

PILOT EVALUATION REPORT - LUKA KOPER

D.T2.1.6

Work paper

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1) Introduction

The fast development of technology and the contemporaneous spreading of port's capacities, due to the rising volumes of cargo transported through the port of Koper, are bringing new opportunities for the better organization of spaces and technologies adopted for the management of the cargo. The modal split in the port is in favor of railways since we have approximately 60% transport on rail and 40% on road. We were in search of the solution that can speed up the process, produce a better linking with stakeholders on the same logistic chain and a further and concrete collaboration in the region, including areas beyond national borders.

Challenges in the port of Koper are that some data about railway transport and traceability of goods during their trips, are not always automatically or quickly shared with stakeholders, in order to optimize the transport time, or to optimize the usage or limited railway infrastructures connected with port's area.

Within the pilot activity we were testing new approaches to overcome various disruptions to the regional railway network in the participating regions. In the port of Koper we have tested cameras to register numbers on wagons coming to Terminal for iron ore and coal (where the process of registering/checking the numbers on wagons is currently done manually). The port of Koper is going towards digitalization and automatization of operations and processes, also on railway network. The REIF pilot action has helped to do one of the first steps with reducing manual work and optimizing railway services with digitalization and automatization. The data read directly from wagons are gathered in the database and the pictures taken from the wagons are also being saved in the database. With optimal solution developed, there will be no need for operator to go on the field and to manually write down the wagon's numbers. Even in case that the cameras are not being able to read the numbers, the operator can check the photography on the PC screen and then type the correct number into the database.

2) Pilot action description

- **the activities which were realised within the pilot action**

The pilot action was foreseen at the rail section of port to optimize the process of reading and registering the incoming/outgoing wagons by camera (optical character registering) and then processing the data through the IT system. The details were discussed several times at the beginning of the project among key stakeholders in the port (representatives of the terminals, IT department, Strategic Development Department, Investment Department, Operations Department). In July



2020, also the meeting with Market Player Working Group was carried out and pilot action was presented and discussed among stakeholders directly involved with operations in Terminal for iron ore and coal.

By implementing a pilot activity, we have tested a solution with three cameras to digitally read the numbers on wagons (instead of manually detecting them) going to Iron Ore and Coal Terminal and then processing this data through the IT platform. We have estimated that the solution would speed up the process of registering the wagons when coming in the port or through the gate of the terminal.

The solution provider was chosen in August 2020 through public procurement procedure. In September 2020 the cameras were installed. After that, a 6 months period was dedicated for testing the proper working/establishing functionality of the cameras. Several cameras' positions, locations and different lightning settings were tested. After the testing period, the second procurement procedure was carried out for establishing functionality of the system. The second phase of the pilot action was carried out to check if the solution is appropriate for integration on IT platform and if the results of first phase are satisfactory. The second phase consisted of establishing the IT platform to process and present the characters registered from wagons in form of useful database.

The pilot action is presented at: <https://www.youtube.com/watch?v=xBfF4FArX1g&t=2s>

- **how they responded to the challenges previously identified**

The testing phase was carried out and the results were promising. For classic type of wagons (Eanos, Fals-Z) the recognition of characters is close to 100% (98%-100%), the same goes for tank wagons. Some problems are with Rocktainer Ore wagons where the recognition success is not so high. The possible solution for this problem is next major release of software update (in the future).

- **who and how benefited from it**

The investment in development of systems managing data, can allow stakeholders to fasten their services, which attracts new customers and improves flows of cargo. With the development of tools for digitalization or informatization of data flows, to improve and optimize operative tasks and the upgrade of the existing railway operative management system there is a possibility to speed up the registering and monitoring of incoming / outgoing wagons. The constant operative processes could be simplified using new technology. The benefits are not only foreseen for the employees at the port / terminal, but also for the company by time and money savings, for the subregion and as well for the state of Slovenia - as an encouragement to use the railways.

The pilot action was implemented as planned. We have tested the functionality of the cameras and functionality of the software on several types of wagons; as a platform for better detection and use of data registered. The benefits of the pilot action are better knowledge of the possible solution and its deficiencies - which will be tackled in the future with further development/updates of the software. The system for now serves as a backup storage of wagons registered for the Terminal of iron ore and coal and it gives a possibility of double-checking.

The benefits of the pilot action implemented in the port processes are:

- gained knowledge and experience in terms of expanding such technology in the port processes
- optimizing / speeding up the process of registering / recognition of the wagons;
- less manual work;
- less human made errors;

- improved health and safety at work (due to less work on-field - near the railway tracks and trains) in the future;
 - digital evidence of the registered wagons (database of the pictures);
 - possibility of double-checking.
- pictures, schemes, plans (if any)

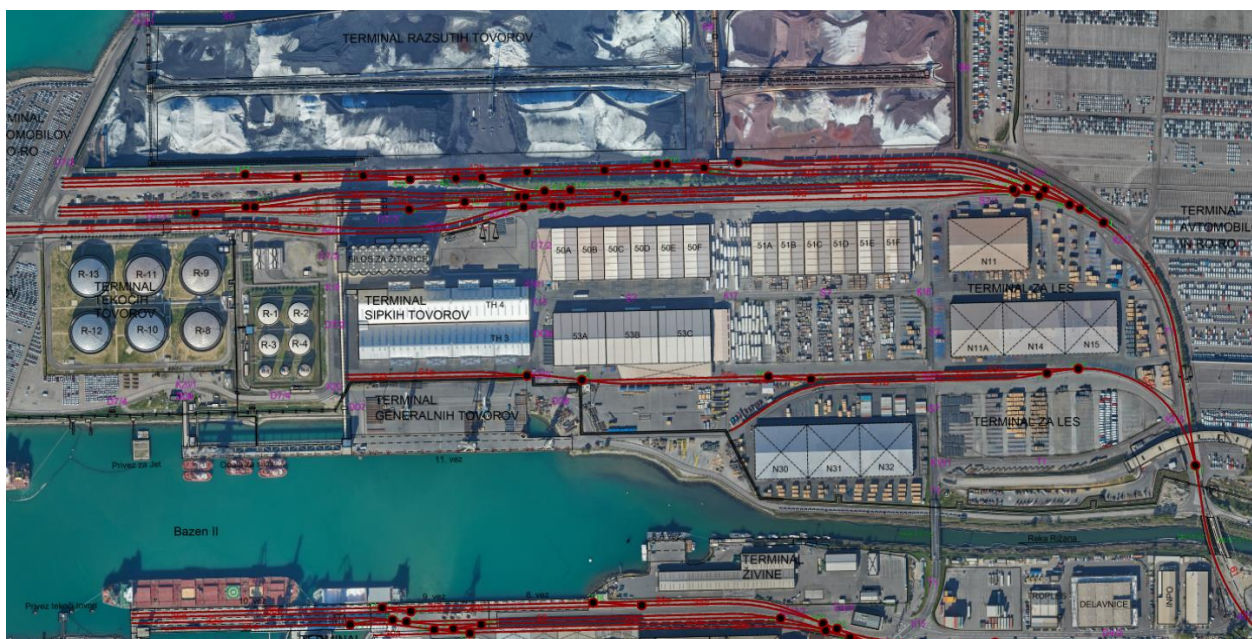


Figure 1: Location of the cameras

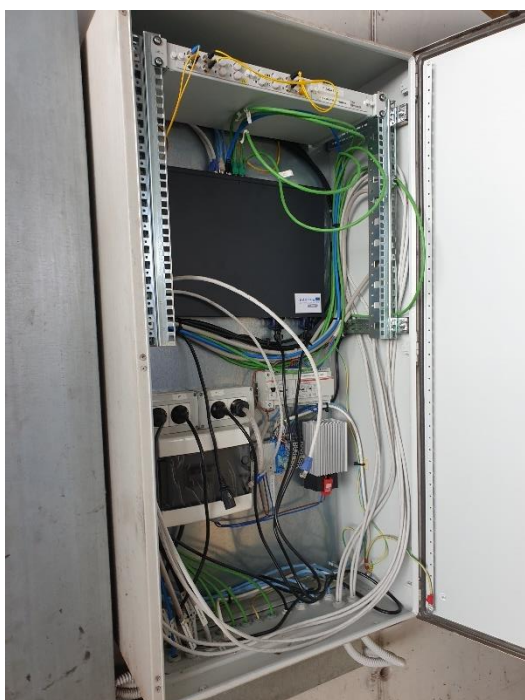


Figure 2: Electrical cabinet



Figure 3: The camera installed under the viaduct



Figure 4: The camera equipped with inventory number



Figure 5: The viaduct and the railway beneath

3) Conclusions

- the main lessons learned from the pilot action

In terms of camera location, the combination with several cameras (3 cameras) in the same location proved to be the most effective, which also coincides with the logic of portals that locate several cameras, sensors and lighting fixtures on the same frame. Within the pilot action it was proved that using multiple cameras in the same location reduces the possibility of errors or improves the overall recognition performance.

In case of further expanding such technology in the port we have gained knowledge on how to place the structure at key locations, equip it with the appropriate communication infrastructure and install sensory and lighting elements in accordance with gained experience.

- whether the initial expectations were met and, if not, why

The optical character registering on wagons has not been tested with such technology before in the port of Koper. The wagons that are carrying iron ore and coal are the most “hard to read” due to special characteristics of the cargo. Iron ore and coal are the type of cargo that is dirty and dusty, therefore the characters on the wagons are often hard to register (low contrast among numbers and the wagon due to dust and dirt). Especially with one type of wagon - Rocktainer Ore wagon - the recognition success was not so high as with other types of wagons, where the recognition was close to 100%. The possibility for improvement comes with next cameras' software release, so it is expected that also characters on Rocktainer Ore wagons will be successfully registered - close to 100% reliability.

- the replicability potential for other PPs or for the Central Europe area at large



This solution is highly replicable among all logistic services involving railway services. It is not only appropriate for the port operations, but anywhere where traceability of cargo in wagons is necessary.