



# NEXT GENERATION TRAINING TOOLS FOR THE CONTAINER INDUSTRY

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The container terminal industry is entering a new era. An era where profit margins will be reduced under pressure from large shipping line alliances and huge investments will be made so terminals can handle the largest vessels and the limited volume growth that expected in the foreseeable future.

This means that container terminals need to become more efficient and effective and offer a compelling product to their customers. A big part of operational improvement lies in business intelligence: creating better control over the cargo flow across the terminal, getting more insight in what is going to happen, and getting grip on the uncertainties.

## IS A BETTER TRAINED WORKFORCE THE ANSWER?

Although there is a market of tools that can support this “intelligence”, there is also much to be said for a skilled and well-trained workforce. A workforce

needs to be able to plan ahead, analyse, quantify and decide, rather than fire-fight (something that often occurs in terminals). A thorough game-plan needs to start with a well-organized DMAIC (define, measure, analyse, improve, control) cycle, that is internalised in the day to day operation.

How can we prepare the workforce better, and train them to deal with optimisation under uncertainty? The answer, in our view, lies in gamification. Gamification is creating ‘near to live’ training circumstances through simulation, and combining them with the real IT environments people have to deal with. Whether it is a terminal truck driver, a hatch clerk, a vessel planner, or a shift manager; all contribute to a smooth and productive operation, and are continuously interacting with the various IT systems present in the terminal.

The clearest and best-known example of using simulation technology is the quay crane simulator. Although typically not

connected to the terminal operation, the cranes simulators represent the crane control operation in great detail, providing an environment where people can be trained until they are prepared for the real job. Analogous experiences can be found in other industries. Airplane pilots and Formula 1 drivers serve as useful examples. While a Formula 1 driver spends as little as 70 – 100 hours per year in a real car, he tends to train in a simulator for as long as 2 – 4 hours per day.

Why has this practice not found its way across other to industries? When we look at the results we have achieved in the last 10 years through our training practice, it seems illogical that this is not a more ubiquitous training option. Although large sums are spent on simulators for quay crane operators, and sometimes RTG and Straddle operators, we see limited investment in training other staff.

Mistakes are often made in the planning and control operations at terminals.

It is believed that mistakes have a 10-30% impact on productivity and in turn, terminal efficiency. It goes without saying that the return on investment of regular, comprehensive training will be short. We're looking at months rather than years. This is why simulated training tools should be considered a viable option for ports looking to reduce errors and improve efficiency.

**NEAR TO LIVE TRAINING**

The solutions TBA has created consist of four key components:

- A copy of the actual software environment people use in their daily operations (e.g. TOS, ECS, RDT's).
- A valid and detailed representation of the physical world (equipment, containers, ships, trucks, etc.) visualised through simulation and combined with virtual reality tools.
- An operational scenario, captured in a so-called dataset (containing a real yard, real container moves, and real-life events).
- A toolset to measure the efficiency and effectivity of the operation in Key Performance Indicators (KPI's), such as vessel turn time, quay crane productivity, equipment running hours, labour hours, truck turn time.

**PLAYGROUND FOR CONTROL ROOM STAFF**

With this combined environment, we are able to run an iterative training process in which trainees can freely try out and experiment, without the possible negative repercussions of mistakes that they would face in real operations. The dynamic interaction between their planning, scheduling, deployment and dispatching decisions is taken in real-time into the systems that then provide feedback through visual means and detailed statistics. In our paper 'The Future: Serious Gaming in Automated Terminals' (PTI Edition 65), we (Saanen and Koekoek) referred to an extensive study by Sitzmann (2011), that emphasises the effect of 'learning by doing'.

In order to create a lasting learning effect, our training approach loops 3 times through the same cycle of planning, execution, and analysis. The learning effect can then be measured by the achieved (vessel) productivity. This is either measured by running a planned operation overnight (without human interference), or while the people are still operating.

Besides the human impact (planning or execution decisions), variations can also be applied in the software environment used. As such we have experimented in the use of various NAVIS advanced applications in the training setting (e.g. Autostow, Prime Route and Expert Decking). We found

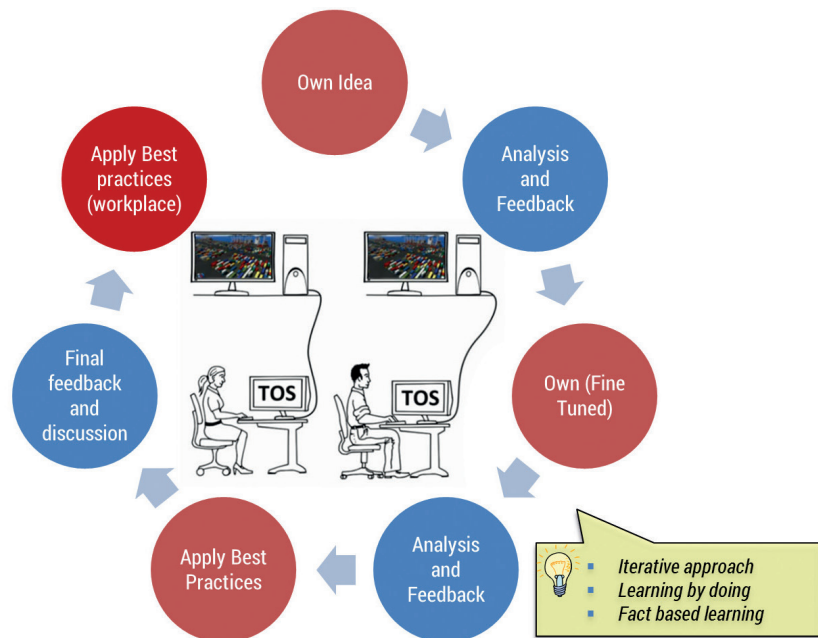


Figure 1: iterative training methodology

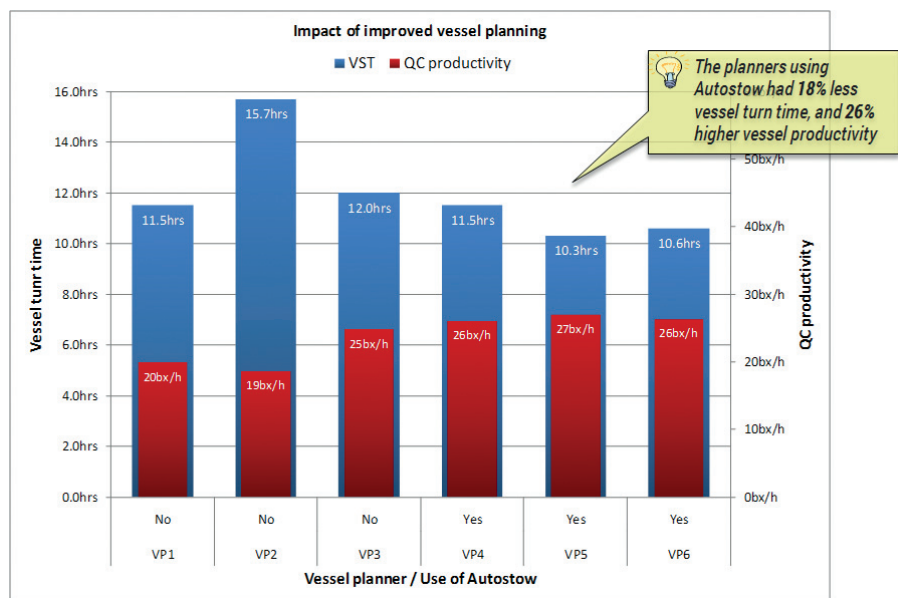


Figure 2: Trainees using Autostow from NAVIS exceeding the performance of vessel planners not using Autostow

that comparisons could be made between planning and execution processes with and without the use of such tools.

**EXPERIENCES AND FINDINGS**

Findings from such training sessions can be summarised as follows:

- In general, unprepared trainees make many mistakes in their typical work, which can have a serious impact on productivity.
- By repeating best practices, they are able to improve their planning and

execution work in a relatively short amount of time.

- The use of advanced tools generally improves productivity, as people can focus on the more complicated tasks because the bulk of the work gets handled automatically.

Further findings from these training sessions:

- The follow-up in the organisation afterwards, including management support to implement new (best) practices is cumbersome, and is

- certainly not guaranteed.
- Staff assigned to the planning and execution jobs in the control room are not used to using detailed statistics to analyse what has happened, and how things can be improved in a structured and systematic way.
- The training environment is recognised as realistic and representative for live operations.

**LEARNING ANYTIME, ANYPLACE**

In order to enable the trainees to follow-up more regularly on their skill set, ‘near to live’ training sessions should be repeated regularly (at least once a year in our opinion). Currently, we are not aware of any terminal operator doing this.

A way we intend bringing this concept to the terminal industry is through the PTI-TBA training portal. The portal has been live since the summer of 2016 and it works to bring extensive best practices to control room staff. The innovative portal not only provides valuable training material, but also tests to verify the knowledge and capabilities of the trainees.

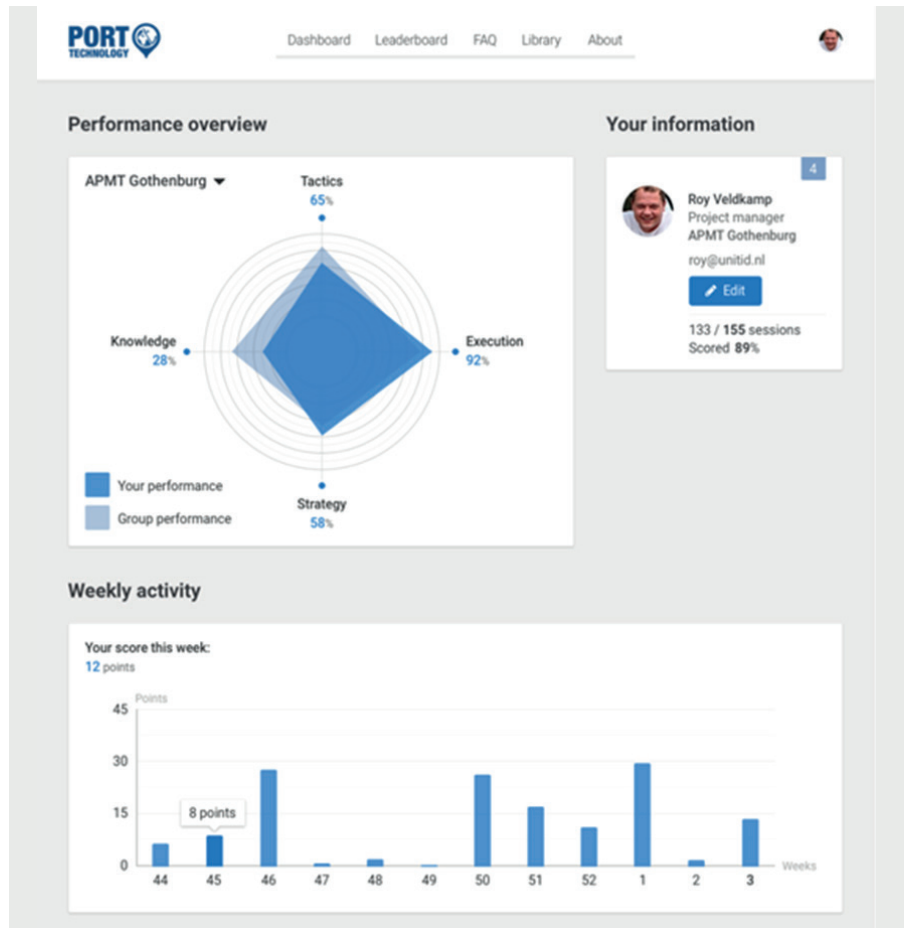
In the near future, the portal is to be expanded with online access to our ‘near to live’ training environment, so that trainees can practice their skills and get feedback. Trainees will be able to monitor their progress, and benchmark their capabilities against peers.

The training portal is already being used by over 1000 terminal professionals, from senior staff to supervisors, with an emphasis on the various planning jobs.

**FUTURE OUTLOOK**

It is our belief that training can seriously contribute to competitiveness within a terminal. Improved motivation and capabilities of terminal staff will in turn reduce inefficiency, and provide better service levels to the customer. For roles such as vessel planning, vessel supervision, yard planning and dispatching, constant learning with measurement and benchmarking is crucial. This will lead to the development of multi-skilled staff that can perceive a terminal as a system and approach problems holistically.

A further development currently being considered is the use of ‘near to live’ training for staff working outdoors. Mechanics, checkers, supervisors, foremen; all are interacting with systems, and the more complex the environment gets, the more training they need. Remember, safety also comes into play when stepping beyond the control room. Following best practice operating procedures is required to minimise injuries in terminal operations. Training for these circumstances is technically feasible, yet



relatively expensive, as it requires detailed 3D depictions of the live operations. However, these methodologies are far ‘cheaper’ than the lives lost at terminal operations every year through improper training and mistakes.

For a palpable change to occur, terminal management need to put training higher on the agenda. Presently, training budgets remain very limited. Hopefully the positive business prospects outlined in this paper suggest that additional training is a no brainer.

**ABOUT THE AUTHOR**

Dr Yvo A. Saanen is Managing Director and Founder of TBA, a leading terminal design and simulation company in the Netherlands. He is in charge of all port and terminal related projects all over the world in the planning and optimisation process of container terminals by means of simulation and emulation. In this role, he has participated in various projects, ranging from long term development, process improvement, terminal extensions and redesign of handling systems to design of greenfield terminals. Dr Saanen holds an MSc in Systems Engineering and a PhD on the design and simulation of robotised container terminals, both from Delft University of Technology. He is a Professor at the Rotterdam School of Management.

**ABOUT THE ORGANISATION**

Netherlands-based TBA is a leading

international provider of consultancy and software. Its product and service portfolio concentrates on marine terminals and intermodal container and bulk terminals. Key services are terminal planning using simulation, support of complex software (TOS) implementations and TOS fine tuning using TBA’s emulation tool CONTROLS, as well as the training of terminal planners. TBA is also a leader in equipment control software (ECS) for automated terminals, having supplied the Euromax in Rotterdam, CTA in Hamburg, Antwerp Gateway, and in the coming years Long Beach Container Terminal with TEAMS; TBA’s Equipment Control Software. TBA’s clients include all major terminal operators worldwide and many local port operators. TBA’s subsidiary DBIS delivers total software solutions for bulk terminals.

**ENQUIRIES**

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