Lessons Learned from Creating a Mobile Version of an Educational Board Game to Increase Situational Awareness

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PROBLEM SITUATION IN LOGISTICS

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Terminal operations are complex and vulnerable

Dobner et al, 2001
Internal disruptions

External disruptions

www.portstrategy.com

APP.com

setsail.com

usnews.nbc.com, 2012

TIB,Wa

The Huffington Post, 2002

www.cargolaw.com
## Challenges in disruption mitigation

<table>
<thead>
<tr>
<th>We need</th>
<th>We have</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant information sharing</td>
<td>Insufficient or excessive information</td>
</tr>
<tr>
<td>Maintaining safe operating environment</td>
<td>Lack of overview on interdependencies in standalone departments</td>
</tr>
<tr>
<td>Satisfying customers and economics</td>
<td>Individualistic sense of urgency and action</td>
</tr>
<tr>
<td>Fast and good decisions</td>
<td>Redundant and contradicting decisions</td>
</tr>
</tbody>
</table>
SALOMO – Situational Awareness for Logistic Multimodal Operations

Mission:

Empower the terminals in the Port of Rotterdam and their hinterland connections by facilitating better decisions and planning through increased situational awareness.
SITUATIONAL AWARENESS
Situational Awareness

Dynamic (Emergent) Situation Awareness
Observe/Regulate -> Analyse -> Synthesize
(coordination, negotiation etc.)

Distributed Situation Awareness
(Themes, topics, compatibility, transactions, activated knowledge)

Team/Shared Situation Awareness
(Individual and team processes: Shared mental models, communication, cooperation)

Situation Awareness
Perception → Comprehension → Prediction

Towards Situational Awareness in Multi-stakeholder Systems
Idea: Gaming to train professionals to move towards Shared Situational Awareness (SSA)

• Concepts of systems thinking and SSA embedded in game
  → Multi user game

• Training towards systems thinking
  → Conflicting game goals

• Users can learn from experience
  → Communicative game elements

• Gaming as tool for prediction of operator performance
  → Individual decisions and scorings
Phase 1

Design and Experience

BOARD GAME
SALOMO Board Game
Game design

Roles

- **Control tower**: overview, permissions to other actions
- **Vessel planner**: plans the unloading and loading of the ship
- **Yard planner**: decides the storage positions for containers
- **Sales**: responsible for the bookings and financial transactions between the clients and the terminal
- **Resource planner**: Assigns resources to each vessel

Different responsibilities, partly conflicting goals
SALOMO Board Game

Game design

Game goal

Generate situational awareness among different roles to improve their behaviour in disruption situations

Approach

Give increasing access to communication means during the game process
Game pieces

Boards
- Individual game boards
- Overall game boards

Cards
- Information cards
- Decision cards
- Joker cards
- Game leader score cards

Items
- Pawns
- Rolling dice
- Stopwatch
- Communication tokens

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Results for the board game

Benefits
- Game was experienced as well balanced and fun to play
- Game was valued as an excellent training tool to learn about challenges in container terminal operations (awareness)

Issues
- Human game master required to guide the game limits applicability and scalability
- Game results are not automatically collected for debriefing
- Scenario unrealistic as all players are present in a single room
Phase 2

Transfer of the board game into a MOBILE SERIOUS GAME
Mobile game design requirements

Follow board game process
- Multi-role design
- Individual notifications
- Individual decisions
- Communication means

Improve design
- Automate game master
- Allow players to be distributed
- Introduce message style communication
SALOMO ARLearn Game
Game design – Level 1

Vessel Manager

Yard Planner

Control Tower

Resource Manager

Sales

Group Introduction

Individual Information → Personal Decision

Individual Information → Personal Decision

Individual Information → Personal Decision

Individual Information → Personal Decision

Group Evaluation, Score Calculation & Next Round Introduction
SALOMO ARLearn Game
Game design – Level 2
ARLearn – A platform for multi-user, multi-role mobile learning games

• Sensor enabled (location, camera, QR)
• Multi-user, multi-role game play
• Clients for Android and iOS
• Authoring environment
• Open Source

http://ou.nl/arlearn
https://code.google.com/p/arlearn/
SALOMO ARLearn Game

**Version 1: Board game**

**Version 2: Mobile game** in ARLearn

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## Mobile Game Results (1/2): Achievements

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Board Game</th>
<th>Mobile Game</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process / Scalability</td>
<td>Depends on educated master</td>
<td>Automated &amp; Distributable</td>
</tr>
<tr>
<td>Location</td>
<td>Played at one location</td>
<td>Players can be distributed</td>
</tr>
<tr>
<td>Introduction</td>
<td>Explained by game master</td>
<td>Explained through in-game tutorial</td>
</tr>
<tr>
<td>Debriefing</td>
<td>Game master collects data and gives feedback</td>
<td>Data collection automated. Debriefing guided by trainer</td>
</tr>
<tr>
<td>Reusability &amp; variability</td>
<td>Fixed number of scenarios, variations require new game</td>
<td>Authoring tool allows development of variants</td>
</tr>
</tbody>
</table>
## Mobile Game Results (2/2): New Issues

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Board Game</th>
<th>Mobile Game</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group experience</strong></td>
<td>Informal communication between local players</td>
<td>Lack of informal communication, lack of motivation for communication</td>
</tr>
<tr>
<td><strong>Realism</strong></td>
<td>Game setting different from daily work situation</td>
<td>Isolated situation more realistic but direct feedback missing</td>
</tr>
<tr>
<td><strong>Complexity of role definitions</strong></td>
<td>Players observe each other and game master supports understanding throughout the game</td>
<td>Isolated players have a less clear picture of the role concept</td>
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</table>
Phase 3

Re-Designing

MOBILE GAME
## Re-Design Goals and Means

<table>
<thead>
<tr>
<th>Design goal</th>
<th>Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain player independence</td>
<td>Less synchronised game process</td>
</tr>
<tr>
<td>Clearly motivate communication</td>
<td>Reward effective communication instead of limiting communication tokens</td>
</tr>
<tr>
<td>Give feedback for effects of decisions &amp; communications</td>
<td>Players need to know, if a message is received in time and was perceived as valuable</td>
</tr>
<tr>
<td>Direct measurement of communication</td>
<td>Raise awareness about the level of on-going communication</td>
</tr>
<tr>
<td>Simplify role definitions</td>
<td>Reduce the number of roles</td>
</tr>
</tbody>
</table>
Re-Designed Game-Process

Yard Planner

Individual Information → Personal Decision → Individual Information

Controller

Individual Information → Msg → Personal Decision → Individual Information

Sales

Individual Information → Personal Decision → ++ → Individual Information

Feed back

Individual Information → Personal Decision → -- → Individual Information
Conclusions

Creating a mobile training game from a board game creates a whole new situation wrt.

• Communication
• Feedback
• Motivation
• Awareness

Evaluation of re-designed game (phase 3) yet to be performed
THANK YOU!

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