A field-driven framework to assess and improve the network flexibility in humanitarian supply chains

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Relief distribution problems?

• Delays; backlogs; duplications; ineffectiveness and inefficiency of operations (time, money, resources)
• They are caused by:
  – Uncertainties; unforeseen changes; other sources of disruptions;
Recommended Solutions?

• Agility? Resilience?
• Network flexibility

– What is network flexibility in humanitarian supply chains?
– How can we measure it?
  ✓ Direct assessment;
  • Through consequences;
Research Design

1. Review literature
2. Develop a literature-driven framework
3. Conduct field research & collect relevant data
4. Implement the framework on a real case
5. Verify the framework elements
6. Interpret and show some rooms for improvement
7. Future research directions
Literature-driven Measurement Framework

Domains
- Product
- Distribution
- Info. Systems
- Resources

Criteria
- Volume
- Mix
- Local supplier
- Assets
- Fleets
- Delivery
- IT support
- Information database
- Decision support systems
- Human resource
- Local partner

Metrics

Evaluation grid
Nepal Field Research

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Nepal
Data collection

• Semi-structured interviews
  – 16; NGOs, iNGOs, UN, RedCross, Government;
  – Country managers, logisticians, information managers;

• Observations
  – Photos and notes;

• Document collection
  – Online sources, newspapers, reports, cluster minutes;
Data analysis

• Qualitative:
  – Content analysis;
• Quantitative:
  – Fuzzy analysis;

Themes that are based on recurring terms and phrases in all collected data

Keywords from literature

Frequency analysis

Map out who said what

Consensus between literature and field

Comparison with literature

Deep analysis of field data

No consensus

Sufficient relevant data to verify the significance and relevance

Insufficient relevant data

Verified list of flexibility domains and criteria

Assessment metrics

Check with interviewees

Analysis of coded data

Evaluation results

Fuzzy analysis (AHP, TOPSIS)

Future research directions
# Results

- **Verified domains for Nepal case (% impact):**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Impact</th>
</tr>
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<tbody>
<tr>
<td>Delivery</td>
<td>23.3%</td>
</tr>
<tr>
<td>Fleets</td>
<td>12.6%</td>
</tr>
<tr>
<td>Decision support systems</td>
<td>11.1%</td>
</tr>
<tr>
<td>Human resource</td>
<td></td>
</tr>
<tr>
<td>Mix</td>
<td></td>
</tr>
<tr>
<td>Local partners</td>
<td></td>
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</tbody>
</table>

- **Overall Flexibility level in 9 studied organizations:**

![Graph showing flexibility levels](image)
Insights

• Interviewed organizations had major problems in distribution and information related criteria;
• Low levels of flexibility limited possibilities to efficiently respond to environmental, political, and operational challenges;
• HSCs' weakness in providing flexibility hinders achieving resiliency and agility;
Rooms for Improvement

- **Not flexible**
  - SatisfactionDegree < 0.3
  - Delivery, InformationTechnology, Fleets, Volume < Poor

- **Poorly flexible**
  - 0.3 ≤ SatisfactionDegree < 0.5
  - Delivery, InformationTechnology, Fleets, Volume ≥ Poor
  - DecisionSupportSystems, Assets, Mix, InformationDatabase, LocalSources, LocalPartners, HumanResources ≥ Medium

- **Semi flexible**
  - 0.5 ≤ SatisfactionDegree < 0.6
  - Delivery, InformationTechnology, Fleets, Volume, DecisionSupportSystems ≥ Medium

- **Flexible**
  - 0.6 ≤ SatisfactionDegree < 0.8
  - Delivery, InformationTechnology, Fleets, Volume, DecisionSupportSystems, Assets ≥ Medium Mix, InformationDatabase, LocalSources, LocalPartners, HumanResources ≥ Medium

- **Highly flexible**
  - SatisfactionDegree ≥ 0.8
  - Delivery, InformationTechnology, Fleets, Volume, DecisionSupportSystems, Assets ≥ Good Mix, InformationDatabase, LocalSources, LocalPartners, HumanResources ≥ Medium
Summary and conclusion

- Without improving flexibility, humanitarian supply chains are prone to disruptions;
- Shortcuts to flexibility: focusing on delivery, IT support, fleets, volume, decision support systems;
- How? Preparing alternative delivery plans, improving access to information and establishing information sharing platforms, enabling multi-modal transportation, sharing assets, and using IT/ICT solutions;
- By considering context characteristics, proposed framework can be adapted for other cases;
Backup 1