Mobile Pictographs for Disaster Communication: Inclusive Public Services

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Why pictographs for inclusive disaster comms?

- ~25% Sub Saharan Africa, ~12% Asia Pacific are illiterate
- ~1.25 billion arrivals in 2016
- Forecast 1.6 billion in 2020
- >75% countries speak >5 languages

Pictographs to serve
- illiterates and functionally illiterates (linguistically challenged)
- Common modality for addressing multiple languages (e.g. alerting)
Inclusive disaster communication requires:

1. Amending national emergency communication plans to support linguistically challenged populations in disaster communication
   a. Include alternative modalities of disaster communication; e.g. pictographs
   b. For share life threatening information; at least, alerting/reporting.

2. Research & Develop national or regional pictograph dictionary (or thesaurus)
   a. To use with ICTs for authorities to alert and public to report incidents
   b. Must be designed for the cultural differences
Research Question

“How do we design symbols, workflows and technology to communicate disaster information through pictographs such that it can be used by linguistically challenged populations?”
Research Agenda

1. Literature Review; Expert Consultations with Disaster Management Professionals

2. Field Studies with Linguistically Challenged Populations (Sri Lanka / Philippines)
   a. Sarvodaya Village Movement, Sri Lanka
   b. Deaf Disaster Assistance Team-Disaster Risk Reduction (DDAT-DRR), Philippines

3. Developed and evaluated a prototypical dictionary (or thesaurus), for flood incidents, with the target users in Sri Lanka and the Philippines
Existing Pictograph Resources

- Usually designed for use on *maps* and/or signage, not for alerting

- Symbols often concentrate on *incident* and omit response actions. Not representing complex situations.

- Designed and evaluated with *professionals* in mind

- *Not* explicitly addressing illiterates / linguistically challenged
Four communities in two countries

Urban Community
Colombo, Sri Lanka

Rural Community
Colombo Region, Sri Lanka

Rural Community
Ratnapura, Sri Lanka

Deaf Community
Cebu City, Philippines
Two Use-Cases

1. Incident Reporting
Person asking for help from the Emergency Management Services indicating hazard (threat) and Immediate Needs

2. Alerting / Warning
Emergency Management Center Warning the Public in the area indicating hazard and required response actions
Pictograph Layout with Mobiles in Mind

- Event (e.g., Rain)
- Incident (e.g., Flood)
- Response Time (e.g., 24:00 hrs)
- Response Action (e.g., Observe)
- Urgency (e.g., “Expected”)
- Severity (e.g., “Extreme”)
- Certainty, (e.g., “Likely”)

6:00
Rain
Flood
What is this and what would you do?

Comprehension by Group - Sri Lanka (n=60)

Comprehension by Group - Philippines (n=20)

Group A

Group B

Group C

Group D
With and Without Context

Comprehension of Flooding

- Adding contextual entities (house and car) adds to comprehension.
- Only 52% understood the meaning without context.

Comprehension and Context

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>14 of 21</td>
</tr>
<tr>
<td>B</td>
<td>14 of 20</td>
</tr>
<tr>
<td>C</td>
<td>10 of 19</td>
</tr>
</tbody>
</table>
Response Actions

- Additionally depicting a response action “evacuate” (right) caused confusion – comprehension rate drops

- However, understanding of what to do (correct response action) slightly increased – even if overall comprehension was lower
Severity Understanding

A
B
C
D
E

Rated Most Severe

Rated Least Severe

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Time Comprehension

- Time representations are generally **not** correctly understood
- Several representations of “for six hours” were tested
- >95% understood this is “about time”, but:
- Comprehension rate: **7.5%** (for “in/for 6 hours”)

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Participants were asked to pick an icon to represent the immediate need for each situation: river is rising, reached a danger level and is flooding.

**Choice of Icon for Immediate Response Needs**

- **Do Nothing**
- **Observe**
- **Evacuate**

<table>
<thead>
<tr>
<th>Situation</th>
<th>Do Nothing</th>
<th>Observe</th>
<th>Evacuate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rising</td>
<td>42</td>
<td>27</td>
<td>10</td>
</tr>
<tr>
<td>Danger</td>
<td>42</td>
<td>32</td>
<td>6</td>
</tr>
<tr>
<td>Flooding</td>
<td>41</td>
<td>32</td>
<td>4</td>
</tr>
</tbody>
</table>

** Participant responses**

- **Rising**: observe or do nothing
- **At Danger level**: mostly observe
- **Flooding**: mostly evacuate but some said observe (perhaps exercise was not understood)

Use a coded water level gauge (colors and numbers)
We asked the participants which of the three symbols would they chose to represent the number of VICTIMS?

- **A** (3.8%): Family
- **B** (37.5%): Family
- **C** (58.8%): People

We asked the participants whether the symbol they chose represented FAMILY or PEOPLE?

- **Family** (45.0%)
- **People** (55.0%)
Local and Cultural Context

Cebuano (Filipino people) living in boathouses perceived the symbol as a rainy day and and strong waves

Evil eye is a kind of black magic that is transmitted on victim overlooking. More precisely, by gazing negative energy and negative thoughts are transferred or transmitted to the targeted person.

Clocks — Bad Luck. In Chinese, saying 'giving a clock' (送钟 sòng zhōng /song jong/) sounds exactly like the Chinese words for 'attending a funeral ritual' (送终 sòng zhōng) and thus it is bad luck to gift clocks or watches.

Money vs OK - local symbol for money
Conclusion

- **Local Design:**
  - Pictographs must be designed locally with target audiences to address cultural differences

- **User-centered Symbology**
  - Usual recommendations for icon design might not hold for illiterates due to deficiencies in abstraction and categorization

- **Level of abstraction**
  - Choosing level of abstraction is crucial due to different cultural background and experiences

- **Time and Numbers:**
  - Abstract concepts like time and numbers must be handled with care – important, but hard to communicate clearly

- **Response actions**
  - Usually not considered, but crucial part of the information

- **Limited success**
  - Evaluations do not show required comprehension rates, even with professionals
Thank you!

More information at project page:
www.sahanafoundation.org/pictographs

Literature survey available:
www.researchgate.net/project/Pictographs-for-Disaster-Communication

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