SALOMO – Situational awareness for logistic multimodal operations

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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 shared situational awareness as well as better trained staff able to *flexibly* deal with dynamic circumstances.

• Develop and test 8 *innovations* to improve shared situational awareness in multi-stakeholder settings
Containers in global transport

→ Maritime transport handles over 80 per cent of the volume of global trade

→ Backbone of world economy

→ 62% of dry cargo transported in containers

→ Containers - Massive growth: 600% in 20 years

Source: UNCTAD Review of Maritime Transport
Ship sizes are increasing

1996 Regina Maersk Class
7,100 TEU

1997 Sovereign Maersk Class
8,100 TEU

2006 Emma Maersk Class
15,500 TEU

2013 Maersk Triple-E Class
18,000 TEU

- but unloading + loading times have remained constant at 24 hours (!)
  - more cranes per ship, twin lift, dual hoist -> complex scheduling problems

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http://www.worldslargestship.com/the-ship/#page/economy-of-scale/big-thinking
Ship sizes are increasing. US ports not...
PROBLEM SITUATION IN LOGISTICS
Container Logistics

- Container terminal: A location for transshipment, import-export and temporary storage of containers
- Container Terminal is a **key interface** in the global transport network
- Sub-systems, operations and equipment
- Complex processes and procedures
Internal disruptions

External disruptions

APP.com

The Huffington Post, 2002

www.portstrategy.com

usnews.nbc.com, 2012

www.cargolaw.com

The Huffington Post, 2002

TIB, Wa
Decision making when disruptions strike

• Complex, chaotic
• Not enough preparedness
• Individualistic sense of urgency and action
<table>
<thead>
<tr>
<th>Challenges in disruption mitigation</th>
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<tbody>
<tr>
<td><strong>We need:</strong></td>
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<tr>
<td>• Relevant information sharing</td>
</tr>
<tr>
<td>• Maintaining safe operating enviroment</td>
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<tr>
<td>• Satisfying customers and economics</td>
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<td>• Fast and good decisions</td>
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<tr>
<td><strong>We have:</strong></td>
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<tr>
<td>• Insufficient or excessive information</td>
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<tr>
<td>• Lack of overview on interdependencies in standalone departments</td>
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<tr>
<td>• Individualistic sense of urgency and action</td>
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<td>• Redundant and contradicting decisions</td>
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Situation Awareness and Integrated Planning

SALOMO APPROACH
Integrated planning

Key requirements

• Systems thinking
• Shared / Distributed Situational Awareness
• Communication and Coordination

(Staton et al., 2008)
Situation Awareness and Integrated Planning

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
Gaming to train professionals to move towards Integrated Planning

- Platform to understand the importance of integrated planning
- Concepts of systems thinking and SSA embedded in game
- Training towards systems thinking
- Users can learn from experience
- Training both for situational awareness as well as integrated planning
- Gaming as tool for prediction of operator performance
SALOMO RESULTS

Board Game, Micro Games, ARLearn

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Result 1 – 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
Result 1 – 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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Result 1 – SALOMO Board Game
Result 2 – SALOMO ARLearn Game
Game design – Level 1

Diagram showing the flow of information and decision-making for different roles:
- Vessel Manager
- Yard Planner
- Control Tower
- Resource Manager
- Sales

Steps include:
1. Individual Information
2. Decision
3. Group Introduction
4. Individual Information
5. Decision
6. Group Introduction
7. Individual Information
8. Decision
9. Group Introduction
10. Individual Information
11. Decision
Result 2 – SALOMO ARLearn Game
Game design – Level 2
Result 2 – SALOMO ARLearn Game

Version 1: Board game

Version 2: Mobile game in ARLearn
The main goal of simulation games is to simulate the actors’ decision-making process and to demonstrate the (long term) consequences within complex systems (e.g., within a company).
Simulation of inter-port dependencies

Circle Lines
(InThere)
Result 3 – SALOMO Simulation- / Microgames

Score: 1126

Answer the need for short, flexible and engaging learning activities

Yard Crane Scheduler (InThere)

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Test sessions and evaluation

Expert validation ($t = 6$) on the balanced design of the game

User group tests ($t = 90$) on the playability of the game and its usability as a tool to support awareness and communication within container terminal operations
Results for “The game as a training tool”

- 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)
- Limitations due to its level of abstraction
Result 4 – SALOMO Disruption Manager

- Scalable problem solving process that can be used by multiple stakeholders
- Mobile participation possible
- Invite of additional experts
- Scaling up when problem is larger or risks increase
... and next steps

Developing further Microgames for the transport and logistics domain and others

Conduct more tests with expert user groups

Develop evaluation method for long-term effects
Thank you!

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