Technical Action Sheet No. 1

Pilot Case 1 — Wagons sharing concept

Short description of Action

Wagons sharing identifies a new operating model of management and optimization of trains and wagons' arrivals and departures, reinventing the logic of loading and unloading of inter-modal freight trains, and ensuring the competitiveness of the railway transport modality. It focuses on flexible management of the railway tracks and terminal slots, not strictly linked to the scheduling of inbound trains, but always respecting the departure time of outbound trains, with wagons taken over by the terminal operator anonymously.

Fields of optimisation

Transshipment terminals and ports: Organization and process.

Production know-how

Two methods were taken into consideration for the wagon sharing solution:

- Plan Do Check Act – PDCA: Process monitoring is followed in PDCA logic, through continuous improvement to production, separating the phases in four key points and working separately at each stage. Also called Deming Cycle, it pursues highest quality with interaction between research, design, testing, and production (intended as the number of trains). PLAN phase identified costs, expectations, inefficiencies and evaluation of possible variants. DO phase applied chosen decisions and tested their validity. CHECK phase controlled and compared PLAN and DO stages, and standardized the final management model. ACTION phase codified and applied the model.
- First In First Out – FIFO: Process where the first wagon that entered the railway terminal, is the first to exit. The exit order is the same as the entry one, with the first train arrived being the first unloaded and then reloaded, to guarantee the planned departure and thus avoid delays.

Objectives of the action

- Improve Railway terminal production process;
- Increase the rotation of the wagons in time of permanence in terminal / decrease time spent in storage of the intermodal units;
- Increase terminal capacity and therefore greater availability of empty slots for the reception of new trains;
- Optimize railway asset (wagon availability);
- Reduce waste time and delays along the entire intermodal chain;
- Respect scheduled departure times (especially useful for railway undertakings).

Technical Action Sheet No. 1

Obstacles

The involvement of the multimodal transport operator, MTO KombiVerkehr and the wagon owners. In InterTeminal, MTO is the only customer of the terminal operator (Quadrante Servizi), thus easily persuaded, while the wagon owner, perceiving changes in its business model (for ex. the traceability of the wagons is not yet timely and precise as it should be) even though part of the pilot, had still some reservation. A great leverage in this case is the major production when using wagons sharing: with wagons sharing applied in a terminal, MTO processes higher number of trains and optimizes the production time, achieving higher efficiency, thus MTO itself convinces the owner of wagons to use this model in the first place, followed by railway undertaking, in view of greater traffic volumes.

Target group

- In first place terminal operators (Hupac, VTG, Terminali Italia, DUSS), stakeholders of the railway transport (e.g. railway undertaking, shunting companies), maritime ports that could replicate the model.

Responsible actors

Consorzio ZAI, Quadrante Servizi and KombiVerkehr

Involved stakeholders

Interporto Quadrante Europa of Verona (QEVR)

Evaluation (Key Performance Indicators or estimates)

- ✓ "InterTerminal" performance results 34% higher than the performance of the other two intermodal terminals inside Interporto, measuring it through loading and unloading services of a train, with related auxiliary activities (in absolute terms calculated by the number of trains processed on a single track per day);
- ✓ From the literature, given E = terminal efficiency that in theoretical terms can reach the maximum optimal value equal to 3, "InterTerminal" efficiency is calculated just above 2, considering the time needed to process a train, it equals to two trains per day;
- ✓ The medium term target set by Quadrante Europa is to process a train in 12-hour timeframe. "InterTerminal" currently is already above the target set, with 8-hour timeframe from the train arrival to its departure. Thus, the train rotation coefficient exceeds positively the operational target per cycle;
- ✓ The numbers (and the model) reached by "InterTerminal" prove even more how Verona Interporto has a margin of growth in terminals capacity still of + 50% compared to current traffic.

  Not achieved: Application of the model at Terminali Italia (equivalent to Quadrante Servizi), manager of the second railway terminal in QEVR, which manages higher railway traffic than "InterTerminal". The same model applied in all terminals of QEVR would be a big success.

Timeline of implementation

Short-term (< 2 years)

Estimation of shift from road to CT / rail

Short-term (< 2 years):
"With crane lifts in 2018, 90.921 ITU (Intermodal Transport Units) (equivalent 161.621 TEU moved from road to rail), with higher performance, 9.3 hrs to process a train in "InterTerminal" instead of 16.43 hrs (average time in terminal), +45.5 % performance. Although this increased efficiency is important, nevertheless this is just one part of the whole transport chain. In total, small amount of direct shift from road to CT/rail can be expected by this measure.

Detailed description of the action

Slot Management analysed the "InterTerminal", located in Verona and of European relevance, improving operational plan and optimizing railway tracks management. The terminal capacity intended as working railway tracks, allows only some infrastructural improvement, while a reorganization of human resources along the railway tracks and technological tools, can significantly increase the productivity with in/outbound trains. The introduction of Wagons Sharing in the organizational model was the real strength, with the concepts of dynamism and flexibility of resources applied to management of railway tracks and terminal slots: the wagons are taken over by the terminal operator anonymously without reference to arrival destination, e.g. inbound train (from Rostock) can become outbound train with different destination (to Bremen), trivializing railway shuttles. The composition of a freight train finds the reference of intermodal transport unit in a semi-trailer, and the railway wagons respond to flexibility. The use of Wagons Sharing cuts the railway queues, managing the wagons independently from the origin, composing trains for different destinations and cutting the inefficiencies of the railway system at the station.

Good Practice / Others

No specific reference to other initiatives/pilots. What could be outlined is the need to develop and implement a railway wagon database, where available information are all aligned with the existing software that monitors the terminal process. The implementation of this database would guarantee the removal of the constraint of the non-traceability of wagons, which for wagon sharing constitutes quite an obstacle.

Recommendations for implementation and dissemination

It would be of great importance to get the model implemented on a larger scale in Verona intermodal terminal, as the next step. To do this, wagon sharing should be discussed and eventually implemented also in other terminals in QEVR, managed by Terminali Italia. If applied also by Terminali Italia, the entire QEVR would have the same management policy for arrivals and departures. The next step could be Terminal Italia applying wagon sharing also to all the other terminals it currently manages.

Pilot Case 2 —
Train-related electronic data interchange

Short description of Action

In order to accommodate increasing maritime and rail cargo flows, in the last five years the Port of Trieste has been steadily investing in ICT measures able to smooth communications and data exchange along the entire supply chain to decrease congestion and enhance CT efficiency. The main goal is to develop new extensions and modules based on interoperability standards of the ICT platform currently in use, the Port Community System (PCS) of the Port of Trieste, Sinfomar. Public and private actors that manage the processes and documentation related to rail traffic are important stakeholders involved in the current layout and future developments of the Sinfomar PCS. It is of utmost importance that electronic data are exchanged in a consistent and harmonized way and to this purpose, the Port of Trieste is willing to test such data exchange on the Trieste-Bettembourg corridor operated by TX Logistik.

Fields of optimisation

Transport corridor related: IT

Production know-how

The main process to be applied is the supply chain.
Too often the transport of goods is seen as an initial and final part of the product added value. As a matter of fact, one of the main components of the added value is the time and cost of transport and logistics from production site to the market of destination. Especially in railway transportation, a real Track &Trace system (interoperable with different railway operators) does not exist. Therefore, the pilot action focuses on integrating processes and data along the overall supply chain, trying to cover the entire door-to-door chain.
Thus, the whole transport chain should be seen as a function of the overall supply chain, whereby each component of the transport chain needs to be optimised, as to reduce time and costs for the shipment of the goods.

Objectives of the action

Improved planning of CT/rail services

Obstacles

Absence of common shared standards: the joint technical analysis carried out by the Port of Trieste, TX Logistik and Mercitalia Rail revealed that in order to automatically exchange waybills the same standards need to be used (e.g. H30 Hermes for the data included in the waybill and TARIC/HS or NHM to classify goods).

Target group

- Railway undertakings, Terminal operators

Responsible actors

- Port of Trieste – Port Network Authority of the Eastern Adriatic Sea
- TX Logistik AG
- Friuli Venezia Giulia Region (evaluation of the action)

Involved stakeholders

- Mercitalia Rail S.r.l. – railway undertaking providing the traction on the Italian territory
- RFI S.p.A. – Italian railway infrastructure manager
- Adriafer S.r.l. – railway company 100% owned by the Port Network Authority, sole licensee to carry out shunting within the port railway network

Evaluation/Key Performance Indicators or estimates

- Time to automatically create the train-related documentation (e.g. waybill);
- Percentage of reduction of errors in train-related documentation.

Based on the results obtained through the implementation of a similar IT solution with another RU (Rail Cargo Austria), it can be estimated that the time needed for the automatic creation of the train-related documentation will dramatically decrease – of about 90%. Final figures will be available after a long-term run of the developed solution.

Timeline of implementation

- September 2019 (implementation/realization on the Port of Trieste side)

Estimation of shift from road to CT/rail

Final figures will be available once the impact of the IT solution is evaluated against the baseline scenario, however the action is expected to significantly contribute to shifting traffic flows to CT/rail.
The table below contains preliminary data useful to compare the rail traffic on the Trieste-Bettembourg relation as observed in the first semester of 2017 and the first semester of 2019:

	Jan – Jun 2017	Jan – Jun 2019
No. of trains	260	363
Vehicles transported by train	7,542	10,265
% of full wagons	95 %	97 %

In the periods taken as reference, this relation marked an increase of about 40% in the number of trains and of about 36% in the number of vehicles transported by train. For the reasons illustrated above, it is not possible to isolate, at this stage, the results directly linked to the implementation of the pilot action from those derived from other, further developments in the management of train-related processes.

Technical Action Sheet No. 2

Detailed description of the action

The pilot action carried out by the Port of Trieste focuses on the implementation of the interoperability with TX Logistik to reach a complete automatization of all procedures related to the rail services on the Trieste-Bettembourg corridor. The action aims at enabling the electronic exchange of data concerning the train composition. For information exchange to be effective, data need to be shared from the Port of Trieste PCS, Sinfomar to railway undertakings and vice versa, by using the SOAP (Simple Object Access Protocol) protocol. The exchanged data represent the basis to automatically create the waybill and completely dematerialise the management of train-related processes. For this reason, the use of a single standard in the communications is crucial. The interoperability of Sinfomar with external IT platforms allows the train-related data interchange, specifically on the rail services programming, the transport execution phase and train operations management. Furthermore, taking into consideration security regulations applicable to railway transportation, real-time data is collected (automatically through SOAP-based interoperability) to know exactly the actual position of the train for each timeframe. By automatically associating the train, wagon and goods (through the several modules of the Sinfomar), an innovative service of Track & Tracing for cargo using combined transport is realised. All these data are automatically collected and presented in a newly, ad hoc created dashboard to monitor combined transport traffic in the area of the Port of Trieste. This dashboard communicates via web services to external platforms, presenting the actual data concerning rail services operations status and thus allowing better planning of future actions.

Good Practice / Others

A good practice concerning the management of train-related processes and documentation is currently in place between the Port of Trieste and Rail Cargo Austria. Within this cooperation framework, the so-called train module of the Sinfomar is being further developed to achieve the complete dematerialization of the train-related documentation by automatically generating the CH30 document, which contains data such as the train number, wagons line and goods transported (including type and weight). This module has been active since 2017, thus reducing the time needed to handle all train-related processes from 6/7 hours to 30/40 minutes. In addition, the data included in the electronic CH30 document are considered as certified by competent authorities, i.e. Customs.

Recommendations for implementation and dissemination

The ultimate goal of the Port of Trieste, once the interoperability with TX Logistik/Mercitalia Rail will be realised, is to reach out to other rail undertakings in order to achieve full interoperability of the Sinfomar PCS with external platforms for the management of train-related processes.
In view of further development, it is of utmost importance to take into consideration the use of a single standard in order to smooth the communication with external stakeholders.

Technical Action Sheet No.3

Pilot Case 3 —
Feasibility tests of innovative technologies and digitalization in CT

Short description of Action

The pilot case addresses the lack of digitalization as well as a lack of usage of innovative technologies in CT. Currently many GPS trackers used for railway freight transport do not work autarchic. Instead, they are operated with an attached solar panel or with a “classic” battery. This modus operando leads to the need to change the equipment close to every two years and this only by trained personnel.

Therefore, selected feasibility tests with GPS trackers containing an energy harvesting device have been accomplished in this pilot case. The aim was to create an autarchic GPS tracker which operates at least for 6 years (wagon revision life cycle) without the need to change any equipment such as batteries etc. In addition, the combination of wobbling motions and energy harvesting enables to derive further innovative solutions that can lead to a higher efficiency and reliability for freight railway (e.g. predictive maintenance, automated wagon order assignment). All in all, three different applications were defined and elaborated. Given a number of stakeholders involved and due to the fact that processes in CT are highly regulated, this pilot was solely done from the perspective of the railway undertaking TX Logistik.

Fields of optimisation

All three applications described below have been elaborated during the project of AlpInnoCT. In fact, Application 1 represents the basis of an autarchic working GPS tracker. The other two applications have been set up as a further innovative solution to enhance the usage of such an GPS tracker in daily operations and to cover further potentials such as predictive maintenance of wagons or an automatic wagon order assignment (e.g. in the terminal).

Application 1: Maintenance-free track & trace GPS tracker

With the implementation of an energy harvesting device which recovers energy through wobbling motions while the train is driving, the tracker is able to daily operate up to 6 years (wagon life cycle).

Application 1 entails the following steps:

- ➔ Parameter analysis and feasibility tests for self-powered GPS trackers.
- ➔ Configuration of prototype and laboratory tests.
- ➔ Field test demonstration.

In order to prepare Application 1, certain parameters have been defined within the project team. In fact, three different processes (Terminal, Track, Service) have been derived from daily operations, where the tracker should adapt different modes in terms of tracking and communication to fulfil its use and at the same time be as efficient as possible:

Process	Tracking	Communication
Terminal	Every 5 min (in motion)	Every 5 min optimal; alternative tbd. (in motion)
Track	Every 5 min; alternatively, 60 min (in motion)	Every 60 min. (in motion)
Service / maintenance	Every 5 min (in motion)	Every 5 min optimal (in motion)

Application 2: Early stage detection of wheel flats through vibration sensors

The idea behind this case is the assumption that wheel flats cause higher concussions on track and therefore the advanced GPS trackers are able to predict wheel flats (predictive maintenance).

Application 2 entails the following steps:

- ➔ Data capture in field.
- ➔ Data analysis, feasibility test.
- ➔ Potential test appliance in field.

Application 3: Automatic wagon order assignment

With the support of near field communication and the adaption of multi hop connection, the tracker shall be able to set up the train composition as soon as the wagons are shunted together (e.g. in the terminal).

Application 3 entails the following steps:

- ➔ Feasibility Analysis.
- ➔ Potential test appliance in field.

During the lifetime of the project AlpInnoCT, Applications 1 and 2 were tested positively in field. This functions as a basis for further testing and implementation.

Production know-how

Based on the findings related to production know-how which have been made in the prior Work-packages within AlpInnoCT, the following output can be derived for the Application 3:

Robust and maintenance-free GPS tracker for railway wagons

➔ A self-powered tracking solution will enable new applications since no maintenance and no access to the tracker is required. A cost reduction is a further benefit of the energy harvesting power supply, due to the fact that no maintenance is required. Tracking becomes more robust, flexible and reliable. In addition, a potential direct supply of information from the tracker into the operations management system via an interface or a software increases the usability of the data generated.

➔ On top, predictive maintenance is a key subject of production know-how. Nowadays, the detection of damaged rail wagons mainly relies on manual effort of the wagon inspector during the preparational work carried out in the terminal. With the support of a tracker installed on every wagon, a pre-alert in case of a damaged wagon leads to an increased efficiency and availability of trains. In the end, this leads to an improved service quality.

➔ Currently the wagon order assignment of a train in the terminal is a pretty manual effort and lacks digitalisation. One approach to overcome this issue is the implementation of a GPS based multi hop communication. Here, the trackers are equipped with a near field communication device and through the multi hop communication the trackers are able to define their position in the wagon park and also able to communicate this. With that, the operation speed in terminals will be increased through less paper work and the potential to assign the wagon order automatically.

Objectives of the action

Robust and maintenance-free GPS tracker for railway wagons.
Predictive maintenance (e.g. early stage detection of wheel flats while on track).
Automatic wagon order assignment via GPS based multi hop communication.
Optimization of the processes in the terminal and on track.

Obstacles

Many processes in CT are currently not (fully) digitized and still mainly paper-based with a low degree in automatic transmission (e.g. interfaces). At the same time a certain reluctance in using innovative technologies in CT can be observed. This leads to additional effort in operations, inflexibility, delays and overall competitive disadvantage.
In addition, many players are involved in the CT chain. (e.g. terminal, different infrastructure managers for each country etc.). Therefore, it is hardly feasible to change processes in daily operations without the permission of one of the above-mentioned players.

Target group

- Railway undertakings, operators, infrastructure managers, terminals, wagon producers

Responsible actors

TX Logistik AG, Fraunhofer IIS Nuremberg, Axel Bagszas Industrials

Involved stakeholders

Terminals, railway undertakings, IT-service providers, research institutions

Evaluation/Key Performance Indicators or estimates

➔ Maintenance Time and cost of Track & Trace devices.
➔ Pre-notification time / alert time of wheel flat while on tracks.
➔ Disruptions in railway operations due to damaged wheel flats.
➔ Wagon inspection efficiency in terms of time savings (operational costs).
➔ Power potential wobbling tracker.

Technical Action Sheet No. 3

Timeline of implementation

➔ Application 1: Q1 / Q2 2019
➔ Application 2: Q3 / Q4 2019
➔ Application 3: 2020 / tbd

Estimation of shift from road to CT/rail

No direct impact in CT attractiveness, but mid- to long-term effects due to higher reliability and efficiency in CT can be expected. Therefore, at this point in time an exact estimation of a potential shift from road to rail is not easy to quantify.

Detailed description of the action

It was examined how innovative technologies and digitalization could enhance selected processes in CT. This encompasses:

Background: Self-powered and maintenance-free GPS tracker for railway wagons
GPS trackers are working battery-powered and have limited operation times. The batteries have to be recharged or replaced. Additional sensors to monitor the condition of the trains or the goods increase the power consumption, and thus reduce the operation times of the system. Since typical railway wagons are on tracks for a very long time (up to a couple of years), batteries are not able to power the tracker for the whole duration. Furthermore, extreme low or high temperatures limit the capacity and lifetime of batteries.
Within this pilot case a state-of-the-art GPS tracker with cellular interface and standard sensors like temperature and acceleration have been used to determine the power consumption in a typical transport use-case. The system control of the tracker is adapted to fulfil the requirements of the target use-case. Field tests on the trains provide information about the proper functionality and the related power consumption. Additional measurements of the accelerations during typical transport scenarios are used to characterize the vibrations available, which can be used for energy harvesting.
The goal of this pilot case was to specify and outline a fully self-powered, autarchic tracking system for railway application. Such a solution will provide much higher functionality in terms of sensors and transmission rate than state-of-the-art trackers.

Recommendations for implementation and dissemination

Positive results that should be communicated to stakeholders, especially to railway undertakers, wagon fleet operators etc. Further validation in practice is recommended. Cost benefit assessment is expected to be positive.

Pilot Case 4 — Appliance of production know-how (standardisation, First-in-First-out principle) on high frequent CT routes via the Brenner corridor

Short description of Action

Within this pilot case an improved transport concept has been applied to TX Logistik's most frequently used transport route (via Brenner). In addition to that, it was demonstrated how the appliance of know-how from production industry affects efficiency, reliability and use of resources within intermodal transportation.

Fields of optimisation

Given that 20-25 trains per day are being operated on this route, the Brenner corridor plays a major role in the overall transport network of TX Logistik and can be regarded as a bottleneck. Any disruptions, blockage or delays affect the overall performance of the trains operated. With the implementation of the Brenner-Shuttle-Concept started in January 2019, TX raises the efficiencies on that line for six different traffic lines, all arriving in and departing from the Terminal Quadrante Europe Verona, Italy. The prior setup took only minor dependencies between these different traffic lines into account.

In fact, focus was laid on aspects such as standardisation and harmonisation of used equipment/resources, especially wagons, locomotives & track. Moreover, a First in - First out (FiFo) principle regarding the efficient use of wagon parks has been introduced in the terminal of Verona.

Production know-how

- First-in First-out principle assessed in the Terminal of Verona.
- Standardisation/Harmonisation of more than 20 wagon parks on six different traffic lines.
- Standardisation/Harmonisation of locomotives used.
- Assembly line principle for tracks on the Brenner Corridor.

Objectives of the action

- Increased wagon availability & reliability.
- Increased loco kilometres.
- Increased tons of loading.
- Decreased cancelation of trains.
- Increased punctuality of trains in Verona.
- Increased reliability and flexibility of the system.

Obstacles

The main obstacle is TX Logistik's limited control of the full process as several other stakeholders are involved in the process of operating a train through the alps such as several infrastructure managers, other railway undertakings, terminals as well as construction works on track.

Target group

- Freight Forwarders (customers)
- Terminals
- Infrastructure managers
- Alpine Region
- Railway undertakings

Responsible actors

TX Logistik AG, Infrastructure managers, Terminal Quadrante Europa

Involved stakeholders

Terminals, infrastructure managers

Evaluation/Key Performance Indicators or estimates

Wagon availability

The wagon availability remains 99% (compared to 2018). However, now with the same number of wagons, there is an entire wagon park for quality buffer available. This leads to an increased flexibility and resilience of the whole system.

Increased loco kilometres

Since the implementation of the Brenner-Shuttle-Concept, the average loco kilometres have been increased by 4,2% which relates to a more frequent utilisation rate.

Increased tons of loading

Due to the harmonized wagon park TX is able to transport one additional unit per train. The weight has been increased by 2% in average.

Decreased cancelation of trains.

The cancelation has been decreased by 3 percentage points compared to 2018.

Increased punctuality of trains in Verona

The overall punctuality of trains has been increased by 4 percentage points compared to 2018.

Timeline of implementation

Start: Q1 2019

Estimation of shift from road to CT/rail

Based on the assumption that the resources track, locomotive and train driver are available on the Brenner line, the extra wagon park saved through this Brenner Shuttle concept, would be able to transport additional >90 units / week via the Brenner. This would lead to at least 4320 shifted loading units per year based on 48 calendar weeks where the "additional" train is operated. However, this a pretty theoretical assumption as not only resources mentioned above need to be in place, but also the market conditions. Due to that, it is not easy to quantify such a shift from road to rail.

Detailed description of the action

Within this pilot case an overall analysis of TX Logistik's transport network via the Brenner has been executed. Based on that, the second step was a simulation of this concept, followed by a demonstration in field. The concrete implementation in field and daily operation started in January 2019. As described above, the following figure shows all aspects of improvement:

Resource "wagon":

As-IS Situation (2018):

Due to different wagon sets and individual wagon types it was hardly feasible to interlink different traffic models. Moreover, different relations have different requirements regarding customer needs. Therefore, some wagon sets have a mix of container wagons and double-pocket wagons, and others only consist of double-pocket wagons and T3000 (wagons for loading mega trailers). Wagons with multiple transport functions exist, but they are more expensive.

To-BE Situation (Start 01/19):

Due to the flexibility of certain relations and their customer needs, not all relations can be considered in such a Hub and Spoke Concept. However, after a first analysis it became clear that all relations from and to Verona could be aligned regarding their wagon set as customer needs for wagon set composition are similar. Moreover, a FiFo-System could help the Verona traffic to be more robust in terms of punctuality and reliability. The aim is to harmonize all wagon sets in order to offer a flexible system to all customers on this route.

Resource "locomotive":

As-IS Situation (2018):

Same as with wagons, there is a variety of locomotive types and models in the market available. Moreover, specific country requirements including software packages do make locomotives expensive and unique. Due to different destinations in different countries, it is not easy to harmonize all locos in a hub and spoke system. Again, all relations from and to Verona via the Brenner are of interest, as they all face Germany, Austria and Italy.

To-BE Situation (Start 01/19):

After a first analysis it became clear, that not all locos on this traffic need all three expensive country software packages (Germany, Austria, Italy). Especially the second loco required for the ascent of the mountains (banking) does not need the entire software package. Therefore, the loco's will be changed in Kufstein (German/Austrian border). This should increase efficiency due to lower costs etc.

Resource "track":

As-IS Situation (2018):

Every single train has its determined train path (schedule) from its start in e.g. Germany to its destination in e.g. Italy. A train path is valid for 24 hours. If the train is late, a new train path needs to be ordered. This leads to increased costs as well as manual operation effort on TX side.

To-BE Situation (Start 01/2019):

As with all relations to and from Verona, TX basically have a train northbound and southbound on the Brenner axis (Kufstein – Brenner – Verona) roughly every two hours. The idea behind this shuttle concept regarding the tracks is the following: If one train is e.g. four hours late, another train which arrives earlier than expected e.g. at Kufstein can use the train path of the delayed train. This available train path can be used by the delayed train. In this way, the system can be optimized and allows to minimize waste in terms of waiting times. Again, this leads to a more robust and flexible setup.

Recommendations for implementation and dissemination

As this approach shows several efficiencies by using production know-how, it is key to further validate and monitor this concept on the Brenner corridor to see its benefit on mid and long term. Beside this, TX would like to extend this concept to different corridors of its network.
In general, a pre-requisite for such an implementation is to start with the most frequently used routes in one's network, because here many synergies can interact with each other to raise efficiencies.

Interreg Alpine Space
AlpInnoCT

Technical Action Sheet No.5

Pilot Case 5 — Fostering access to Combined Transport for small and medium-sized transport companies

Short description of Action

The current Action Sheet describes measures and actions which enable small and medium-sized transport and forwarding agency companies to take part in Combined Transport. The focus of this action sheet is put on specific recommendations aiming at the reduction of entrance barriers from the perspective of the above-mentioned companies.
These actions can be clustered according to the following categories:

A Business processes
B Technology and equipment
C Quality requirements
D Know-how

The basis for these categories of actions are results available from previous projects and practical input from the stakeholders and the work accomplished during the AlpInnoCT project. The action intends to emphasize the need for a stronger cooperation – e.g. in companies or cooperatives – to develop a critical mass, come to constant transport volumes and thus to industrial processes. In order to have a long lasting and constant transport service by rail, the train itself must have a utilisation level of 100%. One transport company (as an SME-sized) cannot guarantee this 100% utilisation. Thus, a higher number of transport companies and forwarding agencies must cooperate.

Fields of optimisation

- ➔ Transport corridor-related: Organisation and process.
- ➔ Transshipment terminals and ports: Organisation and process.
- ➔ Transport corridor-related: Technology

Production know-how

Affected production know-how:

- ➔ Standards (in transport units and processes).
- ➔ Definition of quality & service requirements (along the whole transport chain).
- ➔ Definition of a customer.
- ➔ Transparency and information

Objectives of the action

Simplify and fostering access to Combined Transport for small and medium-sized transport companies and forwarding agencies.

Obstacles

Barriers for transport companies and forwarding agencies

1. Punctuality and reliability
2. No guarantee of performance
3. Quality requirements
4. Infrastructure and politics
5. Lack of consulting and advice

Barriers for RU

1. "Critical mass"
2. Complex transport systems
3. Special equipment & know-how is required
4. Balanced transport streams
5. International administration
6. Preparation time of CT

Target group

- Forwarders
- Transport companies
- Railway companies
- Transshipment Centres
- Government

Responsible actors

- Forwarders
- Transport companies
- Railway companies
- Transshipment Centres

Involved stakeholders

- Politics
- NGOs

Evaluation (Key Performance Indicators or estimates)

The actions can be evaluated and measured by following, selected indicators:

Operation performance:
Lead time = time from start of the CT until the end (> benchmark = road transport time)

Service quality performance:
Timeliness = reliability of transport times for customers

Financial performance:
Costs and pricing = no (significant) additional costs for CT compared to road transport

Environmental performance:
Emissions > saving of e.g. CO_2-emissions of CT compared to road transport

Projects of the past have shown that scientific and at the same technical approaches can lead to measurable improvements of rail transport quality e.g.
> www.iml.fraunhofer.de › iml › documents › IS_Tauernachse_Prien

Timeline of implementation

Short-term:
Establishment of working groups (esp. transport companies, railway undertakings, shippers).

Medium-term:
Development of competitive railway offers based on the workshop results.

Long-term:
Use of established cooperation of short- and medium-term actions to institutionalise this cooperation on a formal basis.

Estimation of shift from road to CT/rail

A practical example of requirements for a marketable railway connection is the following example. These are the requirements for solutions which meet the requirements of railway companies, transport companies, forwarding companies and the industry:

- 3 Alpine crossing trains departures per week along the pilot corridor.
- Each direction has 30 trailers per train.
- This leads to 90 (3x30) trailers per week in each direction.
- One year has round about 50 weeks.
- 50 weeks x 90 trailers lead to 4.500 trailers per year.
- This leads to 9000 trailers in both directions.

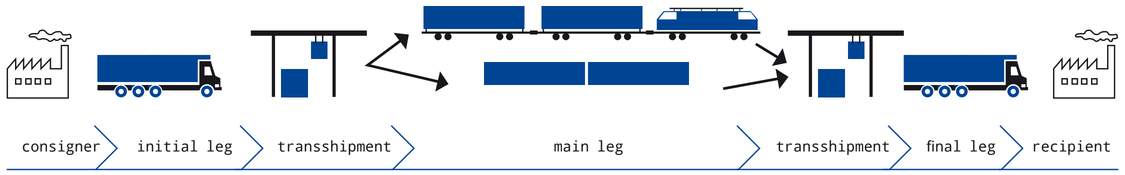
(This calculation is just an example and thus a conservative estimation based on practical input.)

Detailed description of the action

Work processes in SME transport companies are usually designed for their own optimal operation and thus represent isolated solutions. These processes are optimized for internal efficiency. The CT in contrast to the road transport has increased organizational and personal efforts. Because of this, the focus of SME transport haulage companies is often on the road freight transport.

The increasing complexity of CT is based on the increasing number of participants in CT (one carrier in road transport vs. three carriers in CT). This number of participants is necessary to guarantee a successful process flow. The interfaces between the individual transport chain links in CT must be optimally coordinated with each other (for example: punctual arrival times of trucks at a transshipment centre usually lead to long waiting times). Usually the SME transport company does not have its own organization or special vehicles at the destination of the CT.

Combined Transport Chain



Source: LKZ Prien GmbH

This additional coordination effort in CT leads to an increased internal and external communication effort. Language and cultural barriers can also lead to obstacles in the whole process chain. Furthermore, SME transport companies are no longer able to coordinate the whole transport chain. The transport companies outsource their main business to external service providers in CT and is thus depended on their price, performance and punctuality. The customer of the transport company expects the same performance as continuous road transport and this must be guaranteed by the transport company, even though it has no longer direct access.

An additional obstacle is also the necessary amount of cargo required for the realization of a block train to facilitate an economic transport. Since it is seldom possible for most SME transport companies to fill a complete train with its own loading units, they are highly dependent on third party operators.

How can these barriers be solved?

One high potential solution is the creation of a cooperative which centrally organises combined transport. This cooperative unites members from transport companies, politicians, railway companies and all other participants which will take part in CT. This cooperative can facilitate participation in CT by a central organisation of all involved actors and work flows. It also can provide help, support and advice.

Actions to be taken in the future:

1. Development of a blue-print for cooperatives.
2. Umbrella organization with regional organizations.
3. Invitation and establishing of regional working groups which consist at least of transport companies and forwarding agencies (SMEs), railway companies and further stakeholders like infrastructure operators etc.
4. Signature of LOI (Letter of Intent) for the establishment of such a cooperative.
5. Establishment of the cooperative and start of the daily business as well as continuous business development.

Good Practice / Others

- Transporters that already use CT (for example Dettendorfer).
- TX "Pure Green Pioneers".

Flexible transshipment technology offering short-term solutions for shifting freight from road to rail (e.g. NiKRASA).

Recommendations for implementation and dissemination

- Further projects
- Financial support by law
- Neutral coordination
- Involvement of political institutions