ANYLOGISTIX CASE STUDIES
(COMMERCIAL & HUMANITARIAN LOGISTICS)

Presenting de Souza Robert
Executive Director, The Logistics Institute — Asia Pacific
National University of Singapore
CASE STUDY 1:
Integrated Decision Support Framework For Enhancing Disaster Preparedness: A Pilot Application In Indonesia
Authors: Timperio Giuseppe, de Souza Robert

CASE STUDY 2:
Enhancing Supply Chain and Logistics Processes: the Case of a Logistics Service Provider (LSP)
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CASE STUDIES

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INTRODUCTION
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- Frequency and ferocity of humanitarian crises is increasing, globally;
- Humanitarian logistics involves unpredictability of demand, narrow lead times, compromised infrastructure, chaotic and changing environment;
- Burning need of more streamlined logistical processes, in preparedness;

Tackling cost effectiveness, time responsiveness, and agility of disaster relief chains through prepositioning of critical supplies.
THE CASE AT HAND

Indonesia Disaster Risk Context

- Population 257,000,000 (growth +1.49% yearly)
- Urban 49.79%
- Rural 50.21%
- 17,000 Islands
- 200,000 people killed by natural disasters (1900-2016)

- Poor domestic and international connectivity
- Poor infrastructure (intermodal Transportation)
- Heavy reliance on land transportation
- Underutilization of maritime corridors
- Empty backhauls (e.g. east to west/rural to urban)
- High exposure to natural hazard (part of ring of fire)
- Lack of facilities to store, consolidate, and forward humanitarian cargos

1. What is the most optimum network configuration for prepositioning stocks of life-saving goods in Indonesia?
2. How would the selected network perform in terms of service level, in view of actual and potential disaster events?
METHODOLOGICAL APPROACH
Framework of Methodology

Phase 1
• Operations Research (OR) for Identification, assessment, and selection of suitable locations for facilities

Phase 2
• Network Optimization for Structuring and optimizing the supply network

Phase 3
• Dynamic Simulation for Stress-testing the supply network and measuring performances

Figure 1. Framework of Methodology
METHODOLOGICAL APPROACH

Framework of Methodology Phase 1: Why Starting off with MCDM (OR)?

“Multi-Criteria Decision Making (MCDM) indicates a discipline of operations research (OR) that considers decision problems in a context of a number of decision criteria”


OR – and particularly MCDM – was used for:

• Filtering of suitable network nodes based on a number of basic criteria such as:
  • High accessibility to suitable infrastructure for transport (air, sea, land)
  • Low exposure to natural hazards;
• For the Indonesian case, 22 candidates, and 8 selection criteria were identified;
• Outcomes show that only 9 locations are meeting basic criteria.
METHODOLOGICAL APPROACH

Framework of Methodology Phase 2: Why Network Optimization (NO)?

“NO refers to a group of methods which, based upon the definition of object functions and constraints, help to determine how an effective supply chain design can be achieved, given a specific performance measure, or a set of them”


NO was used for calibrating baseline network configuration, and particularly to:

• Select the optimal network nodes out of the subset of suitable candidates from Phase 1, based on costs
• For the Indonesian case, 6 locations were to be selected out 9 filtered resulted from Phase 1.
METHODOLOGICAL APPROACH

Framework of Methodology Phase 2: Why Dynamic Simulation?

“Simulations allows to evaluate supply chain performances in a virtual environment prior the implementation into the real world, and therefore to reduce the risk of making costly mistake”

“Supply Chain Management Simulation: An Overview” Thierry et. al. (2008),

Dynamic Simulation was used to stress-test selected supply network and:

- Assesses network robustness and resilience;
- Measure operational performances;
- For the Indonesian case, 11 big scale humanitarian emergencies and 489 recurrent small/medium scale disasters were considered to trigger demand. Exact historical demand was used.
METHODOLOGICAL APPROACH
Framework of Methodology Phase 2 & 3: Why AnyLogistix?

AnyLogistix (2017) was selected to undertake framework Phase 2 and Phase 3 due to:

- Platform’s capabilities to handle both Network Optimization and Simulation seamlessly and in an integrated manner;

- Platform’s capabilities to handle the complex problems and give robust results;

- Platform’s flexibility and ease of use;
RESULTS & CONCLUSIONS

Phase 2: Network Optimization

The selection of 6 locations out of 9 candidate locations deemed suitable was undertaken.

<table>
<thead>
<tr>
<th>No.</th>
<th>Configuration of Nodes</th>
<th>Difference in Total Transportation Cost [%]</th>
<th>Weighted Average Lead Time [Days]</th>
<th>Standard deviation on lead time</th>
<th>&lt;=1 day [% on total demand]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pekanbaru, Surabaya, Banjarmasin, Ambon, Timika, Manado</td>
<td>0%</td>
<td>0.19</td>
<td>0.31</td>
<td>98.76%</td>
</tr>
<tr>
<td>2</td>
<td>Pekanbaru, Surabaya, Banjarmasin, Ambon, Jayapura, Manado</td>
<td>0%</td>
<td>0.19</td>
<td>0.31</td>
<td>98.76%</td>
</tr>
<tr>
<td>3</td>
<td>Medan, Surabaya, Banjarmasin, Ambon, Jayapura, Makassar</td>
<td>+14.9%</td>
<td>0.21</td>
<td>0.38</td>
<td>98.39%</td>
</tr>
</tbody>
</table>

Figure 1.a) Optimum Configuration by AnyLogistix (2017)

Figure 1.b) Second-best configuration by AnyLogistix (2017)

Figure 1.c) Configuration by Operational Research

The solutions identified via network optimization experiment in AnyLogistix (2017) will allow a potential cost saving of 15% as compared to the solution prospected by OR, with no impact on lead time.
RESULTS & CONCLUSIONS

Phase 3: Dynamic Simulation

Supply Network was stress-tested on two parameters: Fleet Size and Inventory.

The solutions identified via simulation experiment in AnyLogistix (2017) allowed to compute service level values at various levels of fleet and inventories. A good combination could be 70% of Inventory level and 100% of Fleet size as to have a) High Service level and b) Reasonable impact on Transportation Cost.
RESULTS & CONCLUSIONS

Phase 3: Dynamic Simulation
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- Rapid growth of LSP usage;
- Competition level tremendously high;
- Clear need for LSP to seamlessly and effectively navigate their logistics assets as to gain competitiveness.

1. How to determine the **optimum number of DCs** in the context of a supply network which is meant to serve a **highly populated urban area**?

2. How to decide on the **locations for the DCs** for an optimized supply network?
METHODOLOGICAL APPROACH
An ideal approach towards modeling

**As-is**
- Understanding the existing;
- Identifying bottlenecks and areas for improvement.

**To-be (Ideal)**
- Identifying ideal solution on:
  - No. of DCs;
  - Location of DCs;

**To-be (real)**
- Adjusting the ideal solution based on real-life constraints;
METHODOLOGICAL APPROACH
Framework of Methodology

Focus at date

Phase 1
• Green Field Analysis (GFA) for Identification of number of suitable locations for the nodes

Phase 2
• Network Optimization for Structuring and optimizing the supply network

Phase 3
• Dynamic Simulation for Stress-testing the supply network and measuring performances

Figure 1. Framework of Methodology
To enhance effectiveness, efficiency, and agility of relief chains, prepositioning of stockpiles can be a good strategy to look at;

Proposed decision support frameworks are able to:
- Resolve successfully the facility location problem, and suggest the most cost-effective and time responsive solution;
- Provide managerial insights on transportation and inventory policies;

An integrated approach to decision making is needed since:
- Network optimization provides good strategic support, but only from a static perspective
- Dynamic simulation provides food operational support, but its applications for strategic decision-making has been quite limited

**REMARKS**

**Insights on Case Studies**

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In the humanitarian context, Demand is uncertain.
  - How can AnyLogistix support demand Estimation?
  - How can AnyLogistix be integrated with existing software such as InaSAFE (simulate disaster scenarios and generate data) or GIS Platforms?

Training of users is required;

Lack of easy-to-use platform to translate operational data into AnyLogistix format;

Lack of capabilities to model:
  - Infrastructure availability and development (e.g. port/airport);
  - Intermodal transportation;
Thank You

The Logistics Institute Asia - Pacific
National University of Singapore
21 Heng Mui Keng Terrace #04-01, Singapore 119613, Singapore