Early response in disaster operations management with focus on social accountability and TQM

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Abstract

Researchers have emphasized need for Disaster Operations Management (DOM), particularly in ethical factors and services to disaster victims. Literature positively relates early response to social accountability and identifies response time to be most critical measure of DOM performance.

Study measures human suffering in terms of needs and relates the gap between needs and assistance to response time. Based on predictability disasters are classified in two categories (High and Low). Pakistan's floods (2010) and earthquake (2005) are studied as representative of each category. Since DOM involves diverse organizations using various types of KPIs, to encourage early response use of R (response)-factor based on beta distribution defined by time and other factors (predictability, accessibility, delivery), is proposed as a multiplier to their existing KPI scores. To assist organizations in attaining early response for low and highly predictable disasters, generic process improvement models based on TQM are presented.

Key words: Early response, DOM, social accountability, TQM

Introduction

Atlas of mortality and economic losses from weather climate and water extremes (2014) reports 8835 weather related disasters only during 42 years (1970-2012) that caused 1.94 million deaths and economic loss of $2.4 trillion. UN General Assembly noted that economic losses from disasters exceed $100 billion/year (UN General Assembly report, 2014). Consequently DOM is increasing in its importance, and increasingly becoming relevant field in OM research (Galindo and Batta, 2013). Social, economic and environmental accountability are the three main performance measures of DOM. This paper focuses on social accountability of the organizations in DOM. Pakistan earth quake 2008 and floods 2010 are used as representative disasters. The gap between needs and assistance is identified by empirical evidence from data received from NDMA (National Disaster Management Authority) and ERRA (Earthquake Response and Rehabilitation Authority) .The literature also suggests response time as measure of social accountability. To encourage early response already used KPIs by organizations are studied and new KPIs are suggested converging early response in DOM. After studying 30 large and small organizations it is noted that various KPIs are used to satisfy diverse stakeholders, so adaptation of a single standard KPI looks impractical. To encourage early response introduction of "R-Factor" is suggested as multiplier to calculate bonus points in organizations existing KPI scores. At the end paper also presents generic operational models based on proactive approach of TQM.

A comprehensive content analysis by Galindo and Batta (2013) noted research gap in DOM on ethical factors and modeling service allocation to disaster victims, and emphasized its inevitability. They noted that most of DOM research is dominated by social science. This paper responds to need for DOM research to "include ethical factors and modeling service allocation to disaster victims" as suggested by Galindo and Batta (2013). DOM research focuses on disaster outcomes, including social Impacts, psychological aspects (Altay & Green, 2005).Report on

tsunami Katrina by C. Richard Baker (2014) emphasized precedence of social accountability over other forms of accountability in humanitarian operations, and it also highlighted that timely response as main factor to ensure social accountability. Sargiacomo et al (2014) identified 'justifiable neediness' to include physical, mental, and emotional accounting in disaster relief operations. Researcher differs in definitions of social and environmental accountability. Rasche and Esser (2006) described accountability standards as voluntary rules and procedures for organizations. Nielsen (2004) & Kell (2005) noted lack of consensus in scholars and practitioners in defining corporate social accountability. Present study focusing on social accountability uses human needs as measure of human suffering in disasters.

Discussion and Analysis

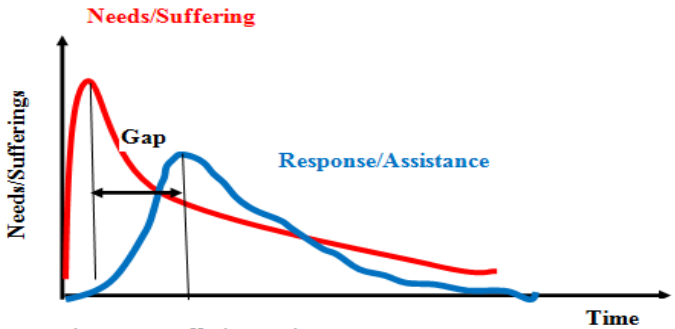


Figure: 1 Suffering and Response curve

Figure 1describles the need and response gap in disaster operations identified in literature and by empirical evidence.

Categories of Disaster. Gass (1994) noted that the disasters involve response beyond the capacity of the local authorities, DOM involves highly complex multi-functional environment, where many loosely interconnected organizations are working together. Since the predictability of disaster discerns the operational methodologies to be used in DOM planning and execution, this paper categorizes disasters based on their predictability, as highly predictable disasters and low predictable disasters (Table-1).

Table -1

Categories of disasters based on predictability	
Highly predictable Disasters	Low predictable disasters
Floods	Earthquakes
Droughts	Tsunamis
Crop failure	Hurricanes/cyclones
Epidemics	Volcanic eruptions
Internal conflict	Landslides
War, Displacement /forced migration	Avalanches
Border closures	
Food aid pipeline breaks	

Pakistan Floods (2010-2013). Monsoon rain floods is a seasonal process in Pakistan, but floods in 2010 were unprecedented in Pakistan's history. As per NDMA annual report 2010 the flood spread across 78 districts covering an area of 132000 sq Kms. It affected a population of 20.25 million people and caused 1985 deaths and 2946 injuries. The economic loss exceeded 10 billion $,including damages to 1.6 households,10,436 education facilities,515 health facilities and serious damage in water and power sector in the affected areas. Although floods are highly predictable diasters, but NDMA report 2010 and field reseach by Multi-sector Initial Rapid Assessment(MIRA) by NDMA in 2014 for floods 2014, reveals a clear time gap between the needs as assistance to disaster victims in Pakistan floods. MIRA report is based on timely field study of the victims by MIRA teams within the initial 72 hours of the disaster occurrence panned over two weeks, 578 villages in five affected districts were assessed, it provides reliable first hand data for analysis, which shows the time and quantity gap between needs and response. The annual report 2010 of NDMA and data form MIRA report 2014 clearly confirms to our suggested patterns in figure 1.

Pakistan earth quake-2005. The 2005 earthquake (7.6 on Richter scale) caused unprecedented destruction in Pakistan and Kashmir. As per ERRA, s (Earthquake Response and Rehabilitation Authority) first annual report after the earthquake in 2005, the disaster claimed 73,338 lives, caused serious injuries to 69412, and displaced 3.5 million people, it covered 30,000 sq km

across nine districts. Although rescue/relief operation was launched by the government immediately, attracting a massive response from national and international community, the initial "response was largely reactive and in some cases incoherent". The major concerns noted were accessibility to victims, restricted communications, managing huge air traffic, coordination of rescue and relief efforts. Some of the key lessons noted by ERRA during the response phase include need for institution building, development of information systems, capacity building, coordination mechanism, use of NGOs and open policy by the government. The reports and case studies from ERRA illustrate clear time gap between needs of disaster victims and assistance reached confirming the model in figure 1.

KPI,s used in DOM. The literature and empirical evidence reveals the gap between needs and response, and also suggests early response as key indicator of fulfillment of emergent needs. Disaster operations demands an emergency environment where different international/national agencies, organizations and NGO, s work together. These organizations serve diverse range of stakeholders, using diverse KPIs, ranging from international standards to their own standards.To elaborate this diversity we refer to accountability matrix developed by Rasche (2009).

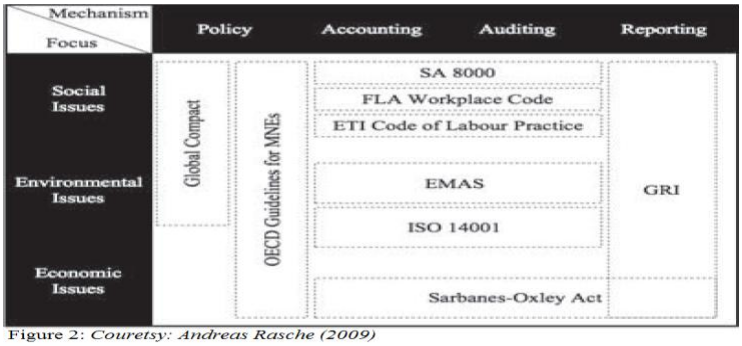


Figure 2: *Couretsy: Andreas Rasche (2009)*

Figure 2 gives an overview of accountability standards used globally by different organizations. In humanitarian operations objective is to minimize human suffering by fulfilling their emergent needs, so needs are used as measure of suffering. Although all types of needs are vital to be

considered, this paper focuses on Tier 1 needs identified by Beamon and Balcik, (2008), as immediate requirement of disaster victims. Studies on Katrina (Baker, 2014) and Asian tsunami (Telford & Cosgrave, 2007), have identified that the gap between needs and assistance is related to timely response. Baker (2014) also suggests that timely response is the main contributor to social accountability. The timely response is taken as a measure of social accountability in this paper. Researchers also suggested that even a timely symbolic response considerably minimizes the human suffering (Sargiacomo et al, 2014).

The Model (Response factor –R). To encourage early response, this study suggests a model based on three dimensions of disaster predictability, accessibility, and fulfillment of tier 1 needs against time. The model suggests award of bonus points for early response with a factor ranging from 0 to 0.4. The model is based on Beta-distribution. In which Response Factor is plotted on Y-Axis against Response Time on X-axis. Value is allotted to Beta while keeping $\alpha=1$ constant. For value of β we used three parameters of accessibility to the disaster zone, predictability of the disaster and delivery of Tier 1 items (Beamon and Balcik, 2008). This is a preliminary effort; further research is recommended to include other factors such as distance, climatic conditions, cultural diversity, marginalized groups and ethnicity etc. This will allow

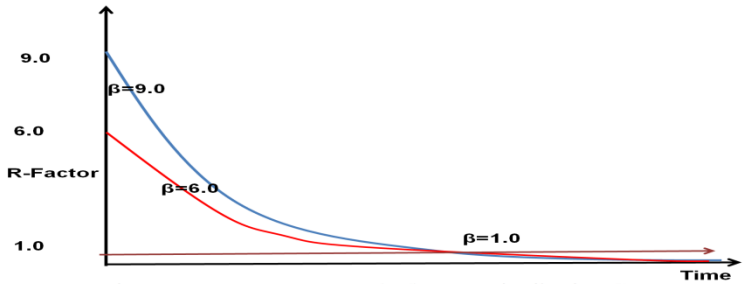


Figure 3: Response Factor (R*f*) Beta Distribution Curve

organizations/NGOs working in humanitarian operations to multiply their earned KPI score by Response-factor, and will encourage them to plan, prepare and execute early response, and will

also encourage donors for extending early donations to such organizations. By collective efforts of all stakeholders more lives will be saved and human sufferings will be mitigated.

Table 2: Delivery (Tier 1) items.

Value	0.5	0.5	0.5	0.5	1	Total
	z1	z2	z3	z4	z5	Z=z1+z2+z3+z4+z5
	food	First aid	WASH(water, sanitation and hygiene)	Shelter	Rescue	

Table -3: Predictability

Value	0.5	1	1.5	2	2.5	3
Y	Eminent	Very highly predictable	Highly predictable	predictable	Rarely predictable	Very rarely predictable
	Floods Crop failure Epidemics	Droughts Food aid Epidemics	Displacement forced migration Border closures	Internal conflict War	Hurricanes/cyclones Tsunamis pipeline breaks	Earthquakes Volcanic eruptions Landslides

Table -4: Accessibility

Value	0.5	1	1.5	2	2.5	3
	Very easy	Easy	Moderate	Difficult	Very difficult	Extremely difficult
X	Helicopter/on foot Animal transport/small boats Rural roads/boats Road/boat Rail Ships Air ports	Helicopter/on foot Animal transport/small boats Rural roads/boats Road/Large boats Rail	Helicopter/on foot Animal transport/small boats Rural roads/boats Road/ large boats	Helicopter/on foot Animal transport/small boats Rural roads/boats	Helicopter/on foot Animal transport/small boats	Conflict zone Helicopter/on foot

Individual z value for each item z1 to z5, will be awarded based on % of units delivered to the total capability of the organization. $Z=z1+z2+z3+z4+z5$ and $\beta=(X+Y+Z)$. Using these parameters B-curve will be responsive to the different disaster situations. Response factor (Rf= 0…9) is measured on Y-axis, against the response time on X-axis, and bonus factor (Bf) is calculated by formula $Bf = C.(Rf\text{-}s1)/2$

Where "1" is bottom-line value which defines the cut-off point for Bf (Bonus Factor). For example : in a particular disaster β was calculated to be 9, and NGO " A "responded in first 24 hours with its full capacity and got R factor =8 , then

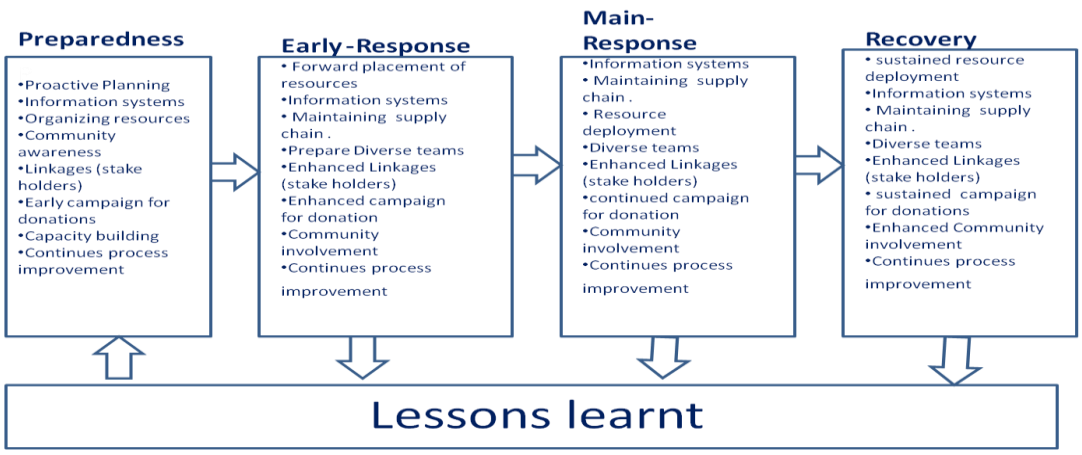
$$B \text{ (Bonus)} = \text{KPI score. } Bf$$

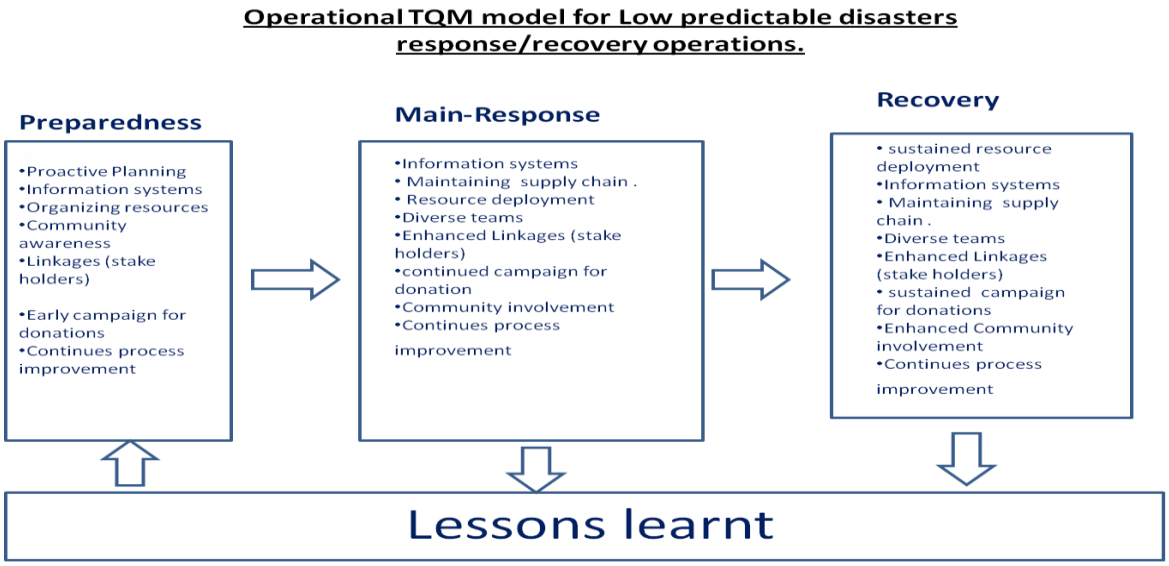
$$Bf = 0.05\ (9\text{-}1) = 0.4$$

An agreed Beta distribution curve can be calculated and R- Factor value will be measured against the response time from the graph for claiming bonus points. For example NGO-B gets KPI rating 70% with $Bf = 0.3$ for early response will get finial rating 70+70*0.3= 70+21= 91, and NGO-C with KPI rating 80% and $Bf = .01$ will get finial rating 80+80*0.1 = 80+0.8=88. These new ratings will support better social accountability, and can also be used by donor agencies to assess the effect of their donations on mitigation of human sufferings.

TQM models for proactive DOM. To improve the responsiveness of disaster management operations with a focus on mitigation of human suffering two models one are suggested covering highly predictable and low predictable disasters. These TQM models are based on proactive approach and continuous process improvement. These generic models for DOM of the organizations working include preparedness, response and recovery phases.

Operational TQM model for highly predictable disasters response/recovery operations.





Conclusion

Disaster operations require emergency reposes, including multi-organizational actions, in multi-dimensional environment. When organizations apply reactive operational methodologies/ processes, they also increase risk of their own vulnerability to disasters. This restricts their own ability to perform in disaster management operations, resulting in to higher social, economical and environmental costs. Pre-disater and early response by the organizations is related to early funding .Despite all disaster mitigation efforts, Individual and institutionalized donations are influenced by human tendency to contribute after suffering is observable. Future research is needed to convince donors for early donations to encourage organization for development of early response systems, and better accountability procedures. Another aspect of research which needs to be addressed is to develop new KPIs for Agencies/NGOs involved in disaster operations with incorporation of early response. This will help agencies/NGOs to measure social accountability more factually and will also convince donors for early commitment.

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