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SWARMPORT – D3: SERIOUS GAME BLUEPRINT

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PROJECT SHEET

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SWARMPORT

D3: Serious Game Blueprint

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› SWARMPORT BACKGROUND

Seaports provide a range of services that together support the turnaround process of ships, including positioning, piloting, mooring and bunkering or fuelling. As a short turnaround time for cargo vessels is one of the key factors determining the competitiveness of ports, a well-organized chain of nautical services is essential. The performance of this service chain will depend on the dynamic nature of the demand for services (volume and size of ships), external circumstances (e.g. weather), the capabilities of individual agents within the chain as well as on the collaboration between them. Performance can be enhanced in different ways, including through process agreements, information exchange, and regulations.

The handling of ships at deep sea ports is a sophisticated process in which a number of parties are involved. It is a costly process with respect to direct handling costs incurred by the services (terminals, piloting, tugboats), as well as indirect costs (costs of deep sea ships' time, cost related to cargo, etc). Gains in efficiency in the handling process are welcomed by the stakeholders; it is also a primary interest of the port authority, as port efficiency influences the competitiveness of a port.

Port operations are going through a major transition from paper-based to digital systems, where business processes are continuously being improved. Most of these improvements are incremental, which has the advantage of low investment costs but the disadvantage of limited scalability and connectivity by lack of system level redesign or vision on system evolution. The Port Authority has the responsibility to oversee the long term future of the port's information infrastructure and the safety, security and efficiency of port operations.

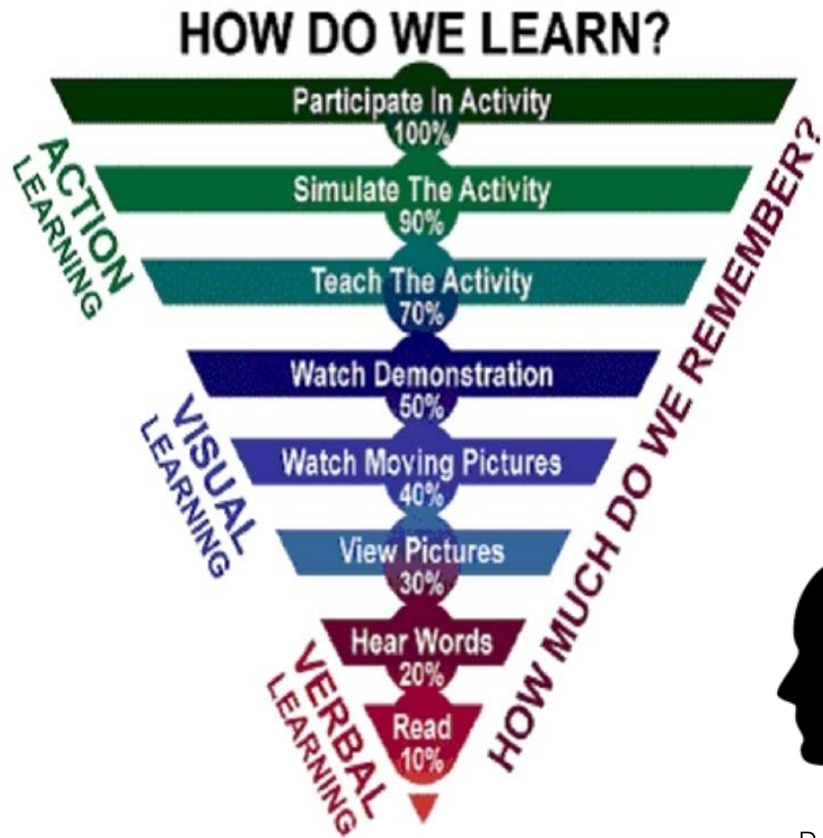
SWARMPORT uses agent based modelling and simulation to allow for the analysis of changes in behaviour/operations of the stakeholders in this complex system. To convey the results to the stakeholders, a serious game – experience the changes – is considered a strong addition to presenting the results of the analysis. For that reason the design of a game concept/blueprint is incorporated in the project activities.

› CONTENTS

- › Serious gaming for logistics
- › Swarmport background information
- › Potential game concepts
- › Swarmport serious game design
- › Swarmport serious game blueprint

SERIOUS GAMING FOR LOGISTICS

› SERIOUS GAMING



Raise awareness



Stimulate collaboration



Generate new ideas



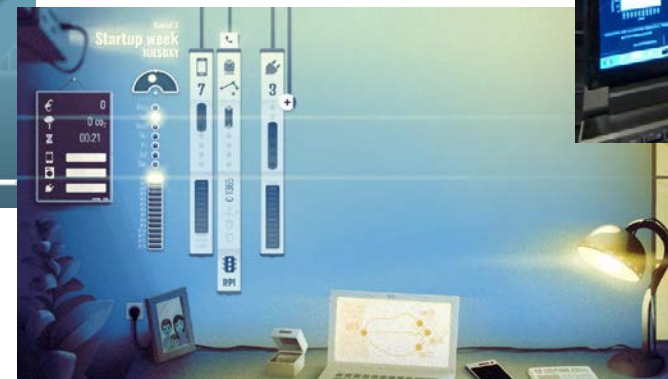
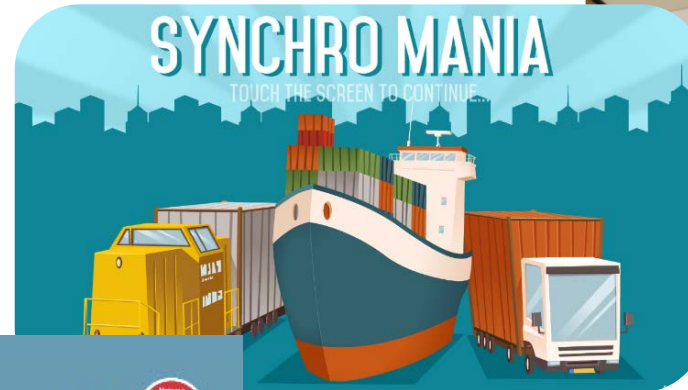
Experiment in a safe environment



Education and training

› OVERVIEW OF LOGISTICS SERIOUS GAMES AT TNO

- › SynchroMania
- › MasterShipper
- › Solve it!
- › Rail Cargo Challenge Rotterdam
- › Rail Cargo Challenge Amsterdam
- › In vloeiende vaart
- › The Chain Game



› EXPERIENCES

- › [Testimonial video Rail Cargo Challenge Amsterdam](#)



- › [Testimonial video MasterShipper](#)



SWARMPORT BACKGROUND INFORMATION

› SWARMPORT: LOGISTICS OF DEEPSEA SHIP HANDLING PROCESSES

- › Seaports provide a range of services for carriers
- › Short and reliable turnaround time is a key for port competitiveness

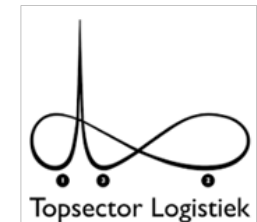
- › Port performance depends on external factors
 - › Weather
 - › Demand

- › And internal
 - › Collaboration
 - › Enhanced planning

- › Performance improvement through (among others) process agreements, collaborative planning, information exchange, regulation

› SWARMPORT PROJECT

- › TU Delft
 - › Analyzing port nautical chain processes
- › Maastricht University
 - › Self-learning methods in port nautical chain
- › TNO
 - › Validating and implementing model development
 - › Prototype simulation model
 - › Blueprint of a serious game



› ACTIVITIES WITHIN TNO

- › Task 1. An autonomous and portable model on the basis of the research output
- › Task 2. Demonstrate applicability and validity of the port model for third parties
- › **Task 3. Blueprint for a serious game**
- › Task 4. Roadmap and valorization plan

Task 3. Blueprint for a serious game

This slide deck is the deliverable for task 3 Blueprint

› SWARMPORT SIMULATION MODEL

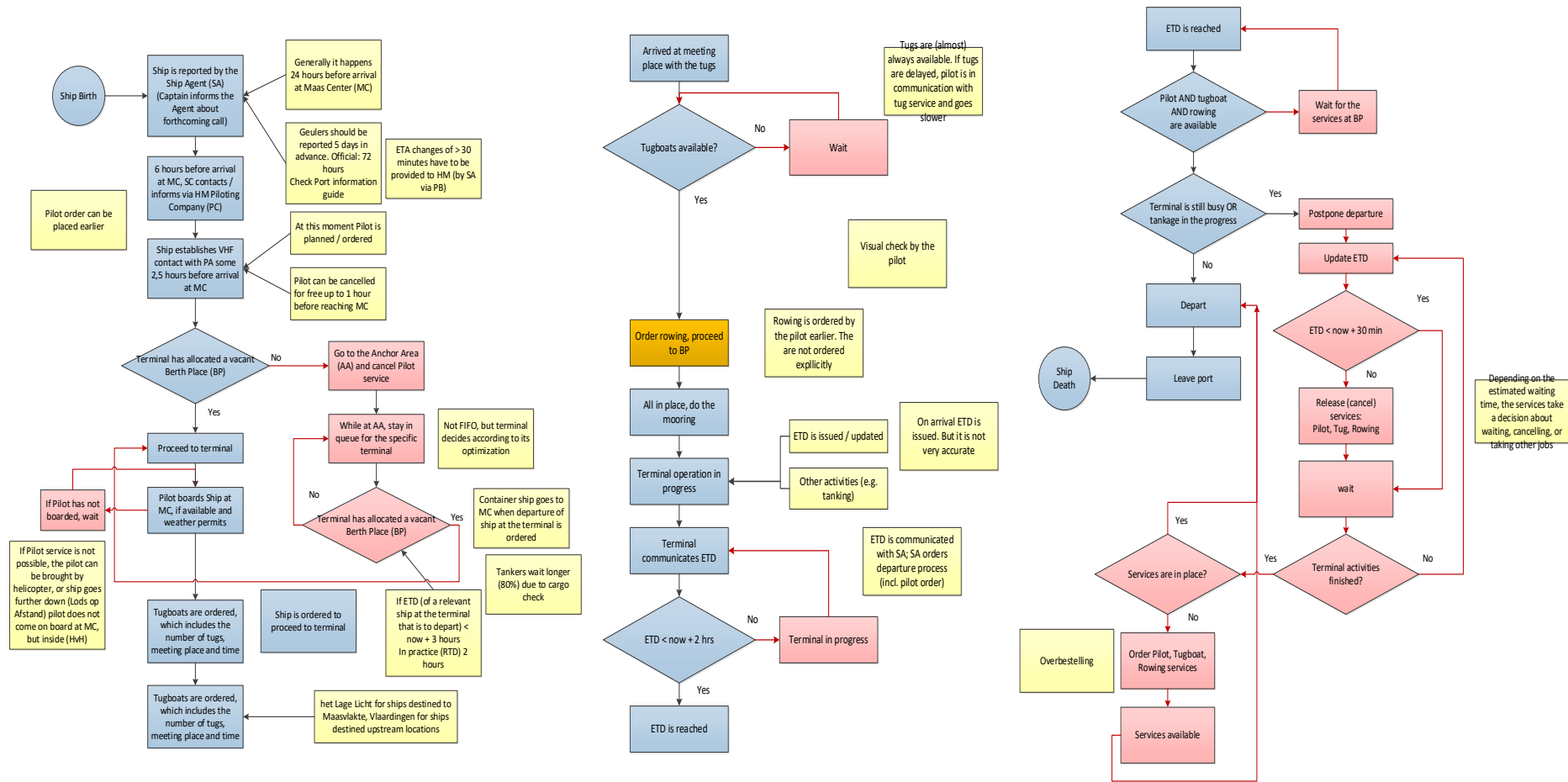
Application of simulation model

- › Two modes of operation
 - › Detailed visualization of agents and process in semi-realtime
 - › Simulation of long time periods to determine e.g. annual KPI's – scenario wise

The simulation model will be used to quantify impact of measures that can be attained from serious gaming workshops

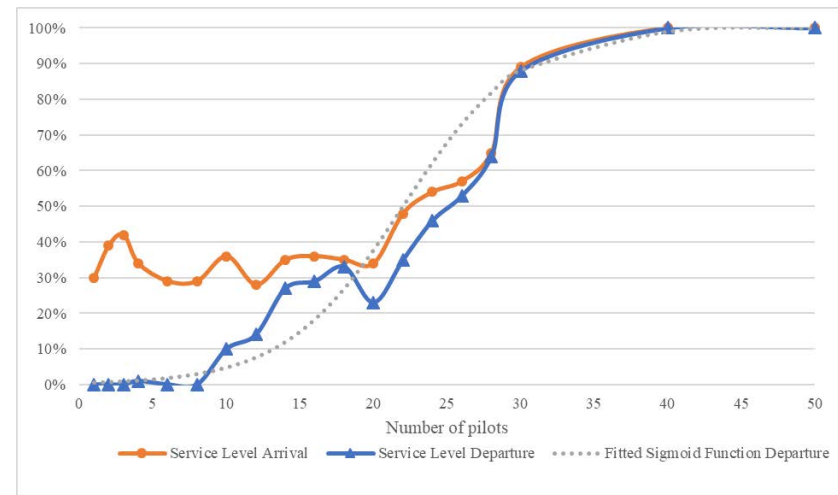
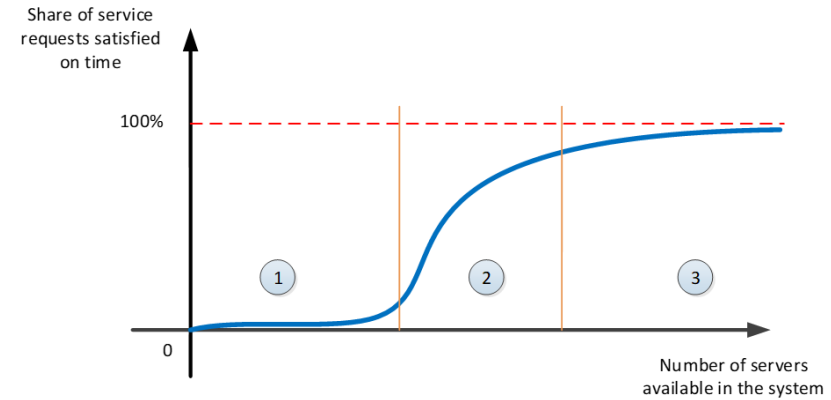
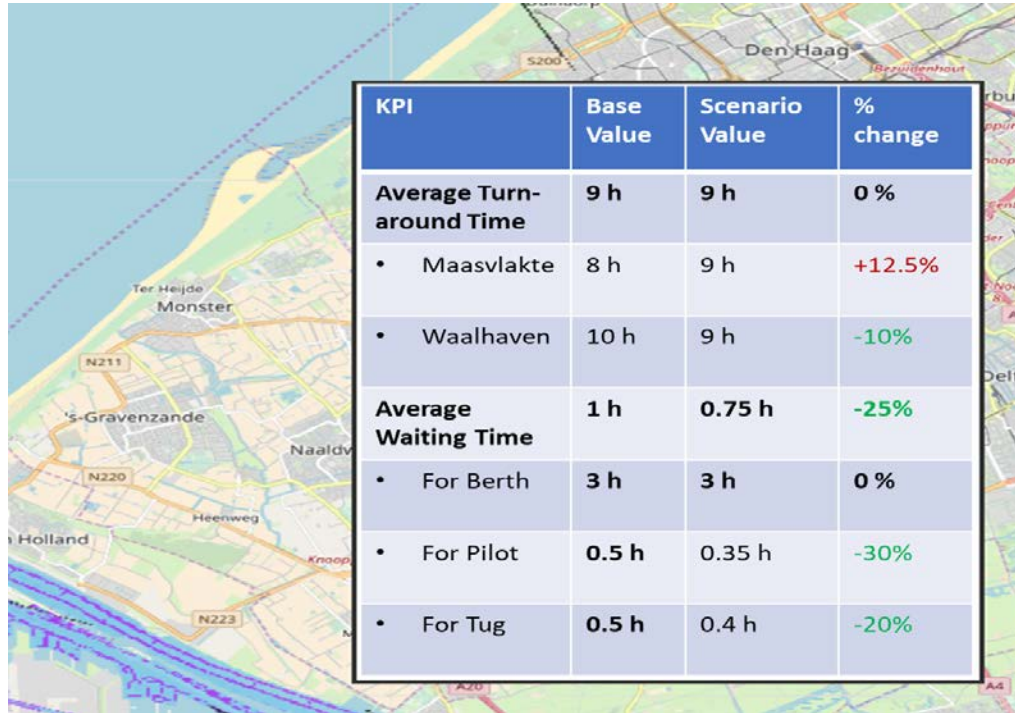


MAPPING OF SIMULATED PORT PROCESSES



The port processes are complex and do not allow, except for very special cases, an analytical approach.

EXAMPLE OF SWARMPORT SIMULATION RESULTS



› The simulation results will be visualized in tables and graphs.

SWARMPORT SERIOUS GAME DESIGN

- › **Objective**
- › **Target audience**
- › **Features**
- › **Scope**

› OBJECTIVE

Main objective: discuss the competitiveness of the port of Rotterdam and create mutual understanding and cooperation between the stakeholders in the nautical service chain

Sub objectives:

1. Get insight in your own and each other's interests within the system.
2. Identify possible improvements and experience their impact on performance of yourself, the other stakeholders and the port as a whole.

› TARGET AUDIENCE

Stakeholders in the nautical process in the port

- › Port Authority
- › Harbour Master
- › Pilotage
- › Tugboat companies
- › Terminals
- › Ship agents (representing the shipping lines visiting the port of Rotterdam)
- › Linesmen

› TARGET AUDIENCE - CHARACTERISTICS

- › Familiar with the nautical processes (in general)
- › Not yet familiar with serious gaming
- › Different stakeholders might know each other personally (e.g. pilots know the tug boat captains)
- › Most participants are male (>90%)
- › Most pilots have had a career as captain or first officer on deepsea vessels
- › Terminals are not only focussed on nautical processes, but also stack management, hinterland transport, etc.

› FEATURES

- › **Type:** board game, digital support possible
- › **Duration:** 1.5 to 2 hours (including introduction and discussion)
- › **Participants:** 4 to 16 players
- › **Location:** portable
- › **Requirements:** table(s) for the players; side table(s) for the game leader; projector / screen for presentation of game rules
- › **Language:** English
- › **Extensibility:** other not competing ports or other target groups (e.g. educational organizations)

› SCOPE

Processes and parties

- › All seagoing vessels entering and leaving the port that require nautical services (e.g. containers, tankers, bulk)
- › Nautical services: pilotage, tugging, terminal operations, vessel traffic management

In scope:

- › Increasing port attractiveness by improving the port performance at system level

Not in scope

- › Improving and optimizing internal processes of individual stakeholders and organizations

CHOICE OF GAME CONCEPT

- › Options
- › Pros and cons

› OPTIONAL GAME CONCEPTS (1/2)

- › Concept A: Operational planning of port processes
 - › **Player perspective:** Nautical actors; pilots, tugboats, terminals
 - › **Game play:** Day by day scheduling of operations
 - › **Game type:** Single player on operational level
- › Concept B: Port process simulation game
 - › **Players perspective:** Nautical actors; pilots, tugboats, terminals
 - › **Game play:** Simulating daily execution of processes; executing processes ship by ship
 - › **Game type:** Multi player table top on operational level
- › Concept C: Redesign port processes
 - › **Player perspective:** Port Authority: 'god mode'
 - › **Game play:** Redesign setup of port processes from scratch
 - › **Game type:** Single player on strategic level

› OPTIONAL GAME CONCEPTS (2/2)

› Concept D: Harbour selection by shipping line

- › **Players perspective** Shipping line
- › **Game play:** Pick ports to plan port calls based upon port attractiveness and port performance
- › **Game type:** Tactical

› Concept E: Strategic port actor investment game

- › **Player perspective:** Nautical actors; pilots, tugboats, harbour master and terminals
- › **Game play:** Periodic investments with impact on port performance and subsequent port attractiveness
- › **Game type:** Multiplayer (multi-team) table top on strategic level

› PROS AND CONS

Concept A and B

- › Operational level concepts do not surface the problems at the desired level, they are too detailed for the desired discussion.
- › Operational processes require specific operational knowledge from the players and are inherently complex; an abstract game version would easily lead discussion away from the right problems.

Concept C

- › The game suggests to look for a completely different harbour design instead of better understanding of current processes and identifying improvement potential.

Concept D

- › The game could create better understanding of port competition, however the concept does not lead to an understanding of current processes and identifying improvement potential at the required level.

Concept E

- › The game leads to negotiations and collaborative investment decisions on the required level. Subsequent discussion leads to the desired involvement and mutual understanding.

*By trialing and discussion **Concept E** was chosen for development of the blueprint.*

SWARMPORT SERIOUS GAME BLUEPRINT (CONCEPT E)

- › **Gameplay**
- › **Description**

› GAME INTRODUCTION

We live in a competitive world. Two ports, A and B, are close to each other and both serve several shipping lines. In each port a team consisting of the Harbour Master, Pilotage, Terminal and Tugboats assure safe passage, handling and moorage of ships. It is your task as a team to remain at the top of your league. If you do not invest, you risk losing market share, i.e. port visits, to the other port.

› GAMEPLAY (1/2)

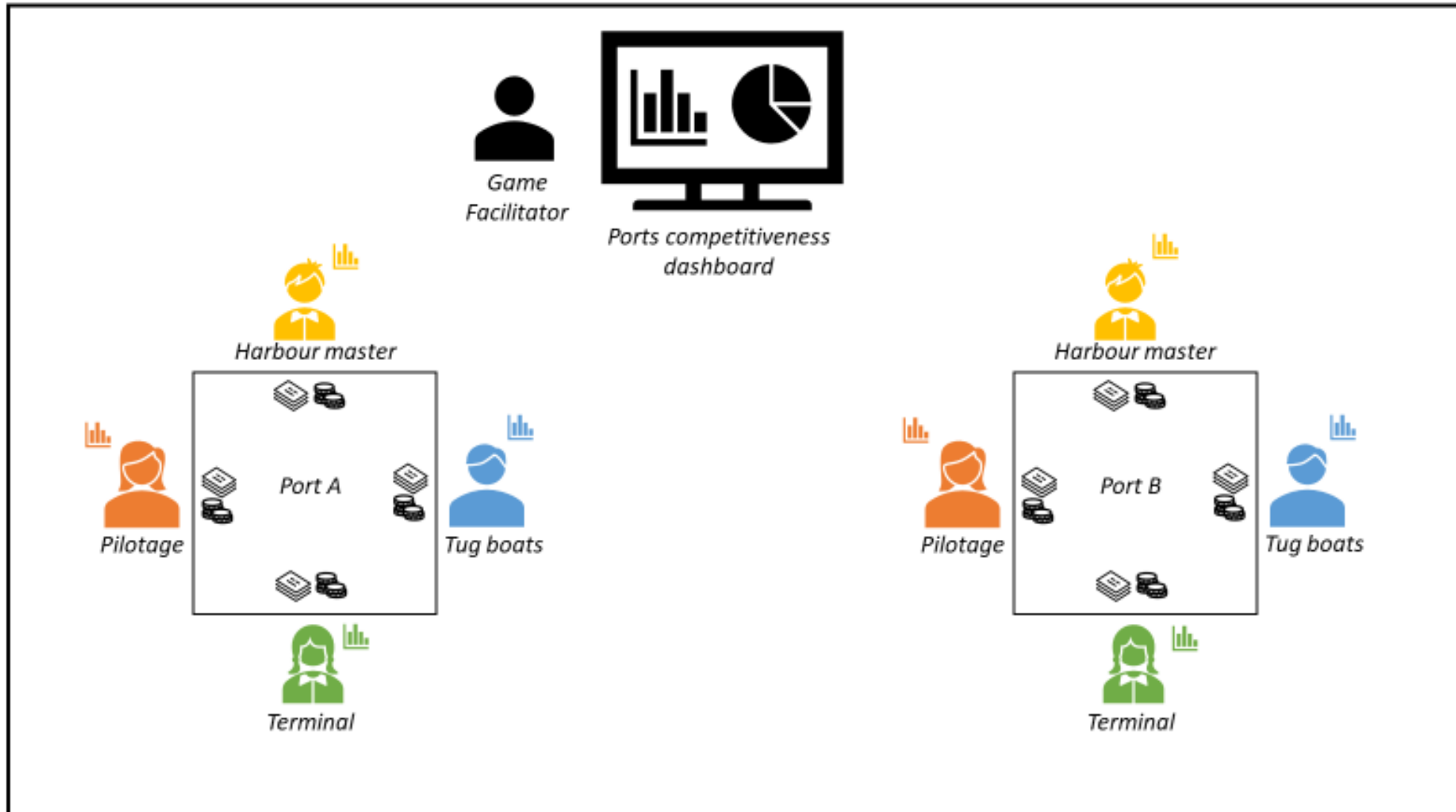
- › Multiplayer boardgame (team competition)
- › Roles:
 - › Terminal
 - › Pilotage
 - › Tugboats
 - › Harbour Master
- › External role: shipping agent (representing the shipping company and choosing the most attractive port)
- › Improve the nautical processes in case of disturbances: increase the robustness of the port.
- › Different ports (teams) compete against each other (or against a benchmark/computer) to become the most attractive port in the region.

› GAMEPLAY (2/2)

- › Each round represents one year (15 minutes).
- › During one gaming session four rounds will be played.

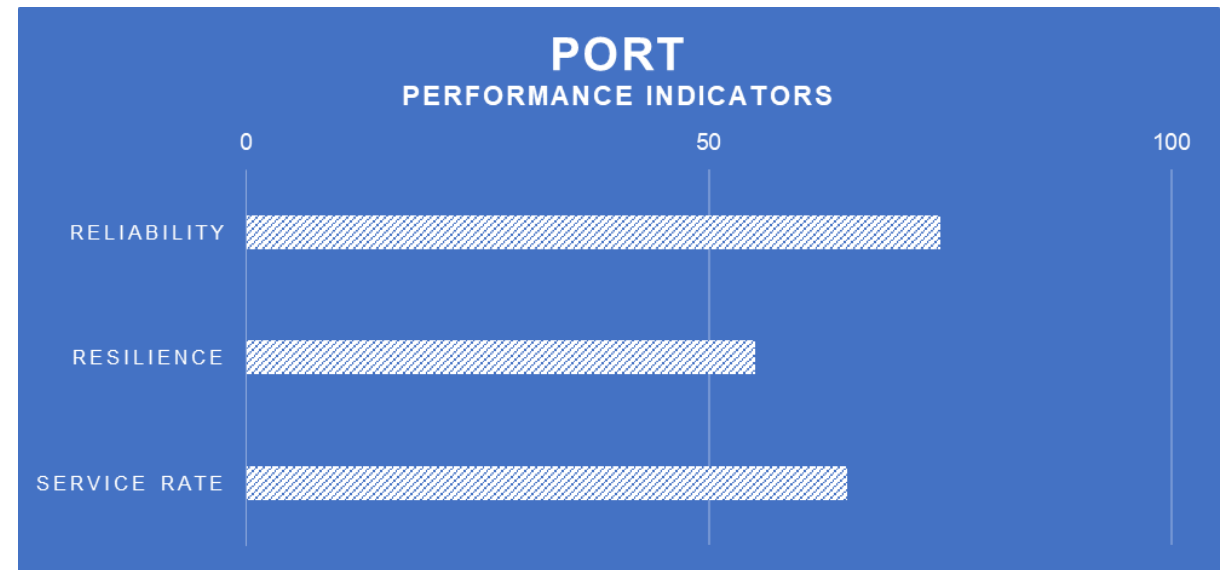
- › Each round consists of the following steps:
 1. Buy individual or common investments (action cards)
 2. Impact of the investments is shown on the individual and system KPI's
 3. A negative event occurs
 4. Impact of the event is shown on the individual and system KPI's
 5. Evaluate the competitive positions of the different ports (in case of competing teams or against a benchmark)

GAME SETTING

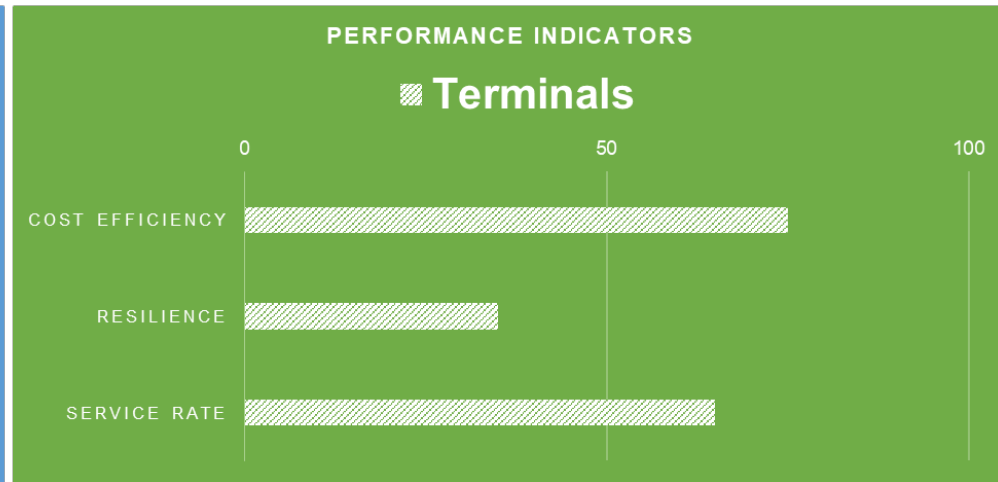
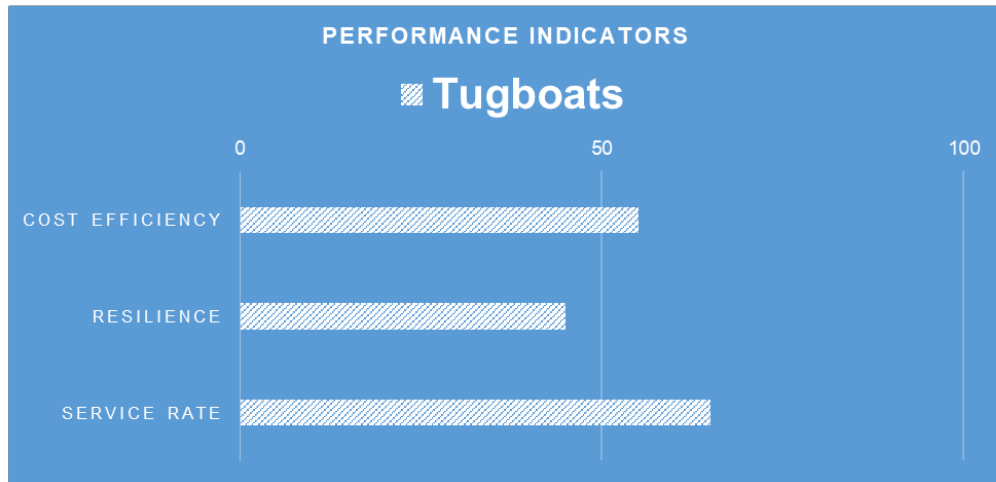
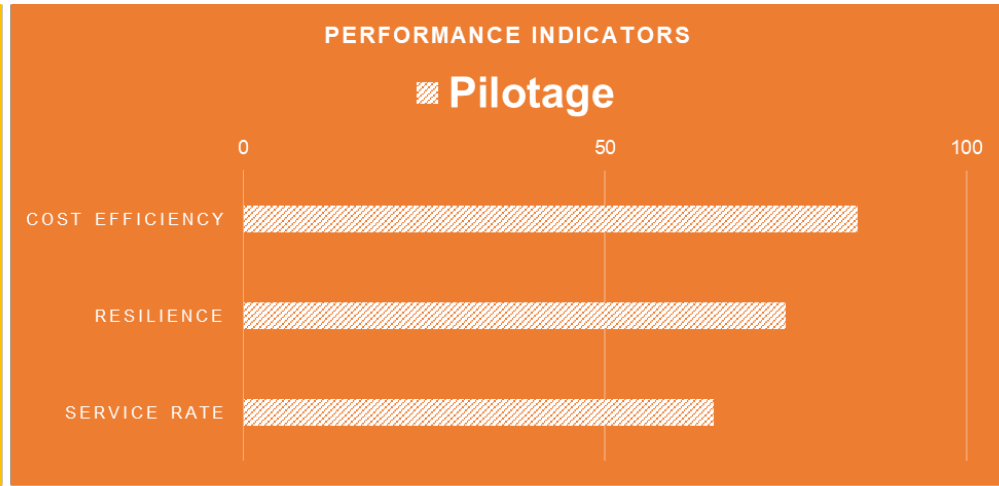
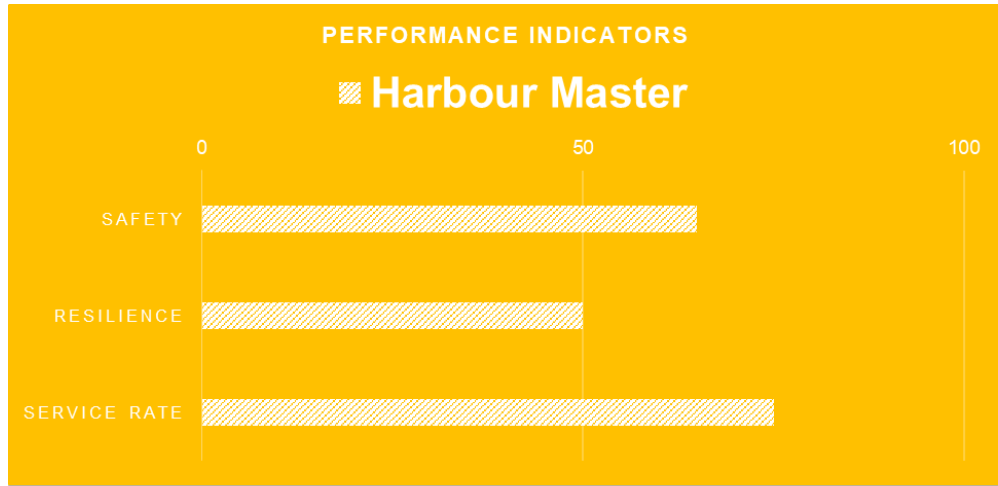


› PORT REPUTATION: SYSTEM KPI'S

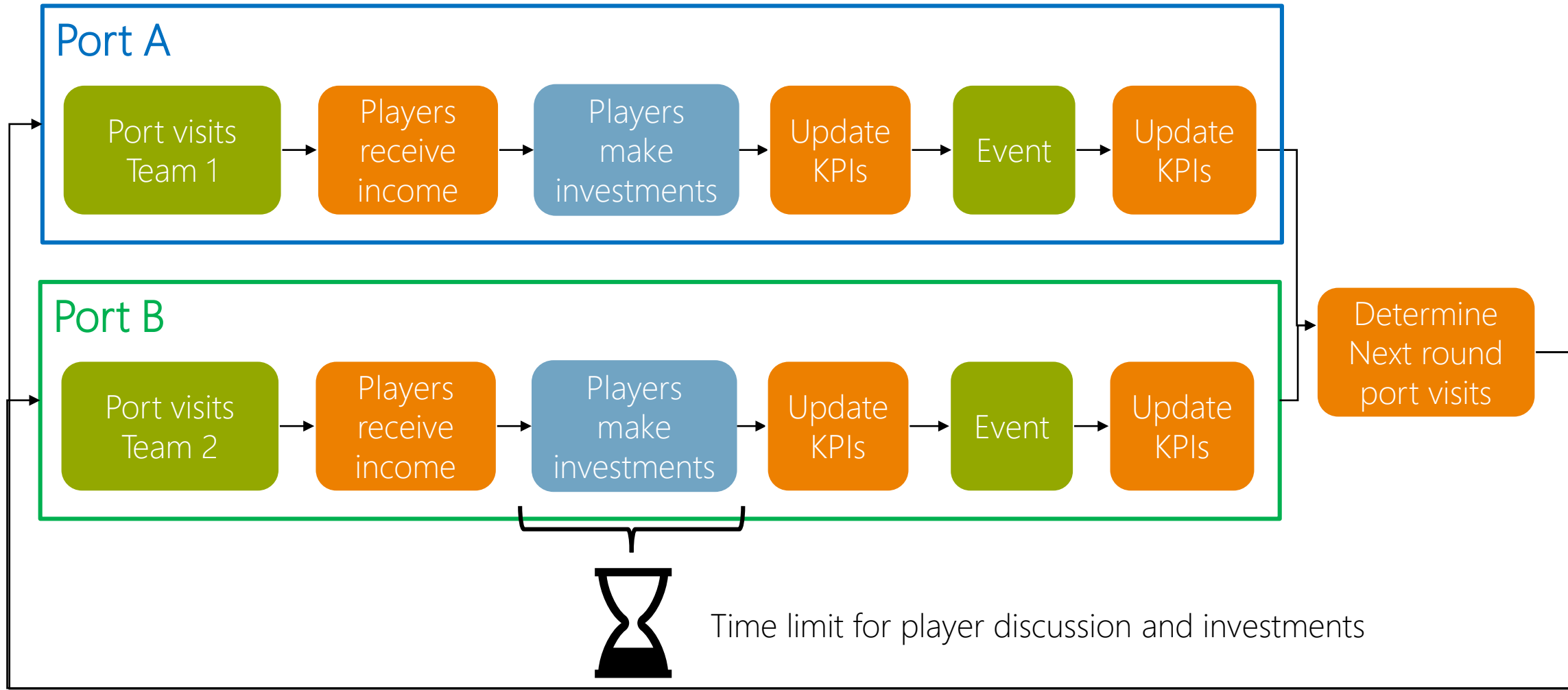
- › Reliability
 - › Attractiveness which results in more port calls
- › Resilience
 - › Quick and cost-effective recovery after an incident
- › Service rate
 - › Decrease leadtime per vessel, minimize waiting times



PLAYER PERFORMANCE INDICATORS

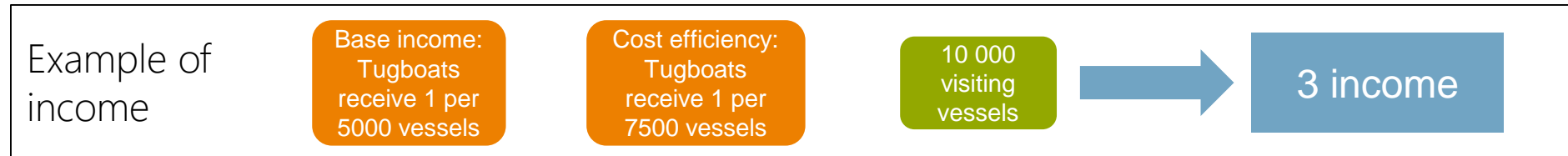


› ACTIONS PER ROUND

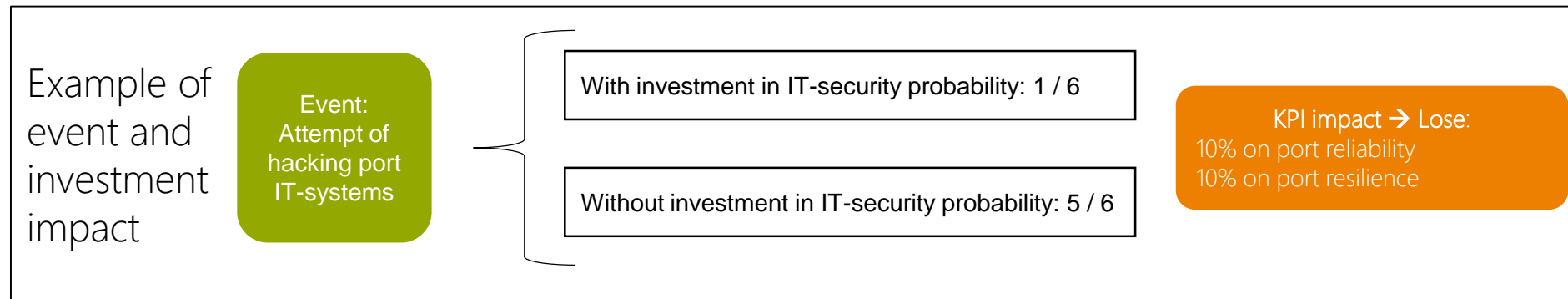


SKETCH OF THE RULES

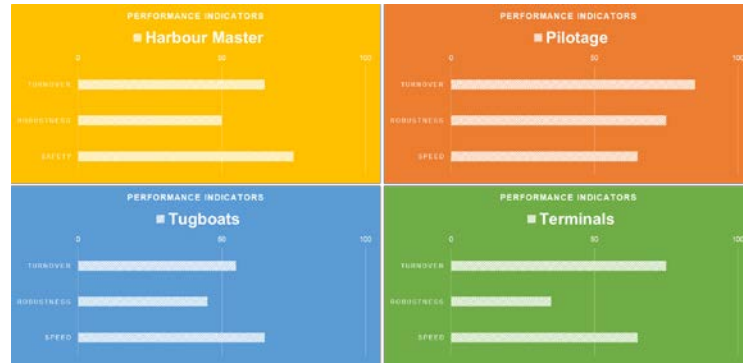
- › Every player gets an investment budget per round (different amount per player).
- › The amount of budget depends on the cost efficiency KPI of that player and on the number of vessels visiting the port, which is determined by the competitiveness of the port (team) as a whole.



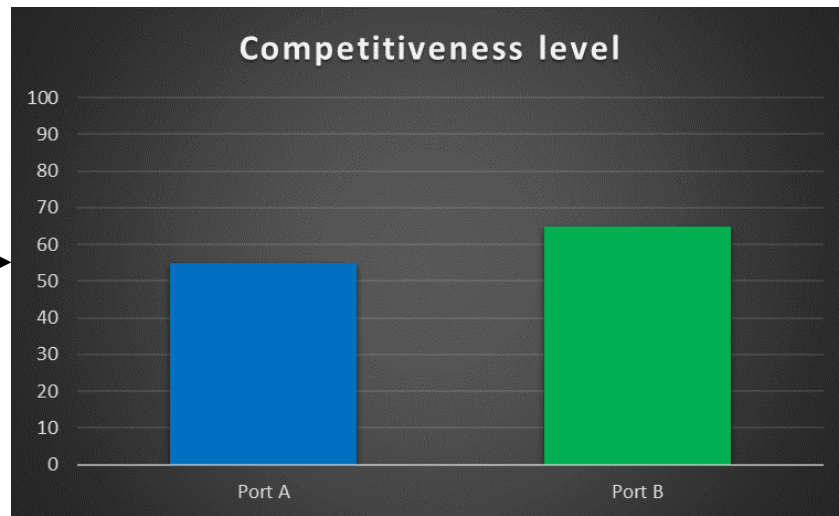
- › Events are drawn at random and the impact depends on the investments that have been made by the players.
- › Investments influence the KPI's of players and/or the port, also some investments impact the probability of a specific event (rolling a dice) or investments impact the severity of events (rolling a dice).



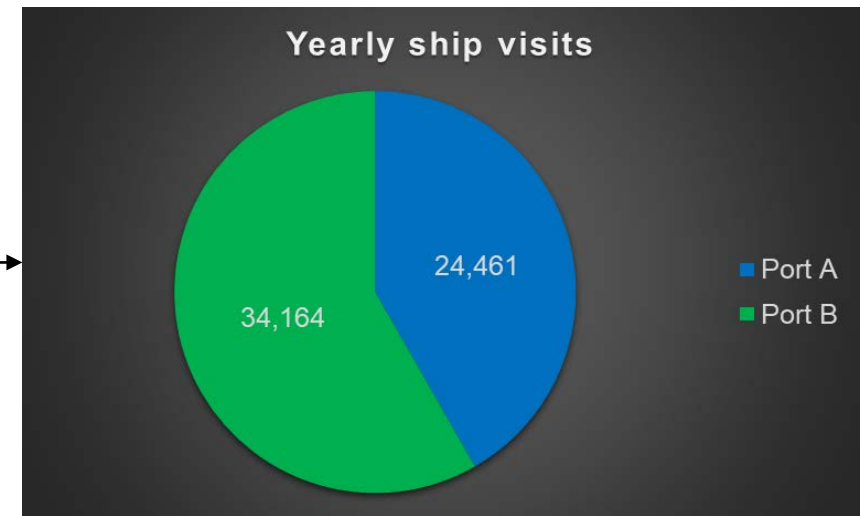
DETERMINE NEXT ROUND PORT VISITS; IMPACT OF KPI'S



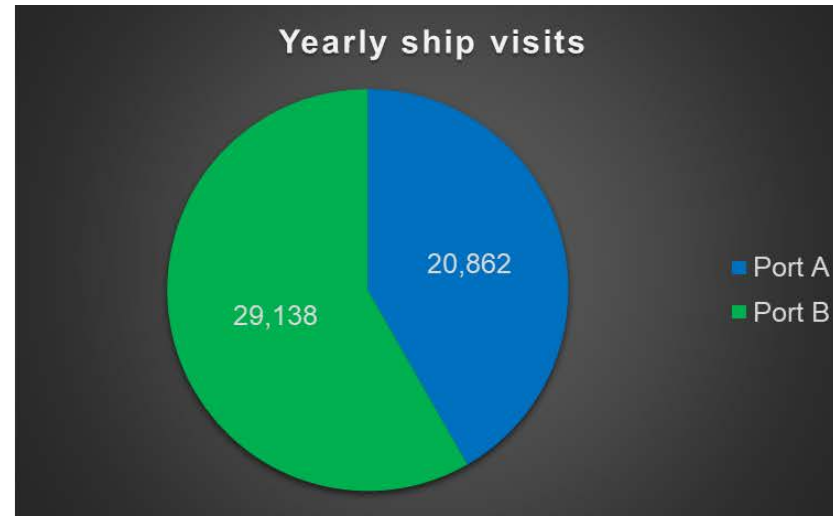
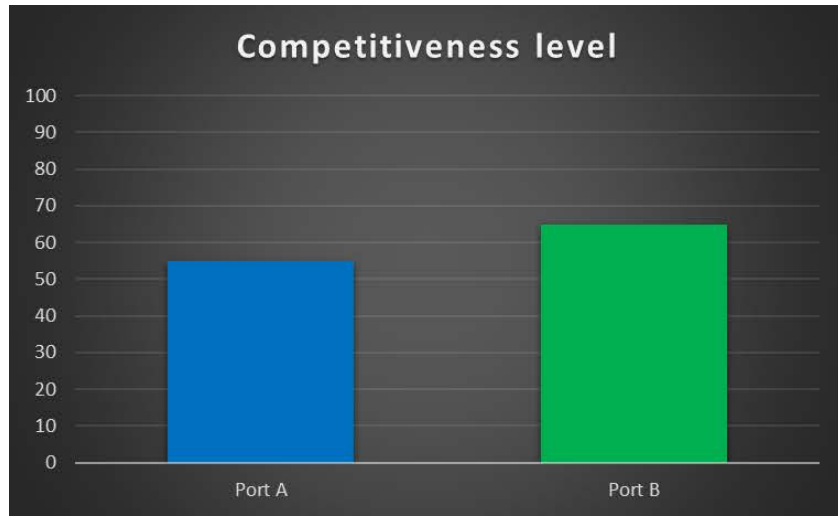
Determine competitiveness level



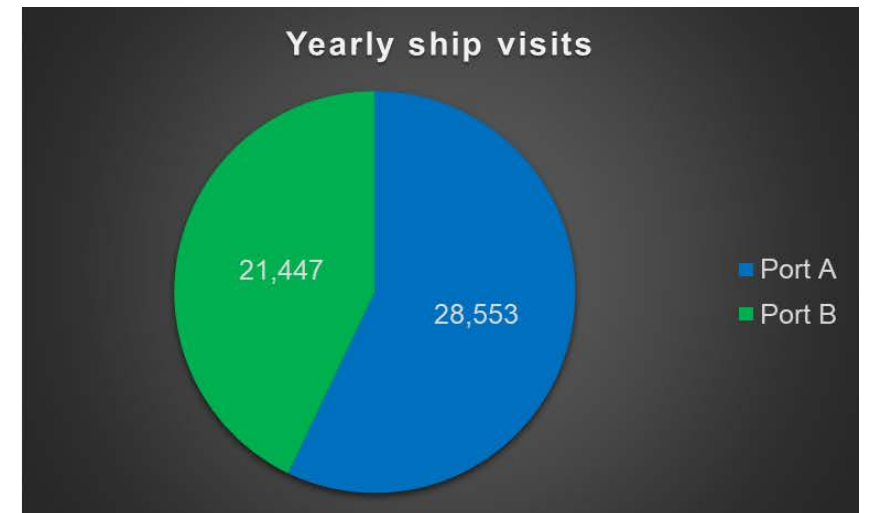
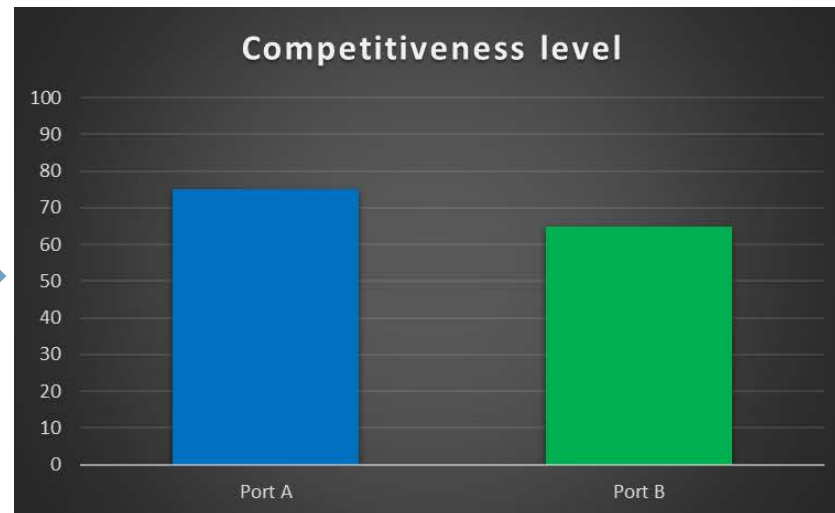
Determine share of port visits



EXAMPLE OF COMPETITIVENESS BETWEEN PORTS



Port A increased the port performance, resulting in more ship visits



› EXAMPLE ROLE DESCRIPTION

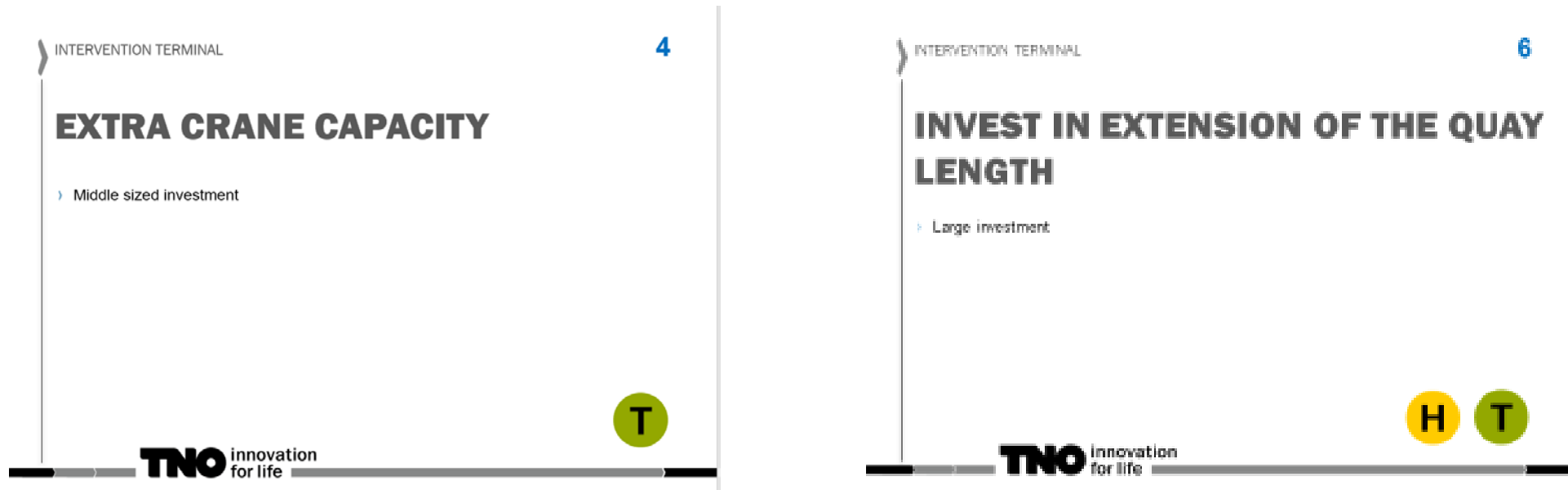
ASSIGNMENT

■ Harbour Master

Harbour master of port A, we need your help to ensure safe passage for all vessels visiting your port. You work for the Port Authority who requested you to sustain the smoothness and efficiency of all nautical processes. Our reputation is at stake and we risk loss of market share to our competing neighbouring ports.

Invest your money wisely to keep our port performance at high level and keep our port more attractive for the shipping lines. Remember that smooth and fast operations are not everything and that shipping lines count heavily on reliability and resilience.

› ACTIONS PER PLAYER - EXAMPLES



- › These are 2 examples of possible actions for the terminal role
 - › The left example is a decision of the terminal alone to increase resilience and service rate
 - › The right example is a decision of the terminal in cooperation with the harbour master to increase resilience and service rate

› EVENTS - EXAMPLES

› INCIDENT

BAD WEATHER

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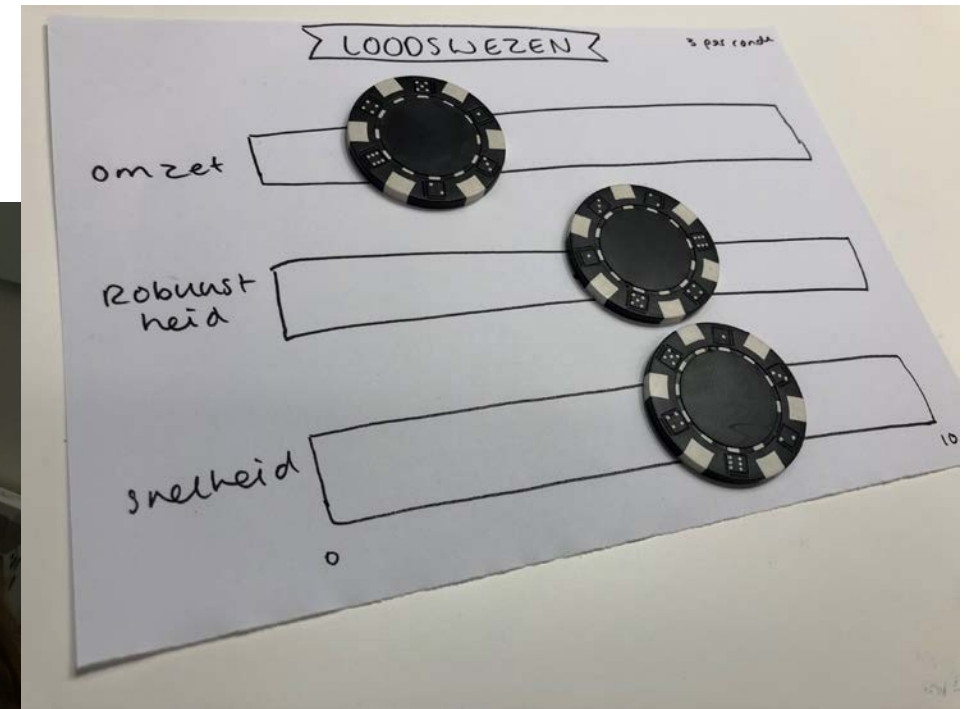
› INCIDENT

STRIKE OF TUGBOAT PERSONNEL

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- › Already made investments influence the level of impact of events on the port KPI's and subsequent number of future ship arrivals

PLAYTEST



› CONCLUSION: BLUEPRINT READY FOR NEXT STEPS

A game development project in general consists of the following game development steps

1. Determine scope, aim and requirements for the game;
2. Develop game concept and story line;
3. *Develop and test the boardgame and, if required, digital support;*
4. *Tune the parameters (costs, revenues, rewards, etc.);*
5. *Iterate step 3 and 4 until the game dynamics are fluent;*
6. *Professionalize game materials (graphics design, tokens, etc.).*

In the Serious game blue print steps 1 and 2 are covered

The game development steps are supported by

- A. Communication
- B. Valorization and dissemination
- C. Project management