Interreg
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CROSSFREIGHT

D 3.1.1 CROSSFREIGHT Transferability strategies analysis

Joint report by PP3 AIN

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1. Executive Summary

The CROSSFREIGHT project (Interreg Italy–Croatia, ITHR0200487) tackles one of the most critical challenges in the Adriatic transport corridor: the need to modernise and digitalise port–rail logistics chains to improve efficiency, reliability, sustainability, and cross-border interoperability. Addressing long-standing fragmentation between actors, manual procedures, and inconsistent data flows, the project introduces a set of coordinated digital solutions tested across seven pilot nodes in both Italy and Croatia.

The WP2 pilots represent a diverse portfolio of technological maturity. They range from advanced AI-driven optimisation systems deployed in large TEN-T hubs such as Ravenna, Trieste and Venice, to medium-complexity digital coordination tools such as the Freight Information System in Rijeka and the Bluetooth-based real-time shunting monitoring solution in Abruzzo, as well as low-cost, high-impact soft-digital tools implemented in Šibenik and within the national accident-investigation system led by AIN. This diversity reflects the different operational realities and digital readiness levels across the programme area and ensures that the solutions remain adaptable and scalable to nodes of varying size and complexity.

All pilots converged on a common set of benefits: improved visibility of operational processes, enhanced communication among stakeholders, reduction of manual errors, optimised allocation of shunting and terminal resources, and faster, more structured information flows. Notably, the adoption of digital technologies—whether highly sophisticated or intentionally simple—consistently generated measurable improvements in planning efficiency, coordination, safety documentation, or infrastructure utilisation. This confirms that digitalisation is effective at every development stage, provided the solution is appropriately tailored to the local context.

The WP3 Transferability Analysis assessed the potential to replicate these solutions in at least five additional intermodal nodes. Transferability potential was rated medium to high across all pilots, though conditional upon factors such as digital infrastructure readiness, governance structures, data availability, and stakeholder willingness to adopt new procedures. Importantly, each partner expressed readiness to support further uptake of their solution through knowledge sharing, peer-to-peer sessions, site visits, and provision of training materials—strengthening the project's cross-border value.

Beyond immediate operational improvements, CROSSFREIGHT contributes to wider strategic objectives, including enhancing interoperability across the TEN-T network, encouraging the modal shift from road to rail, supporting sustainable and energy-efficient transport, and promoting harmonisation of digital processes across the Italy–Croatia cooperation area. By producing validated, real-world evidence of the effectiveness of digital interventions, the project helps shape future policy directions and provides a scalable reference framework for other European port-rail nodes.

2. Project Background

CROSSFREIGHT responds to growing rail freight demands in the Adriatic region and inefficiencies caused by limited IT integration, fragmented communication, and manual shunting operations. The project's objective is to pilot and evaluate ICT solutions capable of:

- Optimizing port–rail last-mile processes
- Enhancing interoperability among logistics actors
- Supporting cross-border multimodal efficiency
- Laying foundations for replicable digital solutions across nodes

WP2 pilots were implemented in seven intermodal nodes: Trieste (Adriafer), Venice (ERF), Ravenna (ITL), Šibenik (LUŠ), Rijeka (Transagent), Abruzzo (Sangritana), and at national level (AIN). WP3 focuses on evaluating transferability of the digital tools to six additional nodes:

- ITL: Bologna Freight Village
- Adriafer: Cervignano Freight Village
- LUS: Port of Split
- Sangritana: Abruzzo Freight Village
- Transagent: Rijeka Brajdica station
- ERF: Terminal Tencara

The CROSSFREIGHT project responds through a two-step approach:

WP2 – Field Operational Tests (FOTs)

Implementation and testing of innovative ICT solutions adapted to local operational contexts.

Assessment of which solutions can be replicated elsewhere, under what conditions, and with what adaptations.

The combination of advanced and soft pilots ensures a broad and inclusive approach, providing options for nodes regardless of size or sophistication.

3. Analysis of Partner Pilot Actions

AIN structured the transferability analysis using a methodological model inspired by the DocksTheFuture Transferability Framework and adapted to intermodal rail-port environments. The methodology includes:

Eight comprehensive questionnaires were distributed to pilot partners, collecting (the questionnaire template is included in the document as Annex 1):

- Contextual characteristics of each node;
- Technical description of pilot solutions;
- Implementation experience and stakeholder involvement;
- KPIs and observed impacts;
- Transferability factors, risks, and conditions.

Comparison criteria included:

- Digital maturity;
- Operational complexity;

- Stakeholder multiplicity;
- Tonnage and frequency of rail operations;
- Available ICT infrastructure;
- Type of pilot (hard/soft/AI/monitoring).

Each pilot was evaluated along five dimensions:

1. Technical fit
2. Operational fit
3. Organisational fit
4. Economic feasibility
5. Scalability & adaptability

Partners proposed potential target nodes (e.g., Bologna Freight Village, Cervignano Freight Village, Port of Split, Abruzzo Freight Village, Rijeka Brajdica station, Terminal Tencara). Below is a structured, partner-by-partner overview of pilots, extracted from all questionnaires.

ITL (LP1)

Local operational context

Ravenna is a TEN-T Core Port with 11 tracks and two different shunting operators, making the node one of the most operationally complex in Italy. Prior to the pilot, a digital Rail Management Platform existed but lacked optimisation functionalities.

Pilot description

ITL deployed a Rail Shunting System (RSS) integrated with the RMP, enriched with detailed JSON-based data structures and optimisation algorithms. The system calculates optimal shunting sequences, resource allocation and parking strategies. A rigorous Gantt-planned timeline ensured structured delivery.

Pilot outcomes

RSS demonstrated strong scalability: even with large increases in train volumes (10 → 114 trains), team workload remained stable while throughput increased. Dwell times decreased, node capacity improved and CO_2 emissions were indirectly reduced through shorter locomotive operations.

Transferability

Ideal for major ports and inland terminals with digital readiness. ITL has carried out a transferability analysis on Bologna Interporto.

Technical fit: The pilot focuses on an optimization module that exchanges data via APIs and JSON payloads. Transfer relies on a connector/API-based architecture that requires the receiving node to have non-obsolete ICT infrastructure and reliable real-time data sources.

Operational fit: The RSS processes path, resource, and capacity data to generate optimized shunting schedules, helping reduce train wait times and CO2 emissions. Preconditions include a requirement for completing the M53 scheduling form.

Organisational fit: Stakeholders may resist transitioning from paper-based and email workflows to digital processes due to job displacement concerns or technology distrust. Effective change management, comprehensive training, and clear definitions of responsibilities regarding the algorithm's output are essential.

Economic feasibility: The cost structure includes initial software development/testing and ongoing maintenance. Revenue models can include SaaS subscriptions or usage-based fees.

Scalability & adaptability: Rated as high transferability, the system uses standardized processes compatible with many ports and intermodal nodes. It offers flexibility and can be customized to adapt specific maneuver planning logic or output fields based on local node requests.

Constraints & success factors

Alignment with port authorities and rail undertakings is essential. Reliable data feeds from RFI PIC are mandatory.

Adriafer (PP2)

Local operational context

Trieste is Europe's core TEN-T rail port, with over 11,000 trains/year across multiple connected stations. Operational complexity stems from multiple terminals, public and private actors and extensive international connections.

Pilot description

Adriafer developed a Digital Decision Support tool enhancing the existing TrainShunt system and synchronising it with PCS Sinfomar and RFI PIC. Functionalities include digital shunting requests, real-time train status, KPI dashboards (energy consumption, personnel hours, cost per shunting movement) and automated gate authorisations for customs.

Pilot outcomes

Expected benefits include reduced idle times, improved reliability, and enhanced environmental monitoring.

Transferability

High, particularly for complex multimodal hubs across the TEN-T Baltic–Adriatic corridor.

Technical fit: The pilot utilizes a Digital Decision Support (DDS) tool driven by big data and artificial intelligence. Transferring this solution requires basic digital tools at the receiving node, such as a Port Community System or terminal management platform, and the technical ability to integrate APIs with varying legacy systems.

Operational fit: The tool bridges communication between maritime terminals and railway undertakings, automating shunting requests and gate crossing authorizations. Operationally, it requires a stable IT environment, reliable internet across the rail yard, and a transparent flow of data.

Organisational fit: The primary challenge is the high degree of multi-stakeholder complexity and inherent resistance to changing established manual workflows. Strict adherence to national and European railway safety regulations (e.g., ANSFISA or ERA) and GDPR compliance for commercial data exchange are mandatory.

Economic feasibility: The initial software adaptation costs can be a significant financial barrier for smaller nodes. Additionally, the transfer requires highly specialized IT and railway logistics personnel, who are often in short supply within the public sector.

Scalability & adaptability: Rated with high transferability, the core logic for reducing "data silos" is highly adaptable to other European hubs. However, the user interface and data fields require tailoring to local languages and specific national safety rules.

AIN (PP3)

Official role

AIN acts as both a WP2 and WP3 key contributor, with a dual responsibility: (1) leading Activity 2.3 focused on impact assessment of ICT solutions, and (2) coordinating Activity 3.1 concerning transferability analysis. This positioning places AIN at the intersection of operational testing, safety oversight and methodological evaluation, ensuring that results from pilots feed directly into structured, cross-border transferability insights.

Local operational context

Unlike other partners implementing pilots at physical intermodal nodes, AIN's pilot takes place within the national institutional environment of the Accident Investigation Body. Daily operations include managing notifications from infrastructure managers and railway undertakings, documenting case evidence, monitoring investigation steps and ensuring compliance with EU railway safety directives. Before the pilot, digitalisation was fragmented across disconnected systems, many based on manually processed documents. Regulatory constraints include strict independence from safety authorities, GDPR requirements, and EU obligations under Directive (EU) 2016/798.

Pilot description

AIN developed a unified digital application to standardise and streamline the management of incidents and accidents in the rail system. The application digitises previously scattered and manually recorded workflows, allowing structured case creation, secure evidence storage, timestamped logs, and internal routing of documentation. Implementation included needs analysis, repeated iterative testing cycles, deployment within AIN's secured IT environment, and training of investigative staff. Although external actors do not directly access the tool, its outputs improve cross-institutional coordination.

Pilot outcomes

Qualitatively, AIN reports a substantial improvement in process transparency, data integrity and ease of retrieval. Documentation is now consistent and structured, reducing time spent tracing information. Internal user feedback highlighted improved clarity, especially in complex investigations. Quantitatively, AIN used KPIs such as time spent per case, number of documents standardised, reduction in missing information and user satisfaction rankings.

Transferability

The core module—digital case management—is transferable to any national safety body or investigation authority, provided local procedures are adapted. Although not targeted at intermodal nodes, its logic (structured digital workflows, secure document management, audit trails) is applicable wherever safety-critical documentation must be safeguarded.

Technical fit: developed a digital application featuring secure evidence storage, timestamped logs, and internal document routing. Deployed within a secured internal IT environment.

Operational fit: Tailored for a national institutional Accident Investigation Body to manage incident notifications, document case evidence, and monitor investigative steps. Enhances process transparency and data integrity, significantly reducing information retrieval times and cross-institutional coordination gaps.

Organisational fit: Satisfies strict regulatory constraints, including organizational independence, GDPR compliance, and EU obligations under Directive (EU) 2016/798.

Economic feasibility: Justified economically through optimized resource usage, tracked by KPIs such as reduced time spent per case and diminished missing information.

Scalability & adaptability: Core digital case management module is highly transferable to any national safety body or investigation authority upon adapting local procedures. Workflow logic (structured tracking, secure document handling) is highly adaptable to any sector safeguarding safety-critical documentation.

Constraints & risks

Key barriers include strict data-protection requirements, need for secure hosting environments, and potential integration challenges if future external interfaces (e.g., National Safety Authority systems) are required. Organisational resistance may arise due to habit-formed manual routines.

Success factors

Clear workflows, engaged staff, and early-stage testing ensured user acceptance. Technical support and training were essential in helping investigators shift from manual to digital workflows.

Willingness to support

AIN expresses readiness for peer-to-peer guidance, sharing templates, and participating in cross-institutional workshops.

ERF (PP4)

Local operational context

The Venezia Marghera Scalo Railway District represents a dense, multi-actor, high-intensity industrial rail ecosystem. ERF performs all shunting operations that link industrial plants, logistics warehouses, port terminals, and the national RFI network.

Pilot description

The MINOSSE pilot introduces a new ICT system designed for digital mapping, geolocation, and structured monitoring of the entire railway siding infrastructure in Porto Marghera. The system records the geospatial coordinates alongside the physical, geometric, and functional properties of each component in a structured digital environment, creating a technical foundation for future integration with the existing SIMA2 optimization platform.

Pilot outcomes

The implementation has driven immediate qualitative and operational enhancements, establishing clear digital visibility over the siding infrastructure's condition and substantially improving coordination between maintenance crews and shunting teams. From a long-term perspective, stakeholders will benefit from reduced infrastructure unavailability rates, enhanced shunting safety, and optimized operational speeds. While the initial setup faced challenges regarding accurate geolocation in complex industrial areas, establishing uniform evaluation criteria, and building historical baseline trends, the pilot successfully tracked core performance indicators including unavailability rates, safety non-compliance detections, and maintenance-related shunting delays.

Transferability

The solution is not context-dependent: any railway siding—regardless of size, location, or operational intensity—can apply the same approach.

Technical fit: The pilot is an ICT tool used to geolocate and monitor the conditions of railway infrastructure elements. The primary technical precondition for transfer is a basic ICT infrastructure and a complete initial census/geolocation of the local railway siding elements.

Operational fit: The system improves maintenance management, reduces infrastructure unavailability rates, and allows for the collection of structured data to enable predictive maintenance.

Organisational fit: Personnel must be specifically trained on the characteristics of the local railway infrastructure and the use of the ICT tool. The receiving node must establish a set of geometric limits based on their specific national rules.

Economic feasibility: While direct costs are not detailed, the system represents an effective solution that positively impacts maintenance management costs, making it economically attractive.

Scalability & adaptability**:** Rated with very high transferability, the tool is not bound by context-specific restrictions and can be utilized by both small and large railway terminals. It can be custom-designed based on different international regulations.

Constraints, risks and success factors

A key constraint stems from the regulatory environment, as the tool utilizes national rules, meaning any transfer to a new jurisdiction requires adapting the software to a new set of national geometric boundaries and safety thresholds. Furthermore, because there is a lack of consolidated international track geometry regulations specifically for sidings, receiving nodes that do not officially act as infrastructure managers may require internal organizational adjustments and consistent data-entry discipline to guarantee long-term system success. Ultimate success depends heavily on close collaboration between infrastructure owners and shunting operators, basic baseline documentation, and a shared commitment to monitoring infrastructure safety.

Willingness to support

ERF is highly willing to support the cross-border uptake of this tool by sharing its specialized infrastructure know-how, hosting peer-to-peer technical guidance sessions, exchanging lessons learned from the pilot execution, and helping propose new or enhanced safety standards for railway sidings.

Logoteam (PP5)

Although not implementing a pilot, Logoteam's contribution is essential:

- Development of AS-IS and TO-BE analyses;
- Harmonisation of methodologies across nodes;
- Ensuring coherence of KPIs;
- Supporting WP3 consistency.

Its work significantly increases transferability accuracy across nodes.

Sangritana (PP6)

Local operational context

The Fossacesia–Atessa–Saletti industrial rail system supports major Italian industries (SEVEL/Stellantis, Honda, Trigano, Amadori, Sidervasto). A 12-km single-track regional line without modern signalling poses challenges for real-time control.

Pilot description

The pilot introduces a cost-effective digital monitoring system composed of Bluetooth gateways along the track and magnetic sensors mounted on locomotives and wagons. The system provides automated localisation, enabling optimisation of movements without the need for expensive signalling upgrades. Additional cameras provide security for parked trains—important due to past theft incidents.

Pilot outcomes

Preliminary results show faster path clearance, improved safety monitoring, and better understanding of infrastructure utilisation patterns. Data collected improves traffic planning and may support future infrastructure investments.

Transferability

Highly suitable for small and medium industrial zones, regional freight lines and terminals with limited capital availability.

Technical fit: The solution relies on a mix of a software platform and hardware devices, specifically Bluetooth gateways (fixed checkpoints) and magnetic Bluetooth sensors placed on locomotives and wagons, supplemented by motion detection cameras. It requires stable interfaces with existing rail systems like RFI PIC. Minimum requirements include at least two gateways and one sensor per train.

Operational fit: The pilot enables real-time traffic monitoring and improves the security of parked trains against vandalism. Operationally, it speeds up departures by removing the need for vocal/phone clearance.

Organisational fit: Human factors and safety concerns are paramount; train conductors must physically install the devices correctly without compromising safety or data quality. Management buy-in and low-level organizational cooperation are critical success factors.

Economic feasibility: It is designed as a highly adaptable, low-cost solution, presenting very limited financial barriers for transfer.

Scalability & adaptability: The overall transferability potential is high. Adapting the system to a new location primarily requires physically mapping the new rail layout and repositioning the Bluetooth gateways (georeferencing). It can easily be scaled to complex scenarios with multiple terminals.

Constraints, risks and success factors

The main constraints involve safe and correct placement of devices, staff training and human-factor risks. Management buy-in and operator discipline are critical.

LUŠ – Port of Šibenik (PP7)

Local operational context

Šibenik is a low-volume port with ageing rail infrastructure and minimal digital tools. Rail flows include bulk cargo, agricultural goods and industrial materials.

Pilot description

A low-cost Excel-based planning and monitoring tool was developed, including sheets for station capacity, loading/unloading cycles, KPI tracking, risk assessment and stakeholder roles. The solution is intentionally simple to ensure usability without advanced ICT infrastructure.

Pilot outcomes

Stakeholders report improved visibility, consistency, and collaborative planning. Although rail volumes are low, the structured approach represents a major quality leap.

Transferability

Very high—applicable to dozens of Mediterranean and Adriatic ports with similar conditions.

Technical fit: This soft pilot utilizes a low-complexity, modular Excel-based ICT tool featuring manual data entry, pivot tables, and conditional formatting. It requires only minimal technical infrastructure, specifically PCs and shared storage.

Operational fit: Designed for nodes with very low traffic volumes and degraded infrastructure, the tool improves capacity planning and visibility of train schedules. Due to the lack of automation, it relies heavily on strict operational procedures to avoid inconsistent data entry.

Organisational fit: Transfer requires strong commitment from node management and clearly defined stakeholder roles. There is a risk of discontinuity without management support and potential organizational resistance to procedural changes.

Economic feasibility: As an internally tested Excel tool, it involves no external ICT providers and ensures very low implementation costs, making it highly feasible for ports with limited financial capacity.

Scalability & adaptability: The solution is highly transferable, serving as a practical, transitional entry point to digitalization for intermodal nodes with low digital maturity. It is easily adaptable as traffic volumes grow.

TRANSAGENT Rail (PP8)

Official role

As PP8, Transagent Rail serves as the implementing body of a WP2 pilot focusing on operational digitalisation for freight rail movements at the Port of Rijeka.

Local operational context

The Brajdica/AGCT terminal is one of Croatia's main maritime-rail nodes, handling high container volumes. The environment involves rail undertakings, infrastructure managers (HŽ Infrastruktura), terminal operators and logistics companies. Prior to the pilot, communication relied heavily on emails, phone calls and manually managed spreadsheets, making coordination inconsistent and delay-prone.

Pilot description

The developed Freight Information System (FIS) is a web-based, device-agnostic platform offering real-time train monitoring, digital documentation, automated alerts, resource management and operational dashboards. System development followed a staged approach: requirements collection, software engineering, internal testing, live environment simulations, and training.

Pilot outcomes

Key impacts include improved situational awareness, quicker decision-making and improved reliability of information exchange. The system reduces administrative workload and improves safety by reducing potential miscommunications. Frequently used

KPI categories include reduction of delays, reaction time to operational events, number of manual interventions replaced, and stakeholder satisfaction.

Transferability

FIS is highly transferable due to its modularity and minimal need for physical infrastructure. It is especially useful for mid-sized terminals lacking integrated systems.

Technical fit: The solution is a web-based ICT platform accessible via desktops, tablets, and mobile phones. Technical implementation requires reliable internet connectivity and successful integration with existing legacy platforms to ensure data interoperability.

Operational fit: Designed to replace manual communication (emails, phone calls), the system provides real-time train tracking, document management, and automated notifications. The receiving node must have clearly defined operational processes and data availability.

Organisational fit: Successful transfer demands strong cooperation among railway undertakings, infrastructure managers, and terminal operators. Risks include staff resistance to change, the necessity for structured user training, and compliance with national railway regulations and data protection laws.

Economic feasibility: Financial barriers include the investment costs required for initial system deployment, as well as ongoing maintenance expenses.

Scalability & adaptability: The pilot has high transferability potential due to its modular and web-based architecture. Core functionalities address common rail challenges and require minimal technical adjustments, though some adaptation to local regulatory frameworks is necessary.

Constraints & risks

Integration with legacy systems (e.g., national infrastructure databases) may require additional effort. Organisational readiness and data-sharing willingness are essential.

Success factors

Active involvement of infrastructure managers and terminal operators is critical. Training and clearly defined operational responsibilities ensure smooth deployment.

Willingness to support

Transagent is open to site visits, training programmes and mentoring.

4. Comparative Evaluation of Pilots

Criterion	Advanced ICT Pilots (Trieste, Venice, Ravenna, Rijeka, Abruzzo)	Soft / Administrative Pilots (Šibenik, AIN)
Complexity	High	Low–Medium
Automation level	Full/AI-enabled	Partial/manual input
Infrastructure prerequisites	Requires digital maturity	Works with minimal ICT
Stakeholder dependency	High	Medium
Primary benefits	Efficiency, capacity, cost reduction	Process organisation, transparency
Transferability	High but context-dependent	High and widely adaptable

All pilots showed improvement in:

- Operational visibility
- Stakeholder coordination
- Data consistency
- Planning efficiency

5. Cross-Pilot Transferability Assessment (WP3)

The project identifies five major conditions required across all nodes:

1. Digital infrastructure readiness

At minimum: shared storage, stable connectivity, basic IT literacy.

2. Stakeholder alignment & governance

Critical for nodes with multiple terminal operators (Trieste, Ravenna, Venice).

3. Data availability & interoperability

Nodes must provide:

- Train movement data
- Wagon lists
- Slot availability data

4. Customisation of tools to local layouts

Especially for:

- Bluetooth-gateway solutions (Abruzzo)
- Track layout optimisation modules (Ravenna)

5. Training & change management

Hands-on training essential for adoption.

6. Cross-Border Added Value

All partners acknowledge that digitalisation enhances:

- Port–rail interoperability
- Cross-border corridor efficiency
- Data harmonisation across Italy–Croatia
- Environmental performance via modal shift

7. Conclusions

The CROSSFREIGHT project clearly demonstrates that digitalisation represents a decisive enabler for improving the efficiency, safety, and sustainability of port–rail logistics across the Italy–Croatia cooperation area. Despite the significant differences in infrastructure maturity, operational intensity, organisational structures, and existing ICT capabilities among partner nodes, all WP2 pilot actions achieved tangible benefits that directly contribute to the project’s core objectives.

A key finding of the analysis is that digital transformation is achievable and impactful at all levels of development. Advanced solutions such as optimisation engines, API-based integrations, and dynamic scheduling tools (e.g., Ravenna, Trieste, Venice) show strong potential to increase capacity, reduce delays, optimise resource allocation, and support evidence-based decision-making. At the same time, soft and low-cost tools tested in Šibenik and AIN illustrate that meaningful progress does not require large investments: even simple digital structures improve operational transparency, stakeholder communication, and data quality.

Across all pilots, stakeholders consistently reported better situational awareness, clearer roles and responsibilities, and more structured workflows. Digital solutions helped overcome long-standing issues such as fragmented communication, manual information exchanges, inconsistent documentation practices, and limited visibility of operations or infrastructure condition. These improvements are not only operational—they also reinforce organisational cooperation and foster a shared understanding of the importance of coordinated, data-driven management in multimodal logistics.

The transferability assessment (WP3) shows that the overall potential for replication is high, supported by three main factors:

1. Modularity of the tested tools, allowing adaptation to nodes with different needs and contexts.
2. Scalability of solutions, from small single-user terminals to large port-rail complexes.

3. Availability of committed partners, all of whom expressed readiness to support knowledge sharing, peer-to-peer transfer, and training activities.

However, successful transfer requires certain preconditions, such as minimum ICT capacity, stable data sources, engaged organisational structures, clear governance, and willingness to adopt new procedures. In several cases, the human factor—especially training, habitual practices, and stakeholder alignment—proved as significant as technical prerequisites.

Ultimately, CROSSFREIGHT provides a robust foundation for future cross-border cooperation in the field of digitalised port–rail operations. The results contribute to wider EU transport strategies, including TEN-T objectives, the European Green Deal, and the ongoing shift toward interoperable, energy-efficient, and resilient multimodal supply chains. The project demonstrates that targeted digital innovation can lead to substantial operational gains, irrespective of node size, and offers a diverse portfolio of solutions ready for replication across the Adriatic region and beyond.

CROSSFREIGHT thus positions itself as a strategic reference point for future investments and collaborative initiatives, supporting long-term harmonisation, improved logistics performance, and sustainable growth in the Italy–Croatia Programme area.

8. Recommendations

For Immediate Transfer:

- Šibenik Excel-based optimisation tool → suitable for small/medium ports.
- AIN case-management system modules → can be replicated in safety agencies.

For Medium-Term Transfer:

- Transagent FIS → adaptable for intermodal terminals.
- ERF VERA-P → applicable in multi-operator port rail yards.
- Sangritana -> adaptable for intermodal terminals and for private rail lines and small-mid port-rail ecosystems.

For Advanced Digital Nodes:

- ITL Ravenna RSS → ideal for major TEN-T nodes with existing PCS/RMP integration.
- Adriafer AI-driven DDS → for large port–rail ecosystems.

Annex 1

Transferability questionnaire

Purpose of the document - partner input questionnaire for the CROSSFREIGHT transferability analysis

This document serves as a formal request for partner inputs essential to the development of Deliverable D.3.1.1. Transferability Analysis, led by AIN within Work Package 3 of the CROSSFREIGHT project.

The purpose of this exercise is to collect data that will enable an objective and context-sensitive evaluation of the potential for transferring the tools tested in the pilot actions in WP2 to additional intermodal nodes across the programme area.

The data provided through this document will directly inform the methodological basis, case analyses, and strategic conclusions presented in the final Transferability analysis.

This questionnaire is structured to enable a granular understanding of the local context, the nature and outcomes of the pilot action(s), and the perceived opportunities and limitations related to the transfer and scaling of digital solutions developed within the CROSSFREIGHT framework.

Each section includes explanatory notes to ensure consistent interpretation of terms and to encourage submission of detailed, nuanced input.

Where available, supporting documentation and visuals are welcome (e.g., pilot photos, system screenshots, stakeholder involvement evidence, diagrams, process charts, etc.).

We kindly request that each project partner involved in pilot implementation return the completed document by 31/01/2026 in editable format, to the coordination team at Alana.Vukic@ain.hr.

Partner's name and number:	
Name of respondent(s):	
Contact email:	

Thank you for your time and commitment. The data you provide will contribute directly to a core output of the CROSSFREIGHT project and will help ensure that the tested solutions find wider application and impact in the programme area and beyond.

1. **General information**

- Official role in the CROSSFREIGHT project:
- Work Package 2 pilot title (if applicable):
- Location of the pilot action:
- Type of intermodal node (e.g., seaport terminal, inland rail terminal, dry port, logistics platform):
- Transport modes involved at the node (e.g., rail, road, maritime):

2. **Local operational context**

Provide a brief but comprehensive overview of the operational setting in which the pilot was implemented. Please include the following where relevant:

- Description of node's primary function in the intermodal chain
- Type and frequency of operations conducted at the node
- Main actors involved in the daily operation (operators, infrastructure managers, ICT providers, etc.)
- Existing digital infrastructure and level of digitalization prior to the pilot
- Regulatory or organizational constraints relevant to ICT or rail operations

3. Description of the pilot action

Please elaborate in detail on the pilot action implemented under WP2. Describe:

- Objectives of the pilot and rationale for its implementation
- Technical description of the solution tested (software, system, digital process, etc.)
- Implementation steps and timeline (e.g., procurement, installation, integration, training, testing)
- Stakeholder involvement and roles in implementation
- Any collaboration with external providers or subcontractors
- Visual material available (screenshots, system interfaces, hardware, events, etc.)

Attach any relevant documents, reports or visuals. Indicate if any material is confidential.

4. Pilot outcomes

Summarize the most important outcomes of the pilot. This may include both qualitative and quantitative aspects.

- Operational improvements observed
- Stakeholder feedback received
- Efficiency or reliability gains (e.g., reduced delays, improved coordination)
- Challenges encountered during or after implementation
- KPIs used for internal assessment
- Lessons learned

5. Elements with potential for transfer

This section explores which specific elements of your pilot action could be considered transferable to other intermodal nodes.

- What aspects of the solution are context-specific and what could be adapted elsewhere?
- Are there elements that require minimal adaptation to be transferred?
- What makes these elements promising for wider application?
- Are there known examples of similar solutions implemented in other contexts?

6. Constraints, risks, and barriers to transfer

Identify any constraints or risks that should be taken into account in a potential transfer scenario.

- Legal or regulatory requirements (e.g., safety, procurement, data protection)
- Technical constraints (e.g., integration issues, interoperability challenges)

- Organizational factors (e.g., stakeholder resistance, training needs, management buy-in)
- Financial or resource-related barriers
- Unforeseen issues or system limitations encountered during the pilot

7. **Success factors and conditions for transfer**

Based on your experience, what conditions must be met for successful transfer of the solution?

- Stakeholder involvement required
- Necessary preconditions at the receiving node (infrastructure, governance, etc.)
- Recommendations for implementation sequencing (what to do first)
- Minimum technical or operational requirements
- Possible need for adaptation or tailoring of the tool/process

8. **Perception of transferability and willingness to support**

- How would you rate the overall transferability potential of your pilot action? (low / medium / high)

- Would your organization be willing to support transfer to another node (e.g., peer-to-peer support, site visits, training material sharing)?
- Have you already been approached by other stakeholders interested in your solution?

9. Suggestions and remarks

Please use this space to share any other observations or suggestions that could be useful for the Transferability Study. This could include:

- Reflections on how your pilot action fits into broader rail freight or port digitalization strategies
- Comments on the relevance of cross-border cooperation for implementation
- Indications of your organization's interest in further collaboration
