747.060	216			
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.102	1.615		1.921	0.056
	Human Resource	0.091	0.074	0.089	1.227	0.221
1	Logistics	0.216	0.077	0.214	2.797	0.006
	Coordination	0.457	0.093	0.420	4.902	0.000

a. Predictors: (Constant), Human Resource, Logistics, Coordination

b. Dependent Variable: Mission Success

job motivation, performance evaluation, compensation, et cetera. Therefore, the sum effect of human resource on organisational performance is difficult to measure. This limitation in methodology can be overcome in future studies by separating and explicitly measuring each construct of human resource and its effect on HADR mission performance.

Multiple Regressions

To examine the simultaneous effects of logistics, coordination and human resource on HADR mission success, multiple regressions analysis were conducted. The results (please see Table 5) show that the three independent variables together have a positive significant effect ($p=.000$) on the success of HADR missions. The R square value at .436 means that the overall model is able to explain 43.6% of the variability in mission success. This generally supports existing literature and confirms that, taken collectively, the three factors are reasonably powerful predictors of performance of HADR operations. On the other hand, they also suggest that there are other contributing factors which explain 56.4% of the variability in performance, pointing to a huge potential for

future research in the area of HADR mission success. From the perspective of less-developed countries, these additional contributing factors include warning and communication systems, the establishment of formal HADR organisations, as well as public relations and education (Moe and Pathranakul, 2006; Hassan *et al.*, 2011; Thompson, 2010).

A detailed examination of the individual standardised Beta coefficients reveals that out of the three independent variables, only coordination and logistics have a significant positive influence on the success of HADR missions, at $p<.05$. This is consistent with the earlier results of correlation and supports the proposition that, when compared with coordination and logistics, the effect of human resource pales in significance. Furthermore, the strongest effect is again demonstrated by coordination ($B=.420$), followed by logistics ($B=.214$). These results provide empirical support for H_1 and H_2 , but not for H_3 .

It must be noted that although the direct effect of human resource on mission performance is insignificant, it does not mean that it is altogether

unimportant. Rather, these results emphasize the earlier observation on methodological limitations and the importance of explicitly measuring various constructs of human resource to derive a more accurate conclusion regarding its role in HADR mission performance.

Implications

Results of the ANOVA tests demonstrate that HADR personnel in the Malaysian army differ in terms of performance according to department and location of mission. This suggests that not all departments enjoy the same quality of coordination, logistics, and human resource management. In this instance, while field operators may be exposed to continuous training and have better equipment and access to information, administration, logistics and medical teams appear to lack the same quality of inputs. Likewise, the higher performance of local missions compared to those conducted abroad point to limited experience in international operations. As a result, these teams may not have been able to develop their skills adequately in communicating and cooperating with foreign units and populations. The above findings have therefore been useful in identifying specific areas of improvement for HADR teams within the Malaysian army.

As indicated by correlation and multiple regressions analysis, the clear dominance of coordination as a success factor underlines that HADR missions depend primarily on extensive collaborations and synchronous implementation of multiple tasks by all participating units. For the Malaysian army, this is perhaps due to its role as

the leading organisation in local missions which demand a special skill in assembling, mobilising and synchronising other units from the police, fire-fighting and medical organisations. In foreign operations too, coordination may be the main factor perhaps because previous experience working with international HADR teams has demonstrated the absolute necessity of understanding and adherence to various systems, procedures and legal frameworks.

The significance of logistics, although to a lesser degree, is in line with the goals of HADR missions to supply core needs to victims and reconstruct basic infrastructure in a timely manner. Effective and efficient logistics management enables HADR teams to deploy and mobilise goods, equipment and expertise accurately, thus improving the performance of the mission. Insofar as human resource is concerned, although it was not found to be a significant success factor in this study, it is very likely that its effects are manifested in an indirect manner.

Theoretically the study has made two important discoveries: one, other factors besides logistics, coordination and human resource which likely determine the success of HADR missions, and two, possible relationships among the independent variables. Results of the multiple regressions analysis indicate clearly that more than 50% of the variability in mission success is due to factors other than human resource, logistics and coordination. Some possible determinants which are worth considering in future research are formal authority of HADR organisations and public relations, besides in-

frastructure such as communication and warning systems. The findings also suggest that the effect of human resource is not easily measured as a total sum. Since the human resource factor includes sub-functions such as recruitment, training and professional development, motivation and job satisfaction, performance evaluation and compensation, the effect of each construct should be separately and explicitly measured to overcome any limitations in methodology.

From a managerial viewpoint, the study has numerous implications which affect various areas of HADR operations. With regard to logistics and coordination, although a thorough understanding of various international procedures is critical in foreign missions, a more long-term solution may lie in efforts to standardise procedures across borders. Greater standardisation can substantially reduce training time for foreign missions because knowledge of home-country procedures can be readily applied in the host-country environment. For governments, building and maintaining good local infrastructure is paramount to improve accessibility of disaster-prone areas and information broadcasting. However, transportation networks and telecommunication systems require massive public funds to build and operate. To minimise taxpayers' costs, private sector participation in infrastructure projects should be encouraged and exercised as part of their corporate social responsibility. This in turn requires leadership skills and initiatives such as stepping up campaigns on sustainable development and cultivating caring values within the corporate sector.

Where human resource is concerned, since foreign missions often take place in non-English speaking societies, the need for linguists and interpreters appears to be pressing. Furthermore, a lack of understanding of local cultures, sensitivities and taboos can easily create anger among the natives towards HADR personnel, and negate the goodwill which should ideally accompany a mission. Thus, as HADR operations become more globalised, traditional training modules focusing on clinical efficiency and effectiveness are obviously no longer sufficient. Trainers are advised to note that soft skills such as language, cultural and interpersonal communication abilities are now just as critical as the technical competencies required in distribution, engineering and medical functions.

Additionally, bearing in mind public awareness as a potential determinant of mission success, future training programs should not only target official HADR teams but also civilians. Volunteerism can be encouraged through formal education and public campaigns, and joint simulation exercises regularly implemented between HADR personnel and volunteer bodies. Although civilian exercises may not be as intensive and technical as formal training, they are extremely useful to improve overall levels of preparedness and public cooperation with the officials. To facilitate civilian training, a national database must be properly maintained to include the latest details of disaster-prone areas and decentralised depots. To this end, information technology requires continuous upgrading to ensure effective broadcasting of public announcements on civilian mobilisation.

CONCLUSION

Based on a review of relevant literature, the current study found that the topic of HADR operations has received scarce empirical research interest in developing countries. Focusing on the Malaysian army due to its extensive experience in HADR missions, the study was attempted to determine empirically the effects of logistics, coordination and human resource on mission performance.

A statistical approach was chosen because it allows for a more objective analysis of the issues. Quantitative findings helped to distinguish the relative importance of logistics, coordination and human resource as common

success factors in HADR missions, and deduce other potential determinants of success such as formal authority of HADR organisations, public relations and education, as well as physical infrastructure. Findings of the study have several theoretical and practical implications to HADR organisations, policy-makers and researchers especially in the areas of training, international and cross-cultural management, communication and interpersonal relations, and information technology. In particular, they should ideally serve as an impetus for future empirical research especially among scholars concerned with organisational perspectives in HADR operations performance.

References

- Andrew, T., Santiago, R. B., & Dimitry, M. (2011), *Representation of Humanitarian Aid and Disaster Relief Missions with an Agent Based Model to Analyze Optimal Resource Placement*, Georgia Institute of Technology Press, Atlanta.
- Ahmad, A. (2001), The management of national disaster and relief: A study of measures undertaken by Malaysian armed forces in managing disaster, *Sorotan Darat – T3029*, 1(37), 24-30.
- Beamon, B.M. & Balcik, B. (2008), Performance measurement in human relief chains, *International Journal of Public Sector Management*, 21(1), 4-25.
- Bluestein, H.B. (1999), *Tornado Alley: Monster Storms of the Great Plains*, Oxford University Press, New York.
- Brodie, M., Waltzing, E., Altman, D., Blendom, R., & Bensom, J. (2006), Experiences of hurricane Katrina evacuees in Houston shelters: Implications for future planning, *American Journal of Public Health*, 96(9), 1402-1408.
- Cantillo, Y. C. (2008), *Integrating Complex Evacuation Dynamics in Resource Allocation for Relief Operations*, Harper Perrenial, New York.
- Chang, W. (2005), Expatriate training in international nongovernmental organizations: A model for research, *Human Resource Development Review*, 4(4), 440-61.

- Czajkowski, J. M. (2007), *Leading successful interinstitutional collaborations using the collaboration success measurement model*, In Chair Academy's 16th Annual International Conference, Jacksonville, Florida.
- David, J. S., Maldonado, E., Orendovici, R., Tchouakeu, L-M. N., Gorp, A. V., Zhao, K., Maitland, C. & Tapia, A. H. (2008), *Building global bridges: Coordination bodies for improved information sharing among humanitarian relief agencies*, Available at: [http:// cohort.ist.psu.edu/ content/ Publications/ Saab_2008.pdf](http://cohort.ist.psu.edu/content/Publications/Saab_2008.pdf)
- Hassan, N.A., Hatiyusuh, N.A. & Rasha, K. N. (2011), The implementation of knowledge management system (KMS), for the support of humanitarian assistance/disaster relief (HA/DR), in Malaysia, *International Journal of Humanities and Social Science*. 1(4), 89-112.
- Hearn, A. & Deeny, P. (2007), The value of support for aid workers in complex emergencies: A phenomenological study, *Disaster Management and Response*, 5(2), 28-35.
- Hilhorst, D. & Schmiemann, N. (2002), Humanitarian principles and organizational culture: Everyday practice in Médecins Sans Frontières-Holland, *Development in Practice*, 12(3-4), 490-500.
- Hunt, M.R. (2008), Ethics beyond borders: How health professionals experience ethics in humanitarian assistance and development work, *Developing World Bioethics*, 8(2), 59-69.
- Jessica, L. H. S. (2010), *Design and Analysis of Humanitarian and Public Health Logistics Systems*, Guilford Press, New York.
- Kothari, C.R. (2004), *Research Methodology: Methods and Techniques*, New Age International, New Delhi.
- Legates, D. & Biddle, M. (1999), *Warning response and risk behavior in the Oak Grove – Birmingham, Alabama, tornado of 8 April 1998*. Available at: [http:// www.colorado.edu/hazards/q116/q116.html](http://www.colorado.edu/hazards/qr/q116/q116.html).
- Lin, Y. H. (2010), *Delivery of Critical Items in a Disaster Relief Operation: Centralised and Distributed Supply Strategies*, ProQuest LLC Publisher, East Eisenhower Parkway, US.
- Loquercio, D., Hammersley, M. & Emmens, B. (2006), *Understanding and addressing staff turnover in humanitarian agencies*, Available at: <http://odihpn.org/report.asp?ID=2806>.

- McCall, M. & Salama, P. (1999), Selection, training and support of relief workers: an occupational health issue, *British Medical Journal*, 318(7176), 113-116.
- McEntire, D.A. (2002), Coordinating multi-organisational responses to disaster: lessons from the March 28, 2000, Fort Worth tornado, *Disaster Prevention and Management*, 11(5), 369-379.
- Mertens, K. & Mees, W. (2006), *Information systems for disaster relief operations*, Available at: http://www.iadis.net/dl/final_uploads/200603PO.
- Military Doctrine MD 3.0 TD (2005), *Operations (Provisional): Fundamentals of Army Operations*, Ministry of Defence (MINDEF), Malaysia, Department of Army Headquarters.
- Moe, T.L. & Pathranakul, P. (2006), An integrated approach to natural disaster management: public project management and its critical success factors, *Disaster Prevention and Management*. 15(3), 396-413.
- National Security Council Directives (1997), *MKN Volume 20*, 11 May.
- Paul, B. & Leven, J. (2002), *Quick Response Report #154. Emergency support satisfaction among 2001 Hoisington, Kansas, tornado victims*, Natural Hazards Research and Application Information Center, University of Colorado.
- Paul, B.K. (2006), Disaster relief efforts: an update, *Progress in Development Studies*. 6(3), 211-223.
- Peerbolte, S.L. & Collins, M.L. (2013), Disaster management and the critical thinking skills of local emergency managers: correlations with age, gender, education, and years in occupation, *Disasters Journal*, 37(1), 48-60.
- Phillips, B., Neal, D., Wikle, T., Subanthore, A. & Hyrapiet, S. (2008), Mass fatality management after the Indian Ocean tsunami, *Disaster Prevention and Management*, 17(5), 681-697.
- PPB MAL 4 (2009), *Military Operations Other Than War (MOOTW): The Planning and Execution of Operations*, Malaysian Ministry of Defence (MINDEF), Department of Army Headquarters.
- Stephenson, M. Jr (2005), Making humanitarian relief networks more effective: operational coordination, trust and sense making, *Disasters*, 29(4), 337-350.
- Stephenson, M. Jr & Schnitzer, M. (2009), Exploring the challenges and prospect of polycentricity in international humanitarian relief, *American Behavioral Scientist*, 52(6), 919-32.

- Subramaniam, C., Ali, H. & Shamsudin, F.M. (2010), Understanding the antecedents of emergency response: a proposed framework, *Disaster Prevention and Management*, 19(5), 571-81.
- Susman, P., OKeefe, P. & Wisner, B. (1983), Global disasters, a radical interpretation. In Hewitt K., (ed), *Interpretations of Calamity from Viewpoint of Human Ecology*, Allen and Unwin, 263-283.
- Telford, J. & Cosgrave, J. (2007), The international humanitarian system and the 2004 Indian Ocean earthquake and tsunamis, *Disasters Journal*, 31(1), 1-28.
- Thompson, W.C. (2010), Success in Kashmir: a positive trend in civil-military integration during humanitarian assistance operations, *Disasters Journal*, 34(1), 1-15.
- United Nations (2012), *Disaster prevention, mitigation and preparedness, and post disaster rehabilitation capabilities*, Available at: <http://www.un.org/>
- US Joint Publication 1-02 (2012), Department of Defence Dictionary of Military and Associated Terms, Available at: http://www.dtic.mil/doctrine/new_pubs/jp102.pdf.
- Wassenhove, L. N. V. (2005), Humanitarian aid logistics: supply chain management in high gear, *Journal of the Operational Research Society*, 57(5), 475-489.