



D3.5

ReMuNet Transformation Methodology

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TABLE OF CONTENTS

1	INTRODUCTION	9
1.1	Project Background	9
1.2	Key Objectives of the ReMuNet Project.....	10
1.3	Objective of Deliverable 3.5.....	12
1.4	From previous Deliverables to D3.5.....	13
1.5	Structure of Deliverable 3.5	13
2	THEORETICAL BACKGROUND	15
2.1	Enterprise Architecture	15
2.1.1	Business Capabilities	16
2.1.2	Human-Technology-Organisation.....	16
2.2	Business Transformation and Change Management.....	17
2.3	ReMuNet Ecosystem	18
2.3.1	Ecosystem Actors.....	19
2.3.2	Multimodal Freight Transportation.....	19
2.3.3	Digital ReMuNet Platform	20
3	RESEARCH DESIGN AND DATA COLLECTION	24
3.1	Existing Transformation Methodologies	24
3.1.1	Industrie 4.0 Maturity Index	24
3.1.2	Business Transformation Canvas.....	25
3.2	Development of the Fit4ReMuNet Methodology	26
4	FIT4REMUNET TRANSFORMATION METHODOLOGY	29
4.1	Readiness Assessment	29
4.1.1	ReMuNet Business Capability Map	30
4.1.2	Role-specific Business Capability Maps.....	53
4.2	Practical Guidance for Transformation	58
4.2.1	Meta Capabilities.....	58
4.2.2	Human-centred Capabilities	60
4.2.3	Technological Capabilities.....	63
4.2.4	Organisational Capabilities.....	65
5	FIT4REMUNET ONLINE TOOL	69
5.1	Readiness Assessment	70
5.1.1	Landing Page	70



5.1.2 User Type Selection72

5.1.3 Self-Assessment73

5.2 Practical Guidance for Transformation74

5.2.1 Matrix and Transformation Roadmap74

5.2.2 Exit Page76

6 CONCLUSION AND OUTLOOK77

REFERENCES79

APPENDIX87

A1: ReMuNet Business Capability Map87

A2: Relevance of the Business Capabilities88

A3: Readiness Assessment Report90

LIST OF FIGURES

Figure 1: Enterprise Architecture.....	15
Figure 2: Human-Technology-Organisation.....	17
Figure 3: Evidence-based Change Management	18
Figure 4: Multimodal freight transport process	20
Figure 5: ReMuNet's digital platform architecture	22
Figure 6: Methodology for introducing Industrie 4.0.....	24
Figure 7: Business transformation canvas	26
Figure 8: Research design	27
Figure 9: Framework for the Fit4ReMuNet methodology	29
Figure 10: ReMuNet business capability map	30
Figure 11: Role-specific capability map – Service user	55
Figure 12: Role-specific capability map – Service provider	56
Figure 13: Role-specific capability map – Data provider.....	57
Figure 14: Role-specific capability map – Capacity provider	58
Figure 15: Fit4ReMuNet online tool – Flow chart	70
Figure 16: Fit4ReMuNet online tool – Landing page	71
Figure 17: Fit4ReMuNet online tool – User type selection.....	72
Figure 18: Fit4ReMuNet online tool – Self assessment.....	73
Figure 19: Fit4ReMuNet online tool – Matrix	75
Figure 20: Fit4ReMuNet online tool – Transformation roadmap	75
Figure 21: Fit4ReMuNet online tool – Exit page	76

LIST OF TABLES

Table 1: Multimodal freight transport ecosystem roles	19
Table 2: Assignment of ecosystem roles to platform user types	23
Table 3: Industrie 4.0 capabilities	25
Table 4: Meta capability – Sensing	31
Table 5: Meta capability – Seizing	32
Table 6: Meta capability – Transforming, reconfiguring, and renewal	33
Table 7: Human-centred capability – Strategic direction and internal alignment	35
Table 8: Human-centred capability – Partnering, collaboration and platform mindset	36
Table 9: Human-centred capability – Change management and communication	37
Table 10: Human-centred capability – Digital literacy	38
Table 11: Technological capability – Digital Infrastructure Management	39
Table 12: Technological capability – Data security and privacy	40
Table 13: Technological capability – Data exchange, interoperability and compatibility	42
Table 14: Technological capability – Platform utilisation	43
Table 15: Technological capability – Data quality management	44
Table 16: Technological capability – Standardised digital processes and automation	44
Table 17: Organisational Capability – Sustainability	46
Table 18: Organisational capability – Regulatory, risk, and compliance	47
Table 19: Organisational capability – Operational management and domain knowledge	49
Table 20: Organisational capability – Holistic value logic	51
Table 21: Organisational capability – Organisational resilience	53
Table 22: Practical guidance for sensing	59
Table 23: Practical guidance for seizing	59
Table 24: Practical guidance for transforming, reconfiguring, and renewal	60
Table 25: Practical guidance for strategic direction and internal alignment	61
Table 26: Practical guidance for partnering, collaboration, and platform mindset	62
Table 27: Practical guidance for change management and communication	62
Table 28: Practical guidance for digital literacy	63
Table 29: Practical guidance for digital infrastructure management	63
Table 30: Practical guidance for data security and privacy	64
Table 31: Practical guidance for data exchange, interoperability, and compatibility	64
Table 32: Practical guidance for platform utilisation	65
Table 33: Practical guidance for data quality management	65
Table 34: Practical guidance for standardised digital processes and automation	65
Table 35: Practical guidance for sustainability	66
Table 36: Practical guidance for regulatory, risk, and compliance	66
Table 37: Practical guidance for operational management and domain knowledge	67
Table 38: Practical guidance for holistic value logic	68
Table 39: Practical guidance for organisational resilience	68
Table 40: Fit4ReMuNet online tool – informational texts landing page	71
Table 41: Fit4ReMuNet online tool - information text 'User-type'	72

ABBREVIATIONS

API	Application programming interface
CBV	Capability-based view
DLSP	Digital logistics service provider
DSR	Design science research
EA	Enterprise architecture
FMEA	Transport failure mode and effects analysis
HTO	Human-technology-organisation
IOM	Infrastructure operator and manager
IT	Information technology
LSP	Logistics service provider
MTO	Multimodal transport operator
OCAP	Out of control action plans
ReMuNet	Resilient multimodal freight transport network
SME	Small and medium sized enterprise
STS	Socio-technical systems

1 Introduction

ReMuNet - Resilient Multimodal Freight Transport Network - is financed by the European Commission through the European Union's Horizon Europe research and innovation program under Grant Agreement No 101104072. It has been proposed by a consortium of 15 beneficiaries coordinated by FIR an der RWTH Aachen and will be lasting 36 months, having started in July 2023. The content of the project and the aim of the Deliverable will be presented in the following.

1.1 Project Background

ReMuNet is tasked with identifying and signalling disruptive events while assessing their impact on transport corridors. By communicating alternative multimodal transport routes to logistics operators and subsequently to truck drivers, train drivers, and barge captains, it facilitates a more rapid network response. Furthermore, ReMuNet orchestrates route and capacity utilisation and enables synchromodal relay transport.

Additionally, ReMuNet is responsible for establishing comprehensive standards for the transnational description of multimodal nodes and transport routes, including infrastructure elements and their parameters. This forms the basis for a unified modelling language. To ensure maximum practical applicability and acceptance, these standards are developed by evaluating and consolidating existing description standards, supplementing technical and sustainability related descriptive attributes, and engaging in close collaboration with European transport companies, associations, and institutions.

ReMuNet's collaborative platform reduces entry barriers for regional transport companies, encouraging participation in multimodal transport, known for its lower average emissions compared to road freight transport. Intelligent routing algorithms prioritise low emission routes and modes of transport, enhancing transport efficiency and significantly cutting emissions. ReMuNet explores the integration of alternative drives to further support sustainability goals, aiding political and economic decision-makers in expanding and maintaining vital transport infrastructure.

ReMuNet's algorithm considers the impacts of disruptive events and strategically plans route distribution to maximise the efficiency of the multimodal transport network. Within the project a comprehensive Transport Failure Mode and Effects Analysis (FMEA) is conducted, including detailed risk analysis of disruptive events and potential transport disruptions, to transparently assess short and long-term effects on the multimodal transport infrastructure. ReMuNet's data pool expedites internal decision-making, supporting the development of business capabilities necessary to manage disruptions.

ReMuNet maintains a catalogue of transport Out of Control Action Plans (OCAP), containing quick reaction strategies to respond to potential transport collapses. Synchromodal relay transport is tested as the preferred transport mode to bridge failed transport routes. ReMuNet's algorithm provides real-time status updates on functioning transport nodes and edges, enabling flexible route adjustments. The algorithm calculates failure probabilities for

transport routes and minimises congestion on alternative routes through intelligent distribution.

ReMuNet's collaborative platform treats small and large companies equally, aiming to integrate local players and connecting freight forwarders, carriers, terminal operators, and other key players in the multimodal transport sector. It enables the digitalisation of communication, contracts, handover protocols, and booking processes, and the orchestration of synchro-modal relay transport. Continuous interactive improvement is achieved through algorithm testing and validation using historical disruptive event data. The platform provides transparent and user-friendly access for small and medium enterprises (SME) to route network structures, scheduling, operators, and capacity booking in road, rail, and barge transport.

The platform's infrastructure includes basic backend functionalities, such as master data management, user administration, roles, rights, and user-friendly application programming interfaces (API) and interfaces to existing systems and data sources. ReMuNet provides an AI-supported transport system model capable of depicting the effects and impact intensities of various disruptive events on the transport infrastructure, recognising patterns, deriving failure probabilities, identifying bottlenecks, and evaluating alternative courses of action, thus reducing reaction time, and offering sustainable, event-based route alternatives and scenarios.

ReMuNet strives to integrate civil protection organisations into the collaborative platform, matching them with freight transporters, and using real-time data to display the status of functioning and failing transport infrastructure, enabling faster and more targeted aid transportation.

By integrating all relevant stakeholders via interfaces into ReMuNet, a wide variety of anonymous planning data is refined to create the necessary basis for decision-making. Clear data governance structures and data handling processes that comply with privacy policy specifications ensure secure and trusted information exchange. External data inputs are obtained through APIs and interfaces from multiple sources, enabling participatory planning.

1.2 Key Objectives of the ReMuNet Project

The concept of the Physical Internet foresees a seamless network where resources and assets can be shared openly and efficiently. ReMuNet's main objective is to support the achievement of this vision by giving the transport network the ability to prepare, respond, and adapt to disruptive events.

In practice, ReMuNet uses digital technologies to holistically improve the resilience of the logistics and freight transport network. This includes making planning more robust and secure, reducing response times, and speeding up system recovery. ReMuNet also takes environmental aspects into account and aims to provide synchro-modal transport options with the lowest emissions. This contributes to the implementation of the Physical Internet and helps to reduce the environmental impact of freight transport.

ReMuNet's key objectives are to:

Lay the foundation for a common standard to describe sustainable European multi-modal transport networks for all stakeholders: ReMuNet creates comprehensive standards for the transnational description of multimodal nodes and transport routes including infrastructure elements and their parameters. This will lay the foundation for a uniform modelling language. To ensure maximum practice orientation and acceptance, the standards are developed by evaluating and consolidating existing description standards, supplementing technical and sustainability-relevant descriptive attributes, and closely collaborating with European transport companies, associations, and institutions.

Reduce European inland transport emissions on the main run by over 50 % in the long term: ReMuNet's collaborative platform lowers entry barriers for regional transport companies to participate in multimodal transport, thus facilitating combined transport which on average produces fewer emissions than road freight transport. Intelligent routing algorithms prefer low emission routes and modes of transport and increase transport efficiency, in turn significantly reducing emissions. To further contribute to sustainability goals, possibilities to integrate alternative drives are explored. Insights support political and economic decision-makers in expanding and maintaining the necessary transport infrastructures.

Enable the multimodal freight network to react and respond 20 % more quickly to disruptive events until 2026 (in comparison to 2021): The algorithm considers the impacts of disruptive events and plans a robust route distribution to maximise the efficiency of multimodal transport system utilisation. Transport FMEA including risk analysis of disruptive events and potential transport collapses is conducted to make the short and long-term effects of disruptive events on the multimodal transport infrastructure transparent. A shared data pool accelerates internal decision-making and supports the development of business capabilities necessary to cope with disruptions. Catalogue of transport OCAPs containing quick reaction strategies to (upcoming) transport collapses ensure the ability to (re-)act. Synchromodal relay transport will be tested as the preferred type of transport mode to bridge failed transport routes.

Provide 50 % more alternative transport routes in the face of disruptive events and make multimodal route planning 10-20 % more accurate and efficient until 2026 (in comparison to 2021): The algorithm displaying the real-time status of functioning transport nodes and edges allows for flexible adjustment of route suggestions. Routes are calculated and forwarded to freight forwarders and navigation systems to ensure communication with drivers and barge captains. The algorithm determines failure probabilities of transport ways and minimises congestion on alternative routes via intelligent route distribution. A collaborative platform connects freight forwarders, carriers, and terminal operators, as well as other key players in the multimodal transport sector to gather real-time data and digitalise communication, contracts, handover protocols, and booking processes and orchestrate synchromodal relay transport. Continuous interactive improvement will be achieved by simulative algorithm testing and validation with historical data of disruptive events.

Create new approaches for benefit-sharing cost-efficient business models and integrate 30 % more companies (>50 % SMEs) into the multimodal freight transport ecosystem: ReMuNet offers an open collaborative data platform, which does not differentiate between small and large companies and integrates local players. The platform provides

user-friendly access for SMEs to route network structures, scheduling, operators, and capacity booking in road, rail, and barge transport. The platform infrastructure includes basic backend functionalities, e.g., master data management, user administration, roles, and rights as well as user-friendly APIs and interfaces that connect the platform to other systems and data sources.

Predict the impact of disruptive events on multimodal transport corridors with a 90 % higher accuracy until 2026 (in comparison to 2021): ReMuNet provides an AI-supported transport system model able to depict the effects and impact intensities of various disruptive events on the transport infrastructure, recognise patterns, derive failure probabilities, identify bottlenecks, and evaluate alternative courses of action. This will lead to shortening reaction time by offering sustainable, event-based route alternatives and scenarios.

Enable civil protection organisations to set up aid delivery logistics for crisis areas 25 % faster in 2026 (in comparison to 2021): ReMuNet integrates civil protection organisations into the collaborative platform and matches them with freight transport companies. The network status will stay updated by using real-time to display functioning and failing transport infrastructure while taking new makeshift transport ways into account. This approach will enabling a faster and more focused aid transportation into crisis areas.

Create a unified data pool that portrays the real-time utilisation of multi-modal European transport infrastructure in compliance with data protection regulations: By integrating all relevant stakeholders via interfaces into the ReMuNet, a wide variety of anonymous planning data will be refined to create the necessary base for decision making. Clear data governance structures and secure data handling processes will be implemented to meet privacy policy specifications. External data input is pulled via APIs and interfaces from multiple different sources enabling participatory planning.

1.3 Objective of Deliverable 3.5

The objective of this deliverable is to develop the Fit4ReMuNet transformation methodology. The methodology serves as a guide for logistics companies to develop the competencies and business capabilities needed to participate effectively in the ReMuNet platform ecosystem. It includes role-specific competency maps, a readiness assessment and practical guidance for transformation.

The role-specific business capability maps are derived from an overarching capability map for digital platforms developed as part of a non-public master's thesis by Bareuther (2026) and supplemented by insights from previous deliverables, especially von Stamm et al. (2024a), von Stamm et al. (2024b), Dicks et al. (2025a), and Dicks et al. (2025b). The ReMuNet business capability map consolidates competencies and their characteristics to effectively participate in the ReMuNet ecosystem. They are not a prerequisite, but they are crucial for leveraging the strategic and operational advantages of the ReMuNet platform and creating maximum value.

A readiness assessment and gap-analysis evaluate strengths and weaknesses of logistic companies regarding human-centred, technological, and organisational capabilities based on the requirements of the ReMuNet ecosystem. The assessment identifies potentials for

strategic development and transformation, which are summarised in practical guidance as a transformational roadmap.

The Fit4ReMuNet transformation methodology will be implemented in a digital open access online tool as part of Task 3.4.

1.4 From previous Deliverables to D3.5

Deliverables 3.2, 3.3, and 3.4 analysed the current multimodal freight transport ecosystem, designed the ReMuNet ecosystem and digital platform architecture, and developed the ReMuNet business model and operator model.

D3.2 identified current challenges and derived requirements for a digital solution to address these shortcomings. A value flow model visualised the flow of goods and services, information, and finances to identify bottlenecks in the multimodal transport process and the interaction among ecosystem stakeholders.

D3.3 analysed the results of D3.2 regarding the changes ReMuNet brings to the ecosystem with its digital platform. An adjusted value flow model with the ReMuNet platform in its centre served as a foundation for the analysis of changes for relevant logistic actors, resulting in a list of new business models for key stakeholders in the ReMuNet ecosystem.

D3.4 introduced the ReMuNet business model and operator model, implementing the identified requirements from D3.2 to address the current challenges and building on the digital platform architecture developed in D3.3. The business model encompassed the core value proposition of ReMuNet, which “aims to be a digital, AI-powered, open and collaborative platform that strengthens the sustainability, efficiency and resilience of multimodal European freight transport networks against disruptive events” (Dicks et al., 2025a, p. 51).

Deliverable 3.5 develops the Fit4ReMuNet transformation methodology including practical guidance to prepare logistic companies to participate in the ReMuNet ecosystem to make use of its strategic advantages such as improved efficiency, resilience, and sustainability. The results from the previous Deliverables of Work Package 3 have a direct impact on the business capability map, which considers the digital platform architecture and the business and operating model of ReMuNet.

1.5 Structure of Deliverable 3.5

Chapter 2 introduces key theoretical concepts for this Deliverable. The business capability map is situated in the enterprise architecture, which is described in chapter 1.1. The practical guidance derived from the readiness assessment and gap-analysis build on concepts of business transformation and change management, which are defined in chapter 2.2. Chapter 2.3 concludes the theoretical foundation with a summary of insights from previous Deliverables on the ReMuNet ecosystem.

Chapter 3 describes the research design and data collection for this deliverable. This includes a description of the existing transformation frameworks ‘Industrie 4.0 Maturity Index’ by Schuh et al. (2017) and ‘Business Transformation Canvas’ by Gudergan et al. (2022).

Chapter 4 presents the Fit4ReMuNet transformation methodology encompassing the readiness assessment in chapter 4.1 and the practical guidance for transformation in chapter 4.2. As part of the readiness assessment, the ReMuNet business capability map is detailed in its dimensions meta, human-centred, technological, and organisational. Role-specific capability maps are derived based on the user types described in the ReMuNet operator model by Dicks et al. (2025b). Concluding chapter 4, transformation guidelines are formulated for each business capability and its characteristics.

Chapter 5 describes the implementation of the Fit4ReMuNet transformation methodology as a digital, open-access online tool based on visual mock-ups and user story descriptions.

Chapter 6 summarises the key findings of this deliverable and identifies limitations and future possibilities for expansion of both the methodology itself and its online tool.

2 THEORETICAL BACKGROUND

This chapter presents the theoretical background for the Deliverable and outlines all conceptual building blocks that inform the subsequent parts and design decisions. It first introduces enterprise architecture (EA), the Human-Technology-Organisation (HTO) approach and business capabilities. These are then further situated within the broader context of business transformation and change management before outlining the ReMuNet ecosystem, including its actors, multimodal transport processes, and digital platform architecture.

1.1 Enterprise Architecture

EA is defined as “the analysis and documentation of an enterprise in its current and future states from an integrated strategy, business, and technology perspective” (Bernard, 2012, p. 31), thereby providing a holistic view (Lankhorst, 2017). It covers core elements of the business and its information technology (IT) landscape, as well as how they change over time (Lankhorst, 2017). Therefore, it helps to protect what is essential to the business, while still enabling adaptability and flexibility (Lankhorst, 2017). Compared to traditional architecture, which centres on the creation of tangible, physical things, EA is mainly about shaping intangible things, such as capabilities (Bernard, 2012). In the overall context of managing the complexity of an enterprise, it comprises mission, vision, strategy, goals, actions, and operations (Lankhorst, 2017), as illustrated in figure 1.



Figure 1: Enterprise Architecture (based on Lankhorst, 2017)

There are several EA techniques, such as Zachman's (2003) framework, the Open Group Architecture Framework (TOGAF) (The Open Group, 2018), ArchiMate (The Open Group, n.d.), or the Integrated Architecture Framework (IAF) by Capgemini (Van'T Wout et al., 2010). By creating an EA, organisations benefit from several factors. First, it integrates the needs of different stakeholders and provides tailored views that make complex organisations understandable (Bernaert et al., 2014). Second, it serves as a common reference for documenting core business components, testing changes before implementation, and supporting analysis, optimisation, and change-impact assessments (Bernaert et al., 2014). Third, it improves decision-making by clarifying how processes, systems, and resources interrelate, enabling better capacity planning and budgeting (Bernaert et al., 2014). Despite these benefits, EA remains largely unknown and underused in SMEs, with limited academic attention and little practical adoption to date (Bernaert et al., 2014).

2.1.1 Business Capabilities

Business capabilities are defined as “a particular ability or capacity that a business may possess or exchange to achieve a specific purpose or outcome” (Offerman et al., 2017, p. 387) and take on an important role in enterprise architecture (Vayyavur, 2024). They bridge the strategic reasoning and the operative implementation (Offerman et al., 2017). While the strategy looks at the reason why, the implementation is about how it is done (Offerman et al., 2017). Industry standards generally adopt a capability-based view (CBV) focusing on *what* an organisation does rather than *how* it does it (Offerman et al., 2017). In practice, industry standards are set by business capability maps of major software and consultancy firms (Offerman et al., 2017), such as IBM (n.d.) and SAP LeanIX (n.d.). Typically, these capability maps have several levels (Kotusev & Alwadain, 2024).

2.1.2 Human-Technology-Organisation

The HTO approach (figure 2) provides a framework for understanding and designing work systems (Ulich, 2013). Originally, it is grounded in the Socio-Technical Systems Theory (STS) (Trist, 1981). In STS, organisations are conceptualised as open systems, which are composed of two distinct, yet interacting systems (Trist, 1981). People, their roles, and relationships together form the social system, whereas tools, machines, and processes form the technical system (Trist, 1981). Both systems must be considered together, not in isolation, to fully understand organisations (Trist, 1981). Similarly, in the HTO approach, the task in the centre is influenced by human, technology, and organisation, all situated in the context of the overall market and the natural and social environment (Ulich, 2013). Thus, HTO is a practical concept based on socio-technical systems theory. The framework serves as the

overall structure for the conceptualisation of a business capability map, with capabilities being structured in organisational, human-centred, and technological areas.



Figure 2: Human-Technology-Organisation (based on Ulich, 2013)

2.2 Business Transformation and Change Management

Business transformation is the “strategic realignment and organisational transformation of a company, or one of its parts, aimed at sustainably securing its performance in the market” (Klasen, 2019, p. 2). Transformation is often triggered by external disruptions, such as shifts in consumer behaviour, changes in the competitive landscape (Vial, 2019), pandemics, natural catastrophes, and technological developments (Mouzas, 2022). Successful business transformations are built on several factors, which need to be treated in interaction, not in isolation: value streams, strategy, organisation, people, processes, and systems and resources (Bititci, 2007). Additionally, capability building programs, as part of the transformation, further increase the chance of success of the initiative (Dumitrescu et al., 2017). There are several frameworks and methodologies, such as the Business Transformation Canvas (Gudergan et al., 2022), as further described in 3.1.2.

Change management is often part of transformation and aims at implementing changes at the human level (Klasen, 2019). It “focuses on behavioural changes and only considers a small set of clearly defined goals, whereas business transformation management provides a holistic view on the entire organisation, considering complex changes to the business” (Uhl & Gollenia, 2016, p. 4). In academic literature, there is a huge variety of change management models, such as Lewin's (1948) three-phase process, Beer's (1980) six-step change management model, Judson's (1991) five-steps, Kanter et al.'s (1992) ten commandments, Kotter's (1996) eight-step model, and Hiatt's (2006) ADKAR model. Stouten et al. (2018) synthesise both prescriptive and empirical change management literature into ten evidence-based steps, as depicted in figure 3.

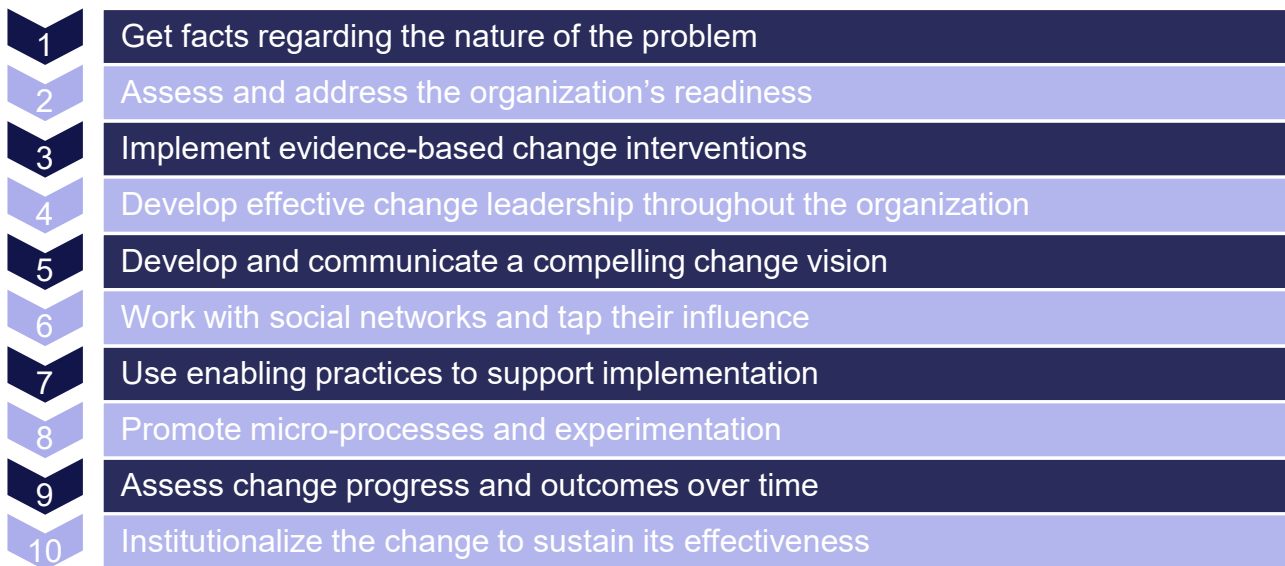


Figure 3: Evidence-based Change Management (based on Stouten et al., 2018)

The first and the second step are diagnosis steps, in which it is analysed whether a change is needed by looking at several information sources, as well as analysing whether an organisation is ready for changes, from both a macro- and micro-level perspective (Stouten et al., 2018). Step three is already about the implementation of concrete interventions, which is supported by a change vision, change leadership, the influence of social networks, and other enabling practices, summarised by steps four, five, six, and seven (Stouten et al., 2018). Ideally, interventions should be implemented with experimentation and micro-processes and celebrated to underline the benefits (Stouten et al., 2018). To track and ensure the intended progress, outcomes, experiences and activities need to be checked on regularly. Finally, the continuity of the change is to be ensured by institutionalising the new measures, rules, or ways of working (Stouten et al., 2018).

2.3 ReMuNet Ecosystem

The ReMuNet ecosystem encompasses a digital platform aiming to improve overall network efficiency, sustainability, and resilience. ReMuNet promotes multimodal freight shifting, connecting all stakeholders of the European freight transport network. The platform features services, data, and algorithms to optimise freight transport planning and orchestration, especially in the event of a disruption.

Disruptions play a crucial role in logistics by affecting both the physical transport infrastructure and the information and communication layer that enables coordination among stakeholders. Caused by events such as natural disasters, technological failures, geopolitical crises, or economic slowdowns, disruptions can lead to significant economic losses and reduced supply chain performance (Kulkarni et al., 2023). Therefore, resilience is essential to ensure the continuity of logistics operations, minimise costs, and maintain reliable goods flows. Effective disruption management includes rapid response measures during events and systematic learning after disruptions to improve future preparedness and strengthen multimodal logistics networks (von Stamm et al., 2024a).

2.3.1 Ecosystem Actors

In the multimodal freight transport ecosystem, different actors interact with each other to transport goods from the consignor to the consignee. Table 1 summarises the respective roles and the advantages or changes through ReMuNet, as analysed and described by von Stamm et al. (2024b) und Dicks et al. (2025a).

Table 1: Multimodal freight transport ecosystem roles (based on Dicks et al., 2025a; von Stamm et al., 2024b)

Actor	Role in the transport process	Advantages through ReMuNet
Consignor	The consignor provides goods and initiates the transport process.	ReMuNet improves data quality and transport planning.
Consignee	The consignee orders goods and receives them at the destination.	ReMuNet increases delivery reliability and ETA accuracy.
Carrier	The carrier physically transports goods using different modes.	ReMuNet supports better capacity use and scheduling.
Freight Forwarder	The freight forwarder organises and manages transport operations.	ReMuNet reduces administrative effort and improves control.
Multimodal Transport Operator (MTO)	The MTO coordinates multimodal transport under a single contract.	ReMuNet enables more efficient multimodal coordination.
Logistics Service Provider (3PL/4PL)	The LSP provides logistics services and supply chain coordination.	ReMuNet enhances integration and optimisation.
Digital Logistics Service Provider (DLSP)	The DLSP digitally orchestrates transport without owning assets.	ReMuNet enables automation, scalability, and transparency.
Software Provider	The software provider develops digital tools for logistics actors.	ReMuNet ensures interoperable and data-driven solutions.
Terminal Operator	The terminal operator enables transshipment and modal shifts.	ReMuNet shortens handling times and improves coordination.
Infrastructure Operator / Manager	The infrastructure operator maintains and manages transport networks.	ReMuNet improves capacity and disruption management.
Support Services & Consulting	Consulting providers support optimisation and innovation processes.	ReMuNet accelerates implementation of digital solutions.
Governmental Entities	Public authorities regulate, fund, and supervise transport systems.	ReMuNet supports harmonisation and regulatory alignment.

2.3.2 Multimodal Freight Transportation

Multimodal freight transport refers to the movement of goods using two or more modes, such as road, rail, inland waterways, maritime, or air, while keeping the cargo in the same loading unit, for example containers or swap bodies. These methods improve efficiency, sustainability, and resilience but are limited by the complexity of coordination, gaps in interoperability, and insufficient transparency (von Stamm et al., 2024a). ReMuNet uses multimodal transportation synonymously for the different modalism and focuses on road, rail, inland waterways, and short sea shipping as modes of transport.

In operational terms, the multimodal transport process follows a sequence consisting of transport planning and preparation followed by physical execution across multiple legs. After

the consignee places an order, the consignor and an orchestrating logistics service provider coordinate feasibility checks, capacity planning, routing, and documentation. The physical transport is carried out in a first leg covering pick up and initial transport, a main leg covering the core multimodal transport including terminal handling and transshipment, and a last leg covering final delivery to the consignee. Throughout all stages, handover protocols and status updates ensure continuity, while disruptions remain a major challenge due to limited standardisation and coordination (von Stamm et al., 2024b).

Figure 4 visualises the multimodal freight transport process based on von Stamm et al. (2024a) and von Stamm et al. (2024b). The flows of goods and information resemble the interaction of the ecosystem's actors as described in table 1. Figure 4 summarises the roles of freight forwarder, multimodal transport operator (MTO), digital logistics service provider (DLSP), and logistics service provider (3PL/4PL) for clarity and readability since they all are involved in the orchestration of the freight transport process.

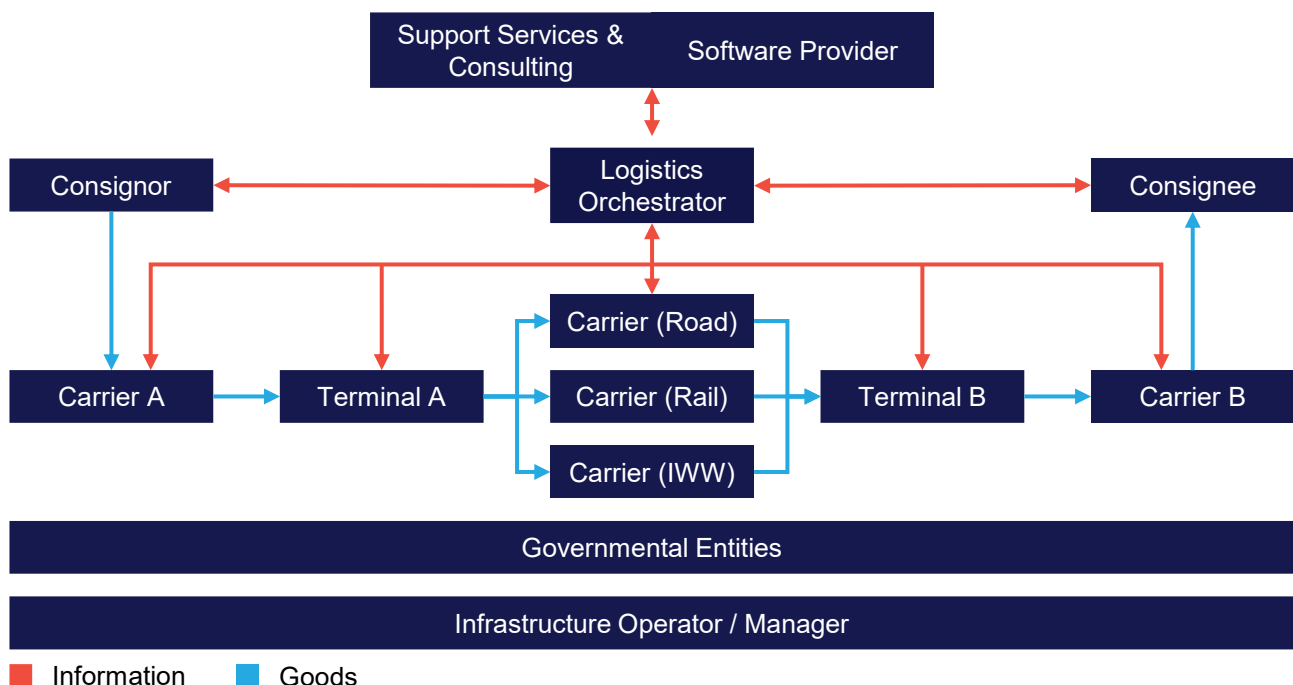


Figure 4: Multimodal freight transport process (based on von Stamm et al., 2024a, 2024b)

2.3.3 Digital ReMuNet Platform

The business model of ReMuNet is designed as a sustainable digital platform model that enables the coordination and optimisation of multimodal freight transport networks. Its value proposition is centred on increasing network resilience, operational efficiency, and transparency by providing real-time data, intelligent routing, and disruption management across transport modes, while simultaneously supporting emission reduction and sustainability monitoring. Value is created through digital services such as data aggregation, analytics, and decision support, which are enabled by shared data resources, interoperable interfaces, and collaboration between freight forwarders, carriers, terminal operators, infrastructure managers, and public actors. The platform facilitates interaction and co-creation within the ecosystem rather than linear service delivery. Value capture follows a long-term logic that

prioritises user adoption and network effects, with monetisation mechanisms designed to be compatible with broad participation and shared benefits (Dicks et al., 2025b).

The operator model specifies how this business logic is implemented and governed in practice. It defines a multi-sided operating structure with clearly differentiated actor roles, regulated participation, and a focus on service-oriented and user-oriented offerings. Ownership of data, services, and IT infrastructure is structured to support collaborative value creation while avoiding excessive centralisation. Governance mechanisms allocate control and decision rights, regulate access and data usage, and ensure transparency, trust, and compliance across the ecosystem. A consortium-oriented governance approach balances coordinated platform control with shared responsibility among key stakeholders, thereby supporting scalability, interoperability, and long-term sustainability in a complex, multi-actor transport environment (Dicks et al., 2025b).

In order to operationalise the defined business and operator logic, the ReMuNet platform architecture provides the technical and functional basis for coordinated action within the multimodal transport system (figure 5). The architecture is designed as an integrative, modular system that connects heterogeneous actors, modes of transport and existing digital systems via standardised interfaces. Its core components support real-time data aggregation, fault detection, analytical processing and decision support, enabling continuous situation awareness and adaptive route guidance under dynamic conditions. Interoperability is ensured by application programming interfaces that enable bidirectional data exchange with transport management systems, infrastructure systems and external data sources. The architecture design supports distributed data provisioning while enabling network-level analysis and coordinated responses to incidents. By combining modular services with regulated data exchange, the platform reduces information asymmetries, facilitates collaboration across organisational boundaries and enables synchro-modal relay traffic in complex multimodal networks (Dicks et al., 2025a).

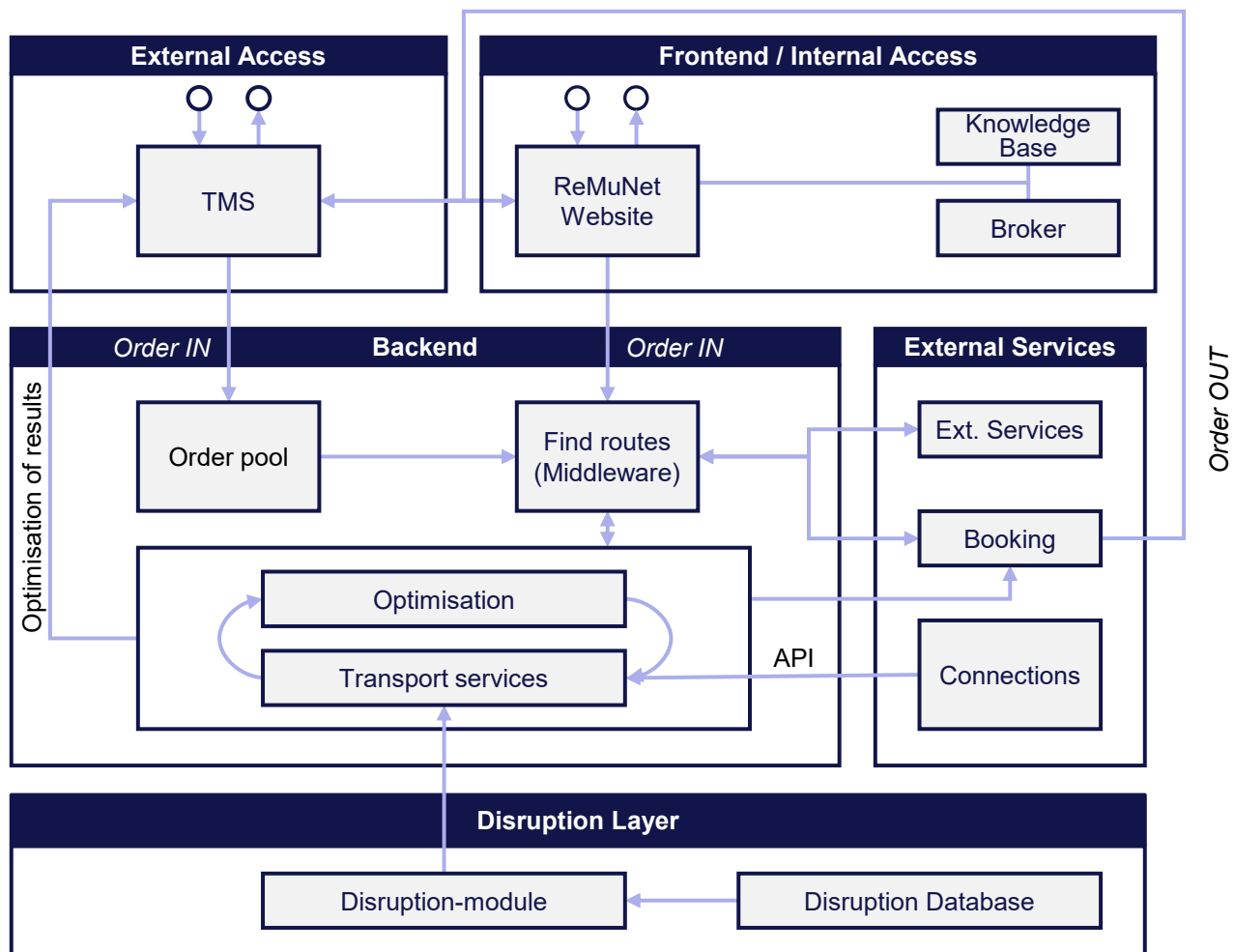


Figure 5: ReMuNet's digital platform architecture (based on Dicks et al., 2025a)

Users participate in the ReMuNet platform according to their role within the multimodal transport ecosystem as users, data providers, capacity providers, or service providers, with several actors assuming multiple roles. Participation is enabled through standardised interfaces and governance rules that allow actors to contribute data, capacity, and services while accessing shared platform functionalities. In return, participants benefit from increased transparency, improved coordination, and data-driven decision support, particularly in disruption and rerouting scenarios. Operational actors gain access to optimised routing options and real-time network information, while infrastructure and terminal operators benefit from improved flow predictability and capacity planning. Overall, participation enables network-level value co-creation, increasing efficiency, resilience, and sustainability across the multimodal transport system (Dicks et al., 2025b).

Together, these elements enable ReMuNet to function as a neutral, scalable, and sustainable digital platform for resilient multimodal transport networks (Dicks et al., 2025b). Within this ecosystem, participants and stakeholders are reinterpreted and assigned to functional platform roles such as data providers, capacity providers, or service providers. This role-based perspective enables a clear separation between physical transport activities and digital interactions while allowing a single actor to assume multiple responsibilities simultaneously. Participation is enabled through standardised interfaces and governance rules that allow actors to contribute data and capacity while accessing shared platform functionalities

to facilitate network-level value co-creation. An overview of the resulting platform role assignments for the relevant ecosystem actors is provided in table 2.

Table 2: Assignment of ecosystem roles to platform user types

Ecosystem Actor	Primary Platform Role	Secondary Platform Role(s)	Rationale
Infrastructure Operator & Manager (IOM)	Data provider	-	IOMs are the main source of authoritative infrastructure data such as closures, capacity restrictions, incidents, and maintenance. This data is critical for detecting disruptions and excluding infeasible routes.
Carrier	Capacity provider	Data provider, service provider, service user	Carriers provide the actual transport capacity that can be matched and re-routed during disruptions. They also deliver real-time operational data (delays, positions, availability).
Multimodal Transport Operator (MTO)	Service provider	Capacity provider, data provider, service user	MTOs orchestrate multimodal transport services and expose them via APIs. They integrate capacity from multiple carriers and modes and provide execution and status data, making them key actors for complex re-routing scenarios.
Terminal Operator	Capacity provider	Data provider, service provider	Terminal operators provide critical real-time data on congestion, slot availability, and handling disruptions. They also offer handling capacity and operational services that enable modal shifts or route changes.
Software Provider / Consulting	-	-	Will not be part of the initial platform pilot as part of the ReMuNet project.
Freight Forwarder	Service user	Service provider, data provider	Freight forwarders primarily use the platform to search for capacity, plan routes, and react to disruptions. They also offer coordination services to customers and contribute planning, booking, and shipment data to the platform.
(Digital) Logistics Service Provider ((D)LSP)	Service provider	Service user, data provider	DLSPs act as digital orchestrators, embedding smart routing into their service offerings. They consume platform outputs, provide logistics services via APIs, and generate high-quality execution and performance data.
Consignor	-	-	Will not be part of the initial platform pilot as part of the ReMuNet project.
Consignee	-	-	Will not be part of the initial platform pilot as part of the ReMuNet project.
Governmental Entities	-	-	Will not be part of the initial platform pilot as part of the ReMuNet project.

Some actors will not be part of the platform's initial pilot. The focus of the digital ReMuNet platform will be on logistics companies that are actively involved in the transport process through planning, coordination or execution. In the future development of the platform, other actors and roles should be considered in order to scale the platform as described by (Dicks et al., 2025b).

3 Research Design and Data Collection

This Deliverable builds directly on insights from the previous Deliverables D3.3 (Dicks et al., 2025a) and D3.4 (Dicks et al., 2025b). The introduction of the digital ReMuNet platform influences both the freight transport ecosystem and its stakeholders' business models (Dicks et al., 2025a). The changed conditions force logistics actors to transform their business to participate in the ReMuNet ecosystem and use its digital platform effectively.

This chapter introduces two relevant concepts for assessing and managing change within a company: the Industrie 4.0 maturity index by Schuh et al. (2017) and the business transformation canvas by Gudergan et al. (2022). The Fit4ReMuNet transformation methodology will build on these foundations.

3.1 Existing Transformation Methodologies

3.1.1 Industrie 4.0 Maturity Index

Industry 4.0 is considered the fourth industrial revolution integrating cyber-physical systems in industrial productions (Schuh et al., 2017). It is defined as “real-time, high data volume, multilateral communication and interconnectedness between cyber-physical systems and people” (Schuh et al., 2017). Benefits are improved decision-making, transparency of information and processes, and better understanding of what a business does and is capable of (Schuh et al., 2017).

The Industrie 4.0 maturity index by Schuh et al. (2017) introduces a sequentially structured methodology to analyse the digital readiness of a company to introduce Industrie 4.0 (figure 6).

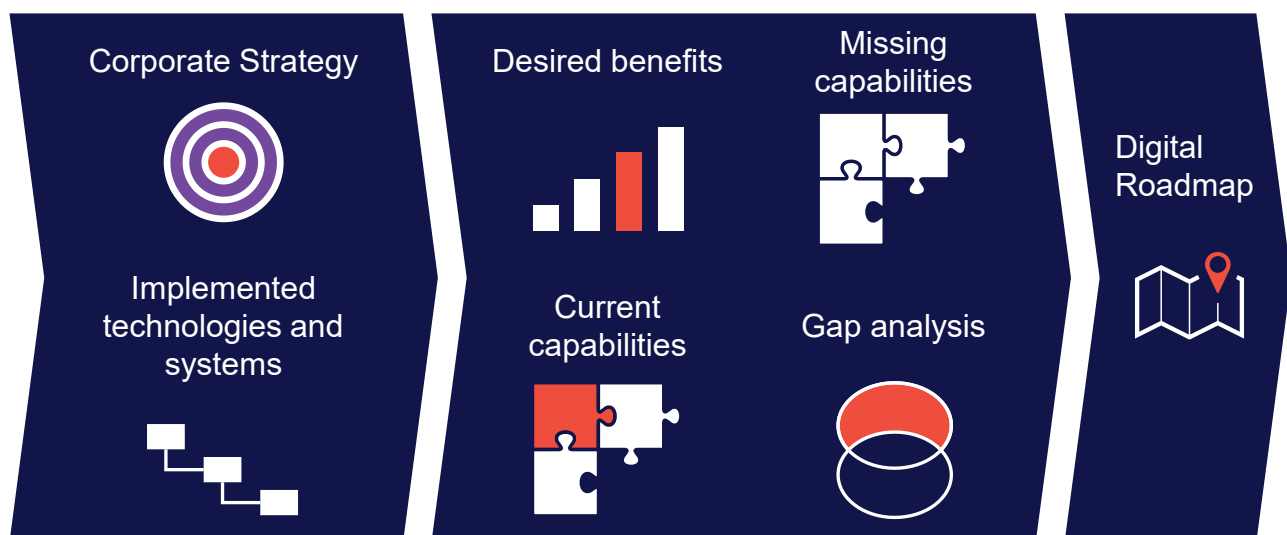


Figure 6: Methodology for introducing Industrie 4.0 (based on Schuh et al., 2017)

Industry 4.0 is characterised by a range of interconnected capabilities that encompass resources, information systems, organisational structure and culture (table 3) (Schuh et al., 2017). Core competencies include decentralised data collection via cyber-physical systems, interoperable and integrated information systems, and advanced analytics that enable real-

time, predictive and self-learning decision-making (Schuh et al., 2017). Organisational capabilities emphasise agile structures, distributed decision-making authority, and collaboration within and between value networks (Schuh et al., 2017). Cultural capabilities focus on openness to change, data-driven learning, open communication, and trust (Schuh et al., 2017). Together, these capabilities evolve across different levels of maturity and collectively enable adaptive, resilient, and digitally integrated industrial systems (Schuh et al., 2017).

Table 3: Industrie 4.0 capabilities (based on Schuh et al., 2017)

Resources	Digital capability	Provide digital competencies
		Decentralised (pre-)processing of sensor data
		Data acquisition through sensors and actuators
	Structured communication	Task based interface design
Information systems	Information processing	Efficient communication
		Information availability and delivery
		Data analysis
		IT infrastructure
	Integration	Data storage
		Horizontal and vertical integration
		Interfaces
		IT security
Organisational structure	Organic internal organisation	Data governance
		Agile management
		Flexible communities
		Motivational goal system
	Dynamic collaboration within the value network	Decision rights management
		Focus on customer benefits
Culture	Social collaboration	Cooperation within the network
		Confidence in systems and processes
		Democratic leadership style
	Willingness to change	Open communication
		Data-based learning
		Openness to innovation
		Shaping change
		Continuous professional development
		Recognise the value of mistakes

3.1.2 Business Transformation Canvas

As described in chapter 2.2, business transformation is used to stay competitive as a company in a dynamic and changing environment. The Business Transformation Canvas formalises important aspects of business transformation to implement sustainable change in an organisation (Gudergan et al., 2022).

A defined strategy that meets market requirements and takes digital innovations into account compares a company's current capabilities with the desired state to achieve its strategic goals (Gudergan et al., 2022). The Business Transformation Canvas encompasses the three aspects of vision, governance, and roadmapping of a business transformation (figure 7) (Gudergan et al., 2022).

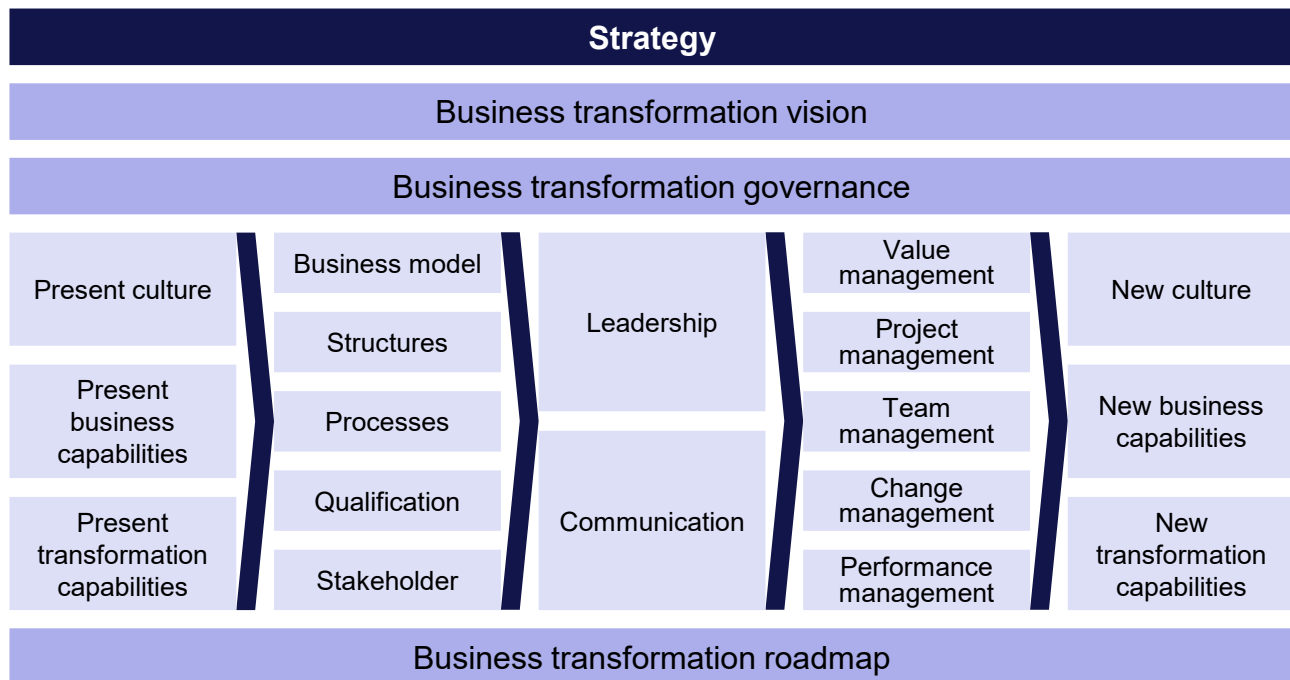


Figure 7: Business transformation canvas (based on Gudergan et al., 2022)

A **vision** anticipates a conceivable future state and is commonly understood as an ‘image of the future’ that serves as a model for the transformation of an organisation (Gudergan et al., 2022). **Governance** structures address the complexity of organisations and ensure transparent decision-making that balances the interests of various stakeholders. When transforming organisations, governance structures provide clarity in control and coordination across all management levels (Gudergan et al., 2022). **Leadership** directs individual and collective action towards defined goals and is a key management tool, whereby a conceptual distinction is made between management and leadership orientations, as well as transactional and transformational behaviour (Gudergan et al., 2022). In the context of digital transformation, effective and early **communication** helps to reduce uncertainty, fear, and resistance among employees, thereby increasing motivation and acceptance of change (Gudergan et al., 2022). A **roadmap** is a key tool for structuring a business transformation’s complexity, as it enables the planning, coordination, control and visualisation of activities and milestones, as well as the efficient allocation of resources over a specific period (Gudergan et al., 2022).

3.2 Development of the Fit4ReMuNet Methodology

The research design of this deliverable is structured into several consecutive steps, each of which reflects a defined part of the Fit4ReMuNet methodology (figure 8). It recognises key aspects of the Industrie 4.0 maturity index by Schuh et al. (2017) and the business transformation canvas by Gudergan et al. (2022).

Both frameworks highlight the importance of business capabilities and their development in the means of business transformation, especially regarding digitalisation. Based on a corporate strategy and a shared vision for future development, the current situation is analysed and weaknesses identified (Gudergan et al., 2022; Schuh et al., 2017). Developing the business capabilities necessary to bridge the gap between the current and target states is the

primary task of a transformation manager and can be supported by a clear transformation roadmap, results-oriented leadership and open communication (Gudergan et al., 2022; Schuh et al., 2017).

The Fit4ReMuNet methodology is designed based on the principles of these two frameworks.

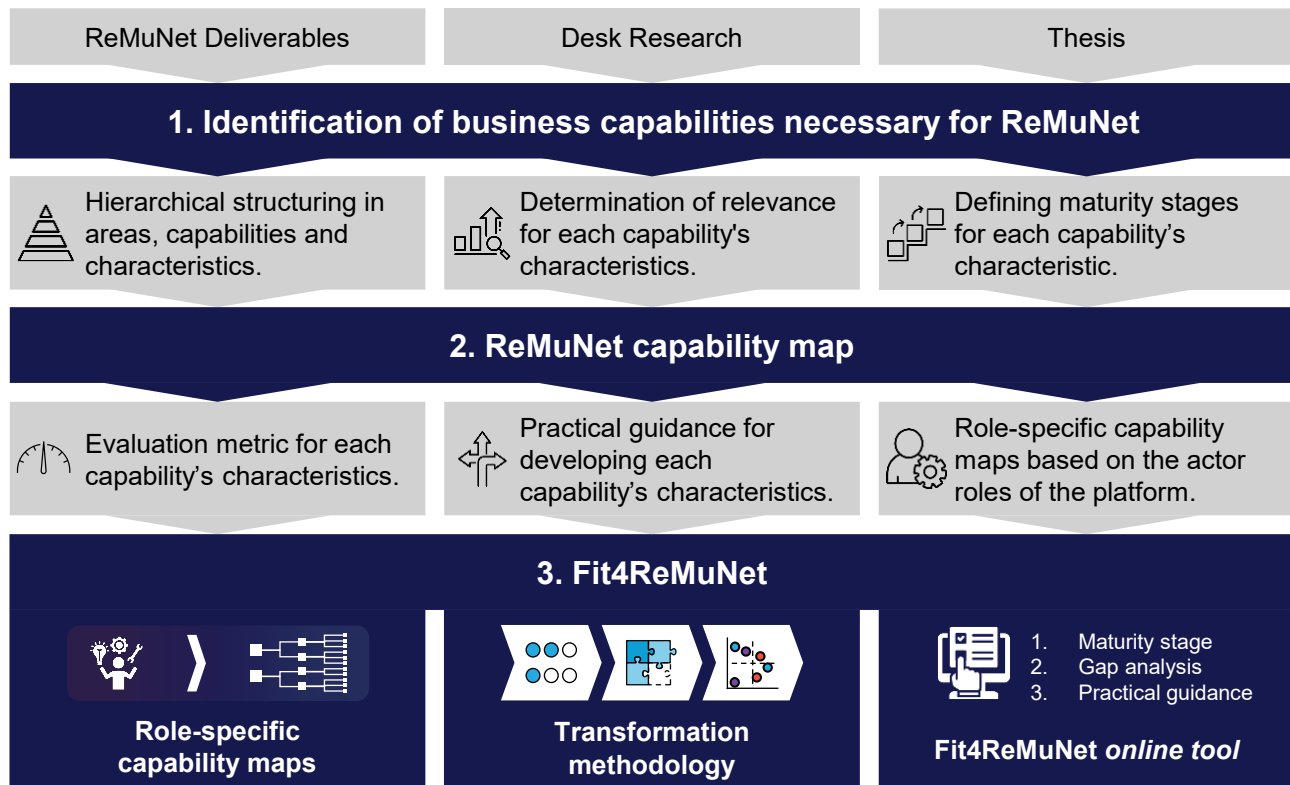


Figure 8: Research design (own illustration)

The theoretical foundation of D3.5 directly builds on the insights from previous Deliverables within the ReMuNet project. These are supported by a master's thesis by Bareuther (2026) and additional desk research focusing on business capabilities, maturity and readiness assessments, and business transformation. This comprehensive research identified business capabilities that are needed for the integration of ReMuNet for a transport company.

The capabilities and their characteristics were structured in a capability map based on the corresponding business area of each capability. The business areas follow the principle of 'human, technology, organisation' described in chapter 1 and is supplemented by a meta-category with overarching capabilities. This approach offers the possibility of dividing the general capability map into sub-areas that can be assigned to the individual actor roles from D3.4, resulting in role-specific capability maps.

The evaluation logic used in the readiness assessment and its translation into a transformation roadmap is based on a combination of the relevance and readiness of each individual characteristic of all capabilities. All capabilities and their relevance were verified both by Bareuther (2026) and a consortium-internal survey, which ensured that industry knowledge and project expertise were taken into account in the final Fit4ReMuNet transformation methodology. The readiness assessment will be described in detail in chapter 4.1, and the transformation roadmap in chapter 4.2.

The underlying master thesis by Bareuther (2026) integrates a Design Science Research (DSR) approach encompassing a hermeneutic literature review and 13 qualitative semi-structured expert interviews (Bareuther, 2026). While the literature review sought and analysed research findings on the business capabilities for transport companies with regard to the integration of a digital platform, as well as their assessments and recommendations for transformation, the expert interviews served to validate these findings and explore further aspects not covered by the literature (Bareuther, 2026). The semi-structured interviews were conducted with 13 industry experts covering all relevant freight transport ecosystem roles as presented in chapter 2.2 (Bareuther, 2026). As a result, the thesis developed and operationalised a capability-based transformation model to assess and enhance the readiness of transport actors to participate in digital platforms by integrating a capability map, a readiness, relevance and effort assessment, and prioritised transformation recommendations (Bareuther, 2026). This Deliverable extends these findings specifically in the context of ReMuNet and its digital platform. Also, as part of Task 3.4, both the readiness assessment and the transformation roadmap will be part of an online open access tool developed by FIR an der RWTH Aachen as part of task 3.4. The tool and its contents, as well as mock-ups for visualisation, are presented in chapter 5.

4 Fit4ReMuNet Transformation Methodology

This chapter presents the Fit4ReMuNet transformation methodology (figure 9). It first describes the approach used to assess companies' readiness for adopting the ReMuNet platform including a gap analysis between the current maturity level of companies and the maturity level required for effective use of ReMuNet is detailed. Finally, the chapter provides practical guidance for companies seeking to implement the ReMuNet platform. The Fit4ReMuNet transformation methodology intends to provide guidelines in developing business capabilities and does not constitute a criterion for exclusion of the ReMuNet ecosystem.

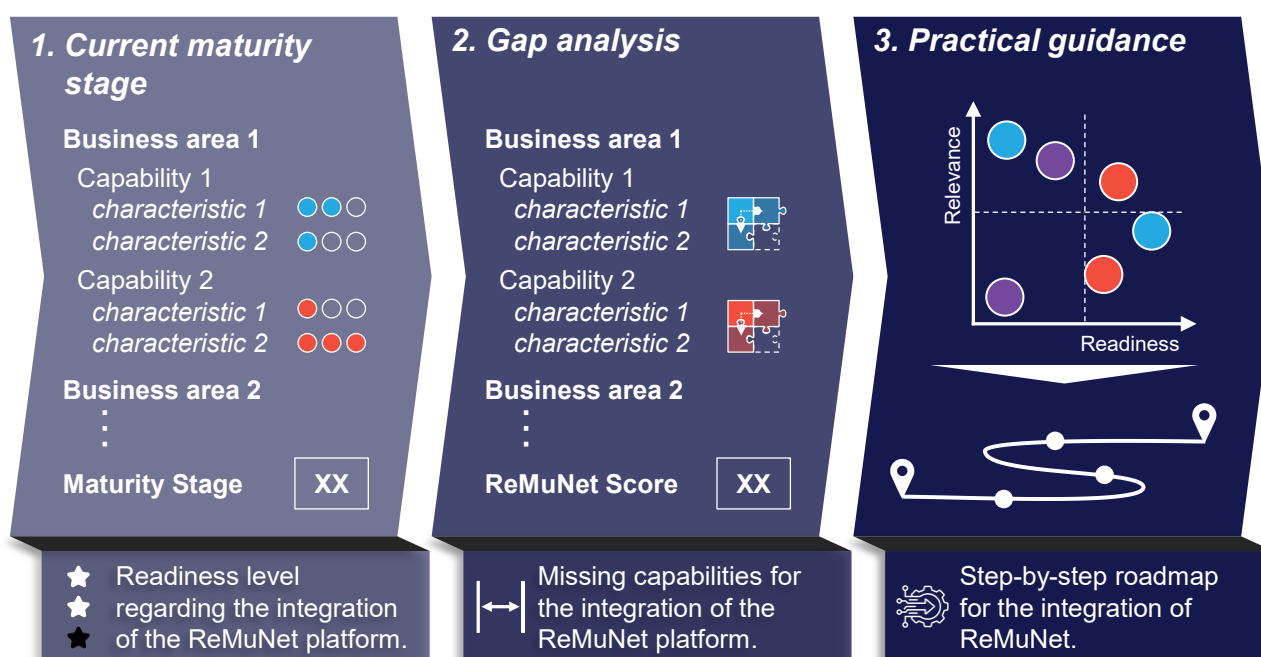


Figure 9: Framework for the Fit4ReMuNet methodology (own illustration)

4.1 Readiness Assessment

Maturity and readiness assessments are used to systematically evaluate an organisation's current capabilities and its ability to introduce new systems or technologies. Maturity models focus on identifying areas for improvement and prioritising the development of capabilities, rather than assigning a fixed maturity level. Readiness assessments complement this perspective by examining how well an organisation is prepared to implement changes in practice. Both concepts support structured implementation planning by clarifying the current status, defining development paths and reducing uncertainties in transformation processes (Shukla & Shankar, 2024).

This chapter explains and describes the ReMuNet business capability map. In addition, role-specific business capability maps are presented.

4.1.1 ReMuNet Business Capability Map

The ReMuNet business capability map encompasses capabilities a company needs for effectively using the ReMuNet platform and its advantages. It is structured in three levels: business areas, business capabilities, and characteristics. Each lower level serves to provide more detail about the higher level and is designed to fit the platform's contextual specificity.

The business areas of the first level are based on the HTO approach (chapter 1). They cover meta capabilities, human-centred, technological capabilities, and organisational capabilities.

This structure enables subordinate capabilities from the second level to be assigned to business areas, thereby enabling statements to be made about specific areas and clusters of business capabilities relevant to enterprise strategy and organisational structure. The assigned capabilities stem from the insights and findings of previous Deliverables within the ReMuNet project.

On the third level, each business capability is described by a distinct set of characteristics aiming for a clear understanding of the competencies needed to effectively use ReMuNet as a collaborative digital platform in multimodal freight transportation. The maturity and readiness of each characteristic is determined using three maturity levels, which generally comprise low, medium and high maturity in relation to the requirements of ReMuNet.

Figure 10 visualises the ReMuNet capability map encompassing its business areas and business capabilities. A complete overview of the capability map including all characteristics is provided in the appendix (A1).

META CAPABILITIES	HUMAN-CENTERED CAPABILITIES	TECHNOLOGICAL CAPABILITIES	ORGANISATIONAL CAPABILITIES
Sensing	Strategic direction and internal alignment	Digital infrastructure management	Sustainability
Seizing	Partnering, collaboration, and platform mindset	Data security and privacy	Regulatory, risk, and compliance
Transforming, reconfiguring, and renewal	Change management and communication	Data exchange, interoperability and compatibility	Operational management and domain knowledge
	Digital literacy	Platform utilisation	Holistic value logic
		Data quality management	Organisational resilience
		Standardised digital processes and automation	

Figure 10: ReMuNet business capability map (own illustration)

Meta capabilities

The meta capabilities describe overarching aspects of a company, which are **sensing**, **seizing**, and **transforming, reconfiguring, and renewal**. While the **sensing** capability focuses on perceiving the environment, the **seizing** capability focuses on acting upon the perceived environment. The **transforming, reconfiguring, and renewal** capability focuses on the change within the company.

A strong **Sensing** capability is essential for effectively leveraging ReMuNet as a logistics platform, as it enables the company to remain attuned to both market dynamics and the ongoing evolution of the platform itself (table 4). Through systematic *market scanning and platform awareness*, the organisation can anticipate changes in customer expectations, competitive conditions, and platform functionalities, rather than responding only after disruptions or missed opportunities occur (Bareuther, 2026). At lower maturity levels, reactive awareness limits the firm's ability to integrate new insights into decisions. As sensing capabilities improve, systematic monitoring enables insights to drive adjustments in routes, processes, and collaboration, enhancing efficiency and relevance in customer and partner interactions.

Table 4: Meta capability – Sensing

Characteristic	Description	Maturity	
Market scanning and platform awareness	The company's ability to continuously track market developments and platform evolution to anticipate changes, adapt strategies, and stay relevant where customers engage (Bareuther, 2026).	Lev. 1	The company does not systematically track market trends or platform developments. Awareness of changes in the ecosystem is reactive and sporadic.
		Lev. 2	The company monitors some market trends, often driven by specific needs or external prompts. Insights are collected irregularly, and integration into decision-making is limited.
		Lev. 3	The company consistently scans market trends, using the insights to guide operations, adapt processes, and leverage new opportunities.
Openness and exploratory mindset	The company's ability to remain curious, open to new ideas, and willing to explore emerging approaches, technologies, and ways of working (Bareuther, 2026).	Lev. 1	The company is risk-averse and reluctant to adopt new tools, methods, or integrations. Learning from new opportunities is minimal.
		Lev. 2	Some experimentation and exploration occur, typically in isolated projects or teams. Risk-taking and learning are limited and not systematically applied.
		Lev. 3	The company actively explores new tools, experiments with platform integrations, and applies lessons learned to improve processes, operations, and collaboration.

Complementing this, an *openness and exploratory mindset* supports the effective use of sensed information by encouraging curiosity, experimentation, and learning (Bareuther, 2026). Instead of avoiding risk, the organisation tests new tools, explores platform integrations, and experiments with new ways of working. As this mindset matures, experimentation becomes embedded in routines, allowing lessons to spread across operations. Combined with continuous market and platform sensing, this exploratory orientation forms a dynamic

capability that enables proactive adaptation, optimised logistics, and better use of ReMuNet's collaborative, real-time coordination potential.

Seizing is critical for realising value from ReMuNet, as the benefits of a logistics platform depend not only on identifying opportunities but on the organisation's ability to act upon them in a timely and coordinated manner (table 5). *Organisational agility* plays a central role in this regard, enabling the firm to quickly translate insights derived from platform use into concrete changes in processes, workflows, and resource allocation (Bareuther, 2026; Dicks et al., 2025a). At lower maturity levels, rigid structures and fixed decision-making limit responsiveness, preventing effective use of opportunities identified through digital platforms. At higher maturity, agility is embedded across the organisation, enabling rapid adjustments and smooth integration of new practices into daily operations.

Table 5: Meta capability – Seizing

Characteristic	Description	Maturity	
Organisational agility	The company's ability to quickly adapt processes, structures, and decisions to seize opportunities and respond to changes effectively (Bareuther, 2026; Dicks et al., 2025a).	Lev. 1	The organisation is rigid and slow to respond to change. Processes, workflows, and decision-making structures are fixed, and adapting them requires significant time and effort. Opportunities identified through digital platforms cannot be acted upon in a timely manner.
		Lev. 2	The organisation can adjust processes and workflows in specific situations, but changes are often slow, reactive, and dependent on individual initiatives or management approval. Agility exists in parts of the organisation but is not consistent or systematic.
		Lev. 3	The organisation can quickly adapt processes, workflows, and resource allocation in response to new insights or opportunities, enabling timely action and smooth integration into daily operations.
Resource sharing	The company's capability to efficiently allocate and share assets, data, and capabilities across teams or with partners to enhance collaboration, reduce costs, and improve operational efficiency (Dicks et al., 2025a; von Stamm et al., 2024b).	Lev. 1	Resources such as data, assets, and capabilities are siloed within departments. There are no established mechanisms for sharing resources internally or with external partners, limiting collaboration and coordinated action.
		Lev. 2	Some resource sharing exists, mainly within teams or departments and on an ad hoc basis. Data and assets can be shared when needed, but processes are informal, limited in scope, and not designed for collaboration.
		Lev. 3	The organisation can efficiently share assets, data, and capabilities across teams and with partners, supporting collaboration, coordinated decision-making, and effective use of resources.

Sharing resources (Dicks et al., 2025a; von Stamm et al., 2024b) is essential for effective seizing, as platform-based value creation relies on the efficient allocation and mobilisation of assets, data, and capabilities across organisational boundaries (Dicks et al., 2025a; von

Stamm et al., 2024b). When resources are siloed, collaboration is limited and platform efficiency gains are reduced. As sharing matures, formal mechanisms enable data, assets, and capabilities to be shared internally and with partners, enhancing coordination and efficiency. Together, agility and effective resource sharing form a core seizing capability that turns insights into action and fully leverages ReMuNet's opportunities.

A strong **Transforming, reconfiguring, and renewal** capability is essential for embedding ReMuNet into organisational operations and ensuring that logistics practices evolve in line with platform developments over time (table 6). *Integration of new processes* is a foundational element of this capability, as it determines how effectively platform functionalities are translated into daily work (Dicks et al., 2025b). At lower maturity, the organisation relies on established routines and resists change, limiting platform integration. As maturity grows, new processes are piloted but remain fragmented. At higher maturity, workflows are systematically designed and embedded to align with platform data flows and collaboration features, enabling seamless, consistent use in daily logistics operations.

Table 6: Meta capability – Transforming, reconfiguring, and renewal

Characteristic	Description	Maturity	
Integration of new processes	The company's ability to design, implement, and embed new workflows and processes that align with digital platforms, enabling seamless use of their features, data flows, and collaborative functions within daily operations (Dicks et al., 2025b).	Lev. 1	The organisation relies on existing routines and resists process changes.
		Lev. 2	New processes are introduced selectively, often as pilots or workarounds, but they are not standardised or widely adopted across the organisation.
		Lev. 3	The organisation can design, implement, and embed new workflows and processes that support platform-based operations and collaboration.
Innovation management	The company's ability to generate and implement new ideas, approaches, and improvements, enhancing logistics performance, collaboration, and operational value (Dicks et al., 2025a).	Lev. 1	There is no structured approach to innovation. New ideas or process improvement are rarely explored or implemented.
		Lev. 2	Innovation occurs occasionally through isolated initiatives or individual efforts, but it lacks structure, coordination, and clear links to platform use.
		Lev. 3	The organisation systematically identifies, tests, and implements improvements and innovations to continuously enhance organisational performance.
Business model adaptability and co-creation	The company's ability to adjust its business model and collaborate with partners, customers, and stakeholders to create new value, respond to market shifts, and leverage opportunities together (Bareuther, 2026; Dicks et al., 2025b).	Lev. 1	The business model is fixed, and the organisation does not consider adapting services, revenue models, or partnerships.
		Lev. 2	The organisation explores potential business model adjustments on a limited basis, often through discussions or small experiments, without structural change.
		Lev. 3	The organisation can adjust its business model and collaborate with partners to identify opportunities and create additional value within the ecosystem.

Innovation management further supports transformation by ensuring that change is continuous rather than episodic (Dicks et al., 2025a). At low maturity, innovation is unstructured

and rarely pursued. At intermediate levels, isolated initiatives emerge but lack coordination and links to platform use. At high maturity, the organisation systematically identifies, tests, and implements improvements, using learning to continuously enhance logistics performance, collaboration, and operational value.

Finally, *business model adaptability and co-creation* extend transformation beyond internal processes to the broader ecosystem (Bareuther, 2026; Dicks et al., 2025b). At lower maturity, the business model remains fixed, with little adaptation of services, revenue models, or partnerships. As maturity grows, adjustments are explored through discussions or small experiments, but without structural change. At higher maturity, the organisation adapts its business model and collaborates with partners and customers to co-create value within the ecosystem. Together, these dimensions enable workflow reconfiguration, renewed practices, and an evolving value logic, supporting long-term efficiency, resilience, and innovation as the platform develops.

Human-Centred Capabilities

The Human-centred capabilities are **Strategic direction and internal alignment, Partnering, collaboration, and platform mindset, Change management and communication** and **Digital Literacy**.

Strategic direction and internal alignment are essential for effectively integrating ReMuNet, as platform-based logistics requires coordinated action across teams, functions, and organisational levels (table 7). *Leadership clarity and commitment* form the foundation of this capability (Bareuther, 2026). At lower maturity, leadership offers little clear direction on digital transformation, leading to fragmented efforts and uncertainty around platform use. As maturity increases, leaders recognise its importance but lack sustained action and resource commitment. At higher maturity, leadership sets clear objectives, communicates priorities, and backs them with concrete decisions, dedicated resources, and active support for platform initiatives.

Cross-level alignment and trust further enable strategic direction to be translated into coordinated action (Bareuther, 2026). At low maturity, weak alignment, limited trust, and fragmented information flows hinder collaboration. As maturity grows, alignment improves within specific teams but remains inconsistent and relationship dependent. At high maturity, strong alignment and mutual trust across all levels enable open communication, coordinated decisions, and effective collaboration toward shared goals.

The *definition of the company's own role within the platform ecosystem* ensures that internal alignment extends beyond organisational boundaries (Dicks et al., 2025a; von Stamm et al., 2024b). At lower maturity, the company lacks clarity about its role and responsibilities, resulting in reactive participation and unclear partner expectations. As maturity increases, understanding improves but remains partial and uneven across teams. At higher maturity, the company clearly defines and communicates its role and value within the ecosystem, enabling effective collaboration and alignment.

Table 7: Human-centred capability – Strategic direction and internal alignment

Characteristic	Description	Maturity	
Leadership clarity and commitment	The ability of leadership to clearly define strategy, communicate priorities, and demonstrate commitment, ensuring alignment and guidance for key initiatives (Bareuther, 2026).	Lev. 1	Leadership provides no clear direction regarding digital innovation or transformation. Commitment is weak or absent, and priorities are unclear or inconsistent.
		Lev. 2	Leadership acknowledges the importance of digital logistics services. The commitment is there, but it is not yet reflected in sustainable measures or the allocation of resources.
		Lev. 3	Leadership clearly defines strategic objectives, communicates priorities consistently, and demonstrates commitment through decisions, resource allocation, and active support.
Cross level alignment and trust	The company's ability to foster collaboration, shared understanding, and mutual trust across all organisational levels, ensuring that teams work cohesively toward common goals and initiatives (Bareuther, 2026).	Lev. 1	There are limited alignment and low trust between organisational levels. Information is fragmented, and collaboration across levels is weak.
		Lev. 2	Some alignment exists within specific projects or teams but has not yet scaled across the entire organisation. Trust and collaboration are improving but remain inconsistent and dependent on individual relationships.
		Lev. 3	Strong alignment and trust exist across all organisational levels, enabling coordinated decision-making, open communication, and effective collaboration.
Definition of own role within the platform ecosystem	The company's ability to understand and define its business model, role and responsibilities within the ecosystem to enable effective collaboration and alignment with partners (Dicks et al., 2025a; von Stamm et al., 2024b).	Lev. 1	The company has not yet defined its specific role or responsibilities within its ecosystem. Participation remains reactive, and expectations toward partners are currently not formalised.
		Lev. 2	The company has a partial understanding of its role within the ecosystem, often focused on operational participation rather than strategic contribution. Role clarity varies across teams.
		Lev. 3	The company clearly defines and communicates its role, responsibilities, and value contribution within the ecosystem, enabling effective collaboration and alignment with partners.

The **Partnering, collaboration, and platform mindset** capability is crucial for effectively using ReMuNet, as the platform's value depends on trust-based relationships, open collaboration, and the willingness of participants to share data and resources (table 8). Without this capability, engagement remains transactional and fragmented, limiting efficiency, resilience, and innovation across the ecosystem. *Trustful interaction with other stakeholders* is a central component of this capability (Dicks et al., 2025b). At lower maturity, the company has few trust-based relationships, and interactions with partners and customers are cautious or transactional, limiting collaboration. As maturity grows, trust develops through repeated

interactions, though collaboration remains limited. At higher maturity, the company sustains open, reliable relationships with a broad set of stakeholders, enabling effective collaboration and joint problem-solving across the ecosystem.

Table 8: Human-centred capability – Partnering, collaboration and platform mindset

Characteristic	Description	Maturity	
Trustful interaction with other stakeholders	The company's capacity to build and maintain trust-based relationships with partners, customers, and other stakeholders within the ecosystem, enabling open communication, effective collaboration, and mutually beneficial outcomes (Dicks et al., 2025b).	Lev. 1	The company has limited or no trust-based relationships with external stakeholders. Interactions are transactional, cautious, or minimal, restricting collaboration within the ecosystem.
		Lev. 2	The company engages with stakeholders on a selective basis and begins to build trust through repeated interactions. Collaboration exists but remains limited in scope and depth.
		Lev. 3	The company maintains trustful, open, and reliable relationships with stakeholders, enabling effective collaboration and joint problem-solving within the ecosystem.
Openness to share data	The company's ability and willingness to share relevant data securely with partners in the ecosystem to support collaboration (Dicks et al., 2025b).	Lev. 1	The company is unwilling or unable to share data with partners. Data is tightly controlled, siloed, or inaccessible, limiting transparency and coordination.
		Lev. 2	The company shares selected data with partners under specific conditions. Data sharing is cautious, limited in scope, and not fully integrated into collaborative processes.
		Lev. 3	The company openly and securely shares relevant data with partners to support transparency, coordination, and effective collaboration.
Commitment to platform	The company's dedication to actively engage with the platform, aligning resources and efforts to maximise value within the ecosystem (Dicks et al., 2025b).	Lev. 1	The company shows little commitment to platform participation. Engagement is minimal, and platform use is treated as optional or secondary.
		Lev. 2	The company demonstrates partial commitment through participation in specific areas or short-term initiatives. However, platform engagement is not yet fully integrated into standard operating procedures.
		Lev. 3	The company is actively committed, dedicating resources and aligning processes to support sustained participation and value creation within the platform ecosystem.

Openness to share data further underpins collaborative platform use (Dicks et al., 2025b). At low maturity, data is siloed and tightly controlled, limiting transparency and coordination with partners. As maturity grows, selected data is shared cautiously but remains poorly integrated into collaboration. At higher maturity, relevant data is openly and securely shared, enabling transparency, coordination, and effective ecosystem collaboration.

Finally, *commitment to the platform* ensures that collaboration is sustained over time (Dicks et al., 2025b). At lower maturity, platform engagement is minimal and seen as optional. As

maturity grows, the company shows partial commitment through short-term initiatives, but use remains unembedded. At higher maturity, it commits fully, dedicating resources and aligning processes for long-term participation and value creation.

Change management and communication are essential for the effective adoption of ReMuNet, as integrating a digital logistics platform requires significant changes to established workflows, processes, and ways of working (table 9). Without the ability to manage change and communicate its purpose clearly, new platform-related practices risk being absorbed into existing routines or resisted by employees. *Changing entrenched routines* is therefore a critical component of this capability (Bareuther, 2026). At lower levels of maturity, rigid habits and workflows resist change and limit digital initiatives. As maturity increases, some routines are changed in response to problems or pressure, but the changes remain isolated and dependent on intervention. At higher levels of maturity, the company proactively replaces outdated routines and systematically adapts workflows, enabling effective integration of platform-based practices.

Table 9: Human-centred capability – Change management and communication

Characteristic	Description	Maturity	
Changing entrenched routines	The company's capability to modify established workflows, habits, and practices, overcoming resistance and embedding new ways of working to effectively implement changes (Bareuther, 2026).	Lev. 1	The company is characterised by deeply ingrained routines that are highly resistant to change. Established routines remain rigid, and new digital initiatives are often hindered by traditional habits.
		Lev. 2	The company can change some routines, often in response to specific problems or external pressure. Changes are isolated, inconsistent, and may require high effort or management intervention to implement.
		Lev. 3	The company proactively embraces change and is very open to rethinking established routines. It has the systematic ability to break down outdated habits and adapt work processes to changing requirements and strategic goals.
Communication of necessity of change	The company's capability to clearly explain why changes are needed, the benefits they bring, and their impact on employees and operations, ensuring understanding, buy-in, and engagement across the organization (Bareuther, 2026).	Lev. 1	The reasons and benefits for change are not yet a part of formal internal communication. Employees and teams lack understanding of why new processes or systems are needed, resulting in low engagement and resistance.
		Lev. 2	The company communicates the need for change occasionally or for specific initiatives. Communication may be inconsistent, limited to certain teams or projects, and does not always reach all relevant stakeholders.
		Lev. 3	The company clearly communicates the need for and benefits of change to all stakeholders. This clear communication ensures a shared understanding of why changes are being made and fosters a supportive environment for the transition.

Equally important is the *communication of the necessity of change*, which shapes employee understanding and engagement (Bareuther, 2026). At low maturity, the reasons and benefits of change are not formally communicated, leaving employees unclear and resistant. As maturity grows, change is explained for specific initiatives, but messaging remains inconsistent. At higher maturity, the organisation clearly and consistently communicates the need and benefits of change to all stakeholders, creating shared understanding.

Digital literacy is a critical capability for a company using ReMuNet, as effective platform use depends on employees' ability to work with real-time data, digital collaboration tools, and advanced logistics systems (table 10). Without sufficient *Human digital expertise*, the organisation cannot fully exploit the platform's operational, collaborative, and decision-support potential (Dicks et al., 2025b; von Stamm et al., 2024b). At lower maturity, employees lack digital skills, leading to inconsistent task execution and difficulties using data and tools. As maturity grows, expertise develops within specific teams but remains uneven and limited by insufficient training. At higher maturity, employees across the organisation confidently use platforms, interpret data, and apply digital tools consistently, supporting informed decisions, effective collaboration, and full realisation of ReMuNet's efficiency, resilience, and innovation benefits.

Table 10: Human-centred capability – Digital literacy

Characteristic	Description	Maturity	
Human digital expertise	The company's capability to ensure employees have the digital skills and knowledge needed to understand, use, and work effectively with digital tools and platforms (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Employees lack the digital skills and knowledge required to use digital tools effectively. Digital tasks are performed inconsistently, and teams struggle to interact with data, systems, or collaborative platforms.
		Lev. 2	Digital expertise is present within specific teams or among individual specialists. Teams can perform basic digital tasks and interact with new tools. The broader application of these skills is still being developed through limited guidance and training across the organisation.
		Lev. 3	Employees have the digital skills and knowledge to effectively navigate and use platforms, interpret data, and operate digital tools. Digital expertise is applied consistently across teams, enabling the company to fully leverage its systems for operations, collaboration, and decision-making.

Technological Capabilities

The Technological Capabilities are **Digital infrastructure management, Data security and privacy, Data exchange, interoperability and compatibility, Platform utilisation, Data quality management** and **Standardised digital processes and automation**.

Digital infrastructure management is a fundamental capability for effectively using ReMuNet, as the platform depends on stable IT systems, integrated operational data, and reliable access to digital services (table 11). *Reliable IT systems* are a core component of this capability (Dicks et al., 2025b). At lower maturity, IT systems are unstable, with frequent downtime and limited maintenance, disrupting digital operations. As maturity grows, basic

maintenance keeps critical systems mostly operational, though reliability remains uneven. At higher maturity, systems are fully maintained, continuously monitored, and secure, ensuring stable and smooth digital workflows.

Table 11: Technological capability – Digital Infrastructure Management

Characteristic	Description	Maturity	
Reliable IT systems	The company's ability to ensure IT systems are stable, secure, and available to support operations and platform use (Dicks et al., 2025b).	Lev. 1	IT systems are unreliable, frequently experience downtime, and lack proper monitoring or maintenance. Users face disruptions that impede digital operations.
		Lev. 2	Basic IT maintenance exists, and critical systems are mostly operational. Some monitoring and troubleshooting occur, but reliability is inconsistent, and disruptions may still affect operations.
		Lev. 3	IT systems are fully maintained, monitored, and secure, ensuring reliable availability and smooth operation of digital workflows.
Operational data integration management	The company's ability to collect, integrate, and manage operational data from multiple sources, ensuring it can be used effectively for decision-making and platform integration (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Operational data is siloed, incomplete, or not properly managed. Integration between systems is minimal or non-existent, making data use for decision-making difficult.
		Lev. 2	Some operational data is collected and partially integrated. Data management practices exist in certain areas, but completeness, accuracy, and connectivity across systems are inconsistent.
		Lev. 3	Operational data is consistently collected, well-managed, and integrated across systems, providing accurate, real-time information for decision-making.
Core digital service access management	The company's ability to offer employees and partners reliable access to essential digital services, applications, and tools needed for daily operations (Dicks et al., 2025b).	Lev. 1	Access to digital services is limited, unreliable, or restricted. Users frequently face difficulties in reaching the applications, tools, or services necessary for operations.
		Lev. 2	Access to core digital services is available for most users, but reliability, speed, or consistency may vary. Some key tools are still inaccessible or inconsistently used across teams.
		Lev. 3	All employees and relevant partners have reliable and consistent access to core digital services and tools, enabling seamless participation in digital workflows.

Operational data integration management further enables effective platform use by ensuring that data can be accessed and used across the organisation (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, operational data is siloed, incomplete, and poorly integrated, hindering informed decisions. As maturity grows, some data is collected and partially integrated, but quality and consistency issues persist. At higher maturity, data is consistently managed and fully integrated across systems, providing accurate, timely information to support decision-making and platform integration.

Core digital service access management ensures that users can engage with digital tools and services (Dicks et al., 2025b). At lower maturity, access to essential digital services is limited or unreliable, disrupting operations. As maturity grows, most users access core services, though reliability varies across teams. At higher maturity, employees and relevant partners have consistent, reliable access to essential tools, enabling seamless digital workflows and effective use of ReMuNet.

Data security and privacy are essential capabilities for companies intending to use ReMuNet, as participation in the platform requires the secure handling of data, clear ownership, and compliance with regulatory requirements (table 12). ReMuNet places strong emphasis on trustworthy data practices, making robust data security and privacy capabilities a prerequisite for effective and legitimate platform use.

Table 12: Technological capability – Data security and privacy

Characteristic	Description	Maturity	
Sensitive data protection and management	The company's ability to safeguard sensitive and critical data from loss, theft, or unauthorised access (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Sensitive data is unprotected, unmanaged, and vulnerable to loss or breaches. No clear security measures or protocols exist.
		Lev. 2	Some measures are in place to protect sensitive data, such as basic encryption or restricted storage. Protection is inconsistent and may only cover parts of the organisation.
		Lev. 3	Sensitive and critical data is consistently protected and managed using standardised security measures, ensuring integrity, confidentiality, and availability in alignment with operational needs.
Data regulatory compliance management	The company's ability to comply with relevant data protection laws and regulatory requirements, ensuring legal and ethical handling of data (Dicks et al., 2025b).	Lev. 1	Data handling does not follow regulatory requirements. Awareness of compliance obligations is low or non-existent.
		Lev. 2	Some compliance practices exist in certain areas or for specific data types. Awareness and enforcement are inconsistent, with gaps in meeting regulations.
		Lev. 3	Data handling fully complies with relevant laws and regulations. Policies, audits, and monitoring are in place to ensure ongoing regulatory adherence.
User access and permission management	The company's ability to control who can access data, systems, and platforms, ensuring that users have the right level of access for their role (Dicks et al., 2025b).	Lev. 1	There are no rules established for accessing systems and data is poorly controlled, with users having excessive, insufficient, or inconsistent permissions.
		Lev. 2	Some access control mechanisms exist, such as role-based permissions or basic authentication. Enforcement is inconsistent, and adjustments are reactive.
		Lev. 3	User access and permissions are systematically managed, aligned with roles and responsibilities, and regularly reviewed to ensure security and proper data usage.

A key component of this capability is *sensitive data protection and management* (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, sensitive data is largely unprotected

and unmanaged, with no clear protocols. At intermediate maturity, basic safeguards such as encryption or restricted storage exist but are applied inconsistently. At higher maturity, data is systematically protected through standardised security measures, ensuring confidentiality, integrity, and availability in line with operational needs.

Data regulatory compliance management further underpins secure platform participation (Dicks et al., 2025b). At low maturity, data practices do not comply with relevant laws, and awareness of obligations is minimal. As maturity grows, some compliance measures are introduced, but enforcement remains inconsistent. At high maturity, data handling fully meets regulatory requirements, supported by clear policies, regular audits, and continuous monitoring to ensure sustained compliance.

User access and permission management ensures that data and systems are only accessible to authorised users (Dicks et al., 2025b). At low maturity, access rules are unclear or absent, leading to excessive or inconsistent permissions. At intermediate maturity, basic role-based controls exist but are unevenly enforced. At high maturity, access rights are systematically defined, aligned with roles, and regularly reviewed, ensuring secure and accountable use of data and platform resources.

Data exchange, interoperability, and compatibility are critical capabilities for companies intending to use ReMuNet, as effective participation in the platform depends on the ability to connect internal systems and processes with the platform and with other ecosystem actors (table 13). Without compatible systems and integrated workflows, companies are unable to share data, coordinate activities, or benefit from the collaborative and real-time functionalities that ReMuNet offers, thereby limiting both operational efficiency and platform value creation.

A central component of this capability is *system compatibility* (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, IT systems are isolated and incompatible with external platforms or standards, meaning that integration with ReMuNet or partners is only possible on an ad hoc basis, if at all. At medium maturity, limited data exchange is possible, but standardisation is only partial and integration requires manual effort. At a high level of maturity, the systems are fully compatible with the relevant platforms and standards, enabling seamless, automated data exchange and effective collaboration within the ecosystem.

Complementing this, *cross-actor workflow integration* reflects the organisation's ability to align operational processes with external stakeholders (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, workflows are disconnected, and collaboration is manual and reactive. At intermediate maturity, some workflows align with partners or teams, but integration is inconsistent and unstandardised. At high maturity, workflows are fully integrated across ecosystem actors, enabling coordinated processes, real-time collaboration, and efficient, scalable use of ReMuNet.

Table 13: Technological capability – Data exchange, interoperability and compatibility

Characteristic	Description	Maturity	
System compatibility	The company's ability to ensure its IT systems can interoperate with external platforms, standards, and tools (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Systems are isolated and incompatible with external platforms or standard data formats. Integration with partners is ad hoc or impossible.
		Lev. 2	Some systems can exchange data with external tools or platforms, but compatibility is limited to specific cases. Standardisation and consistency are partial, and integration requires manual effort.
		Lev. 3	Systems are fully compatible with relevant systems and standards, enabling seamless data exchange and interaction with partners across the ecosystem.
Cross-actor workflow integration	The company's ability to coordinate and synchronise operational workflows with partners, suppliers, or other stakeholders (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Workflows are disconnected across actors. Collaboration is manual or reactive, and process alignment with partners is minimal.
		Lev. 2	Some workflows are partially aligned across teams or partners. Integration exists for specific processes but is inconsistent and not standardised across the network.
		Lev. 3	Operational workflows are fully integrated with relevant actors in the ecosystem, enabling coordinated processes, real-time collaboration, and efficient platform use.

The **platform utilisation** capability is essential for companies using ReMuNet because the effectiveness of the platform depends not only on technical availability but also on active and consistent use by employees in their daily operations (table 14). Even well-designed platform functionalities deliver little value if employees lack access, support, or motivation to engage with them. Ensuring that staff are enabled and encouraged to use ReMuNet is therefore a prerequisite for realising its operational, collaborative, and strategic benefits.

A key element of this capability is *employee platform participation* (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, employees lack access, authorisation, or guidance to use the platform, resulting in minimal participation. At intermediate maturity, basic access exists, but inconsistent support leads to uneven usage. At high maturity, employees are fully enabled with appropriate rights, tools, training, and ongoing support, ensuring consistent and effective platform use in daily operations.

Closely related is *employee engagement and motivation* (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, employees lack motivation to use the platform, with no incentives, clear communication, or leadership support. At intermediate maturity, some engagement emerges but remains fragmented and project driven. At high maturity, employees are actively motivated to use ReMuNet, supported by clear benefits, visible leadership backing, and alignment with daily work objectives.

Table 14: Technological capability – Platform utilisation

Characteristic	Description	Maturity	
Employee platform participation	The company's ability to provide employees with the tools, access, and support needed to actively use digital platforms in their daily work (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Employees lack access, guidance, or authorisation to use a platform. Platform use is unclear, unsupported, or discouraged, resulting in minimal or no participation.
		Lev. 2	Employees have basic access to a platform and can participate in limited activities. Support and guidance exist but are inconsistent, and platform use varies across teams.
		Lev. 3	Employees are enabled to actively participate in a platform through appropriate access, tools, training, and support, allowing consistent and effective use in daily operations.
Employee engagement and motivation	The company's ability to encourage employee engagement and motivation to adopt and actively use digital platforms (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Employees show low motivation to use a platform. Engagement is minimal, and there are no incentives or leadership support to encourage participation.
		Lev. 2	Some employees are motivated to use a platform, often driven by individual interest or project-specific incentives. Engagement efforts exist but are fragmented and inconsistent.
		Lev. 3	Employees are actively engaged and motivated to use a platform, supported by clear communication, leadership encouragement, and alignment with daily work objectives.

The **data quality management** capability is essential for companies participating in ReMuNet because reliable, complete, and timely data forms the foundation of effective platform use (table 15). High-quality data enables correct platform workflows, informed decision-making, and successful collaboration with other participants, while poor data quality undermines trust, disrupts operations, and limits the value that can be created within the platform ecosystem. Ensuring data quality is therefore a prerequisite for full and effective participation in ReMuNet.

A central component of this capability is *real-time operational data monitoring* (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, operational data is not monitored in real time and is often outdated or incomplete, limiting situational awareness. At intermediate maturity, selected processes are monitored in near real time, but visibility remains partial and inconsistent. At high maturity, data is continuously monitored across processes, providing timely information for responsive decisions and effective platform use.

Another key element is *performance and KPI tracking* (Dicks et al., 2025b). At low maturity, KPIs are undefined or untracked, and decisions lack reliable performance insight. At intermediate maturity, some KPIs are monitored, but tracking is manual and inconsistently used. At high maturity, clear indicators are systematically tracked and actively used to assess performance, drive improvement, and optimise use of ReMuNet.

Table 15: Technological capability – Data quality management

Characteristic	Description	Maturity	
Real-time operational data monitoring	The company's ability to continuously observe and assess operational data as it is generated, ensuring accuracy, timeliness, and reliability (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Operational data is not monitored in real time. Data is outdated, incomplete, or only reviewed retrospectively, limiting situational awareness.
		Lev. 2	Some operational data is monitored in near real time or for selected processes. Monitoring is partial and may rely on manual checks or limited dashboards.
		Lev. 3	Operational data is monitored in real time across relevant processes, providing accurate and timely information to support decision-making.
Performance and KPI tracking	The company's ability to define, measure, and track key performance indicators to evaluate operational and platform-related performance (Dicks et al., 2025b).	Lev. 1	Performance metrics and KPIs are not clearly defined or tracked. Decisions are made without reliable performance insights.
		Lev. 2	Some KPIs are defined and tracked, often manually or inconsistently. Performance monitoring exists but is fragmented and not systematically used.
		Lev. 3	Relevant performance indicators and KPIs are clearly defined, consistently tracked, and used to assess performance, support improvements, and guide effective platform use.

Standardised digital processes and automation are necessary because participation in ReMuNet requires stable, repeatable, and digitally supported ways of working (table 16). When processes follow common digital standards, the company can connect its operations to the platform more smoothly, reducing coordination problems and operational variability. In the absence of such standardisation, interactions with ReMuNet become inefficient, error-prone, and difficult to scale, which limits the benefits of platform participation.

Table 16: Technological capability – Standardised digital processes and automation

Characteristic	Description	Maturity	
Process standardisation and automation	The company's ability to define standardised digital workflows and apply automation to improve efficiency, consistency, and scalability of operations (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Operational processes are largely manual, undocumented, and inconsistent. There is little to no use of digital standards or automation.
		Lev. 2	Some processes are documented and partially digitised. Limited automation exists for specific tasks, but standards are not applied consistently across the organisation.
		Lev. 3	Operational processes are standardised and supported by digital tools, with automation applied where appropriate. This enables efficient, consistent, and scalable operations and effective integration.

This capability centres on *process standardisation and automation*, understood as the organisation's capacity to design uniform digital workflows and use automation to enhance operational reliability and efficiency (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, processes are manual, poorly documented, and inconsistent across teams, limiting

digital and platform use. At medium maturity, some processes are documented and partly digitised, with isolated automation but uneven standards. At high maturity, processes are standardised, digitally supported, and selectively automated, enabling efficient, scalable operations and smooth integration with ReMuNet.

Organisational Capabilities

The Organisational capabilities are **Sustainability, Regulatory, risk and compliance, Operational management and domain knowledge, Holistic value logic and Organisational resilience**.

The **Sustainability** capability is required because ReMuNet is explicitly designed to support environmentally responsible logistics through greener transport options, intelligent routing, and resource-efficient multimodal mobility (table 17). Sustainability is therefore not an optional add-on but an integral element of the platform's value proposition and operating logic (Dicks et al., 2025a, 2025b; von Stamm et al., 2024b). To participate effectively, companies must be able to measure, manage, and operationalise sustainability objectives in a systematic way, ensuring that platform-based decisions align with environmental goals and regulatory expectations.

A first characteristic is *performance transparency*, referring to the organisation's ability to define, monitor, and interpret environmental key performance indicators (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, sustainability impacts are not measured, leaving environmental performance unclear. At intermediate maturity, selected indicators are tracked, but transparency remains partial and inconsistent. At high maturity, sustainability performance is comprehensively measured and transparently monitored, providing reliable data for operational and strategic decisions.

The second characteristic is *sustainability processes and tools*, which capture the organisation's capacity to embed sustainability objectives into operational routines through appropriate methods and digital support (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, sustainability processes and tools are absent, and environmental efforts are informal. At medium maturity, basic processes or tools exist but are applied unevenly. At high maturity, defined sustainability processes and digital tools are consistently used to monitor, manage, and improve environmental performance.

The third characteristic is *sustainability preferences*, understood as the ability to define and apply environmental criteria within operational and platform-based decisions (Dicks et al., 2025a, 2025b). At low maturity, sustainability criteria are undefined and do not influence decisions. At intermediate maturity, some low-impact preferences are considered, but inconsistently. At high maturity, clear sustainability criteria are systematically embedded in operational decisions and platform interactions, aligning with ReMuNet's sustainability-driven principles.

Table 17: Organisational Capability – Sustainability

Characteristic	Description	Maturity	
Performance transparency	Ability to define, track, and evaluate environmental KPIs and to interpret sustainability-related performance data (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Sustainability performance is not measured or monitored. There is no transparency on environmental or sustainability-related impacts.
		Lev. 2	Some sustainability metrics are tracked, often manually or for selected activities. Transparency exists internally but is limited and inconsistent.
		Lev. 3	Sustainability performance is systematically measured and transparently monitored, providing reliable information to support decision-making.
Sustainability processes and tools	Ability to implement, manage, and monitor processes and tools that support sustainability objectives (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	There are no defined sustainability processes or supporting tools. Sustainability considerations are informal or ad hoc.
		Lev. 2	Basic sustainability processes or tools exist but are applied inconsistently or only in parts of the organisation.
		Lev. 3	Defined sustainability processes and digital tools are consistently used to monitor, manage, and improve sustainability performance in operations.
Sustainability preferences	Ability to define, apply, and operationalise sustainability criteria (e.g. certified or low-impact assets) (Dicks et al., 2025a, 2025b).	Lev. 1	Sustainability preferences are not defined or considered in operational decisions.
		Lev. 2	Some sustainability preferences are defined and considered in selected decisions, but application is inconsistent.
		Lev. 3	Clear sustainability preferences are defined and consistently applied in operational and platform-based decision-making.

The **Regulatory, risk, and compliance** capability is required because ReMuNet processes sensitive, multi-stakeholder transport data and operates within a tightly regulated environment shaped by GDPR and related legal frameworks (table 18) (Dicks et al., 2025b; von Stamm et al., 2024b).

One key characteristic is *process regulatory compliance management*, which reflects the organisation's ability to embed legal and regulatory requirements directly into its operational workflows (von Stamm et al., 2024b). At low maturity, regulatory requirements are addressed reactively, without systematic integration. At intermediate maturity, some regulations are embedded in selected processes but unevenly applied. At high maturity, regulatory requirements are proactively and consistently integrated into daily operations, ensuring sustained compliance in platform-based activities.

A second characteristic is *risk identification and prioritisation*, referring to the organisation's capacity to recognise, assess, and rank operational and IT-related risks (Dicks et al., 2025a; von Stamm et al., 2024a). At low maturity, risks are not systematically identified or assessed, leading to reactive responses. At medium maturity, some risks are recognised, but prioritisation is inconsistent. At high maturity, risks are systematically identified, assessed, and prioritised, enabling proactive mitigation and informed decisions.

Table 18: Organisational capability – Regulatory, risk, and compliance

Characteristic	Description	Maturity	
Process regulatory compliance management	Ability to integrate relevant legal and regulatory requirements into operational workflows (von Stamm et al., 2024b).	Lev. 1	Regulatory requirements are not systematically considered in business processes. Compliance is reactive and addressed only when issues arise.
		Lev. 2	Some regulatory requirements are integrated into selected processes. Awareness exists, but implementation is inconsistent across the organisation.
		Lev. 3	Regulatory requirements are systematically embedded in business processes, ensuring consistent and proactive compliance in daily operations.
Risk identification and prioritisation	Ability to identify, assess, and prioritise operational and IT-related risks (Dicks et al., 2025a; von Stamm et al., 2024a).	Lev. 1	Risks are not systematically identified or assessed. Responses to risks are ad hoc and reactive.
		Lev. 2	Some risks are identified and assessed, often based on experience or individual initiatives. Prioritisation is limited or inconsistent.
		Lev. 3	Risks are systematically identified, assessed, and prioritised, enabling proactive management and informed decision-making.
Implementation verification	Ability to demonstrate and document that regulatory and compliance requirements are effectively implemented (Dicks et al., 2025a).	Lev. 1	There is no structured verification of compliance or risk controls. Deviations often go unnoticed.
		Lev. 2	Basic checks or audits exist but are irregular or limited in scope. Verification depends on manual or informal reviews.
		Lev. 3	Implementation of compliance and risk measures is regularly verified through structured reviews or audits, ensuring adherence to requirements.
Compliance coordination	Ability to align compliance-related responsibilities and processes across internal teams and external partners (von Stamm et al., 2024a, 2024b).	Lev. 1	Compliance responsibilities are currently unclear and distributed across various departments without a central coordination framework.
		Lev. 2	Compliance responsibilities are coordinated within specific teams or projects. However, these efforts are not yet fully standardised across the entire organisation.
		Lev. 3	Compliance responsibilities are clearly defined and coordinated across the entire organisation. Effective communication channels and established roles ensure alignment with regulatory standards.

A third characteristic is *implementation verification*, which captures the ability to demonstrate and document that regulatory and risk-related measures are effectively applied (Dicks et al., 2025a). At low maturity, no structured mechanisms verify compliance, and deviations often go undetected. At intermediate maturity, basic checks or audits occur, but irregularly and with limited scope. At high maturity, compliance and risk controls are regularly reviewed through structured audits, ensuring consistent adherence to requirements.

The fourth characteristic is *compliance coordination*, understood as the alignment of compliance responsibilities and processes across internal units and external partners. At low maturity, responsibilities are unclear and fragmented (von Stamm et al., 2024a, 2024b). At medium maturity, coordination exists within specific teams but lacks organisation-wide standardisation. At high maturity, compliance responsibilities are clearly defined and coordinated across the organisation, supported by established roles and communication channels aligned with regulatory standards.

The **operational management and domain knowledge** capability is essential for ReMuNet because the platform's operation, customer support, decision-making, and ecosystem coordination depend on reliable and efficient day-to-day operations (table 19) (Dicks et al., 2025b; von Stamm et al., 2024a). To ensure scalability and consistent service quality, organisations must be able to translate strategic intent into operational practice, manage initiatives effectively, and maintain high-quality operational and data-related foundations that support stable platform performance.

One core characteristic is *strategic goal alignment*, which reflects the organisation's ability to connect strategic objectives with operational activities (Dicks et al., 2025b). At low maturity, operations are disconnected from strategy, with siloed teams and unclear direction. At medium maturity, some alignment exists but remains uneven. At high maturity, operations are clearly aligned with strategic goals, ensuring coordinated execution and consistent direction.

A second characteristic is *project management*, referring to the organisation's ability to plan, coordinate, and execute operational and strategic initiatives (Dicks et al., 2025b). At low maturity, projects are managed informally, without clear plans or responsibilities. At medium maturity, basic project practices exist but are inconsistently applied. At high maturity, projects follow structured methods with clear planning, monitoring, and accountability.

The definition of *responsibilities and processes* represents another key characteristic (Dicks et al., 2025a, 2025b). At low maturity, roles and workflows are unclear or undocumented, causing inefficiencies and overlap. At medium maturity, some roles and processes are defined but inconsistently understood or applied. At high maturity, roles, responsibilities, and processes are clearly defined, documented, and consistently followed across operations.

From a data perspective, *data standardisation* is a critical characteristic describing the ability to provide consistent operational data (von Stamm et al., 2024a). At low maturity, data formats and definitions vary across teams and systems. At medium maturity, some standards exist but are not consistently enforced. At high maturity, data standards are clearly defined and applied across systems and processes.

Closely related is *data structure*, which concerns how operational data is organised and maintained (von Stamm et al., 2024a). At low maturity, data remains fragmented and poorly structured, limiting usability. At medium maturity, basic structures exist but are incomplete or inconsistently maintained. At high maturity, data is well structured, systematically maintained, and readily usable across operational and digital systems.

Table 19: Organisational capability – Operational management and domain knowledge

Characteristic	Description	Maturity	
Strategic goal alignment	Ability to establish, track, and adjust strategic objectives to guide operational activities (Dicks et al., 2025b).	Lev. 1	Operational activities are disconnected from strategic goals. Teams work in silos with no clear strategic direction.
		Lev. 2	Some alignment exists between strategy and operations, but it is inconsistent across teams or projects.
		Lev. 3	Operational activities are clearly aligned with strategic goals, ensuring consistent direction and coordinated execution.
Project management	Ability to plan, coordinate, and execute operational and strategic initiatives effectively (Dicks et al., 2025b).	Lev. 1	Projects are managed informally without clear plans, timelines, or responsibilities.
		Lev. 2	Basic project management practices exist but are applied inconsistently or depend on individual experience.
		Lev. 3	Projects are managed using structured methods with clear planning, monitoring, and accountability.
Responsibilities and processes	Ability to define, assign, and monitor responsibilities, workflows, and process performance (Dicks et al., 2025a, 2025b).	Lev. 1	Roles and processes are unclear or undocumented, leading to inefficiencies and overlap.
		Lev. 2	Some roles and processes are defined, but responsibilities are not consistently understood or applied.
		Lev. 3	Roles, responsibilities, and processes are clearly defined, documented, and consistently followed.
Data standardisation	Ability to provide accurate, timely, and standardised operational data (von Stamm et al., 2024a).	Lev. 1	Data is inconsistent, using different formats and definitions across systems or teams.
		Lev. 2	Some data standards exist but are not consistently applied or enforced.
		Lev. 3	Data standards are clearly defined and consistently applied across systems and processes.
Data structure	Ability to organise operational data in a clear, logical, and usable format (von Stamm et al., 2024a).	Lev. 1	Data is inconsistently structured and remains fragmented, making it difficult to access or utilise.
		Lev. 2	Basic data structures exist but are incomplete or inconsistently maintained.
		Lev. 3	Data is well-structured, maintained, and readily usable across operational and digital systems.
Data completeness	Ability to maintain comprehensive and fully captured operational data for accurate decision-making (Dicks et al., 2025a, 2025b).	Lev. 1	Data is frequently missing, outdated, or incomplete.
		Lev. 2	Data completeness is monitored for selected areas, but gaps remain common.
		Lev. 3	Operational data is consistently complete and reliable for decision-making and digital use.

Characteristic	Description	Maturity	
Detection and assessment	Ability to identify and evaluate operational deviations promptly (von Stamm et al., 2024b).	Lev. 1	Issues are detected late or only after significant impact has occurred.
		Lev. 2	Some issues are detected early, but assessment processes are informal or inconsistent.
		Lev. 3	Operational issues are promptly detected and systematically assessed to support timely action.
Resolution	Ability to implement corrective actions to restore operations efficiently (Dicks et al., 2025a).	Lev. 1	Issues are resolved reactively, often inconsistently or with delays.
		Lev. 2	Resolution processes exist but vary across teams and lack standardisation.
		Lev. 3	Issues are resolved through defined processes, ensuring consistent and timely outcomes.
Accountability and process ownership	Ability to assign responsibilities and manage escalation processes for disruptions, including IT/internet-related incidents (Dicks et al., 2025b).	Lev. 1	Accountability is unclear, and ownership of processes is fragmented or absent.
		Lev. 2	Some ownership is defined, but accountability is inconsistently enforced.
		Lev. 3	Clear accountability and process ownership are defined and consistently upheld across operations.

Data completeness further captures the reliability of operational data (Dicks et al., 2025a, 2025b). At low maturity, data is frequently missing, outdated, or incomplete. At medium maturity, completeness is monitored in selected areas, but gaps persist. At high maturity, operational data is consistently complete and reliable, supporting accurate decision-making and digital platform use.

Operational resilience is reflected in the *detection and assessment* characteristic (Dicks et al., 2025a; von Stamm et al., 2024b). At low maturity, issues are detected late or only after significant impact. At medium maturity, some issues are identified early, but assessment remains informal or inconsistent. At high maturity, operational deviations are promptly detected and systematically assessed to enable timely action.

The related characteristic of *resolution* addresses the ability to restore operations through corrective action (Dicks et al., 2025a). At low maturity, issues are resolved reactively and with delays. At medium maturity, resolution practices exist but vary across teams and lack standardisation. At high maturity, issues are resolved through defined and consistent processes, ensuring timely and reliable outcomes.

Accountability and process ownership describes how responsibilities and escalation mechanisms are assigned, including for IT- or internet-related incidents (Dicks et al., 2025b). At low maturity, accountability is unclear and ownership fragmented. At medium maturity, ownership exists but is inconsistently enforced. At high maturity, accountability and process ownership are clearly defined and upheld, supporting stable, resilient operations within the ReMuNet ecosystem.

The **holistic value logic** capability is required because sustainable revenue and value models are fundamental to enabling continuous service provision, fair value exchange, and the long-term economic viability of ReMuNet (table 20) (Dicks et al., 2025b).

Table 20: Organisational capability – Holistic value logic

Characteristic	Description	Maturity	
Network participation	Ability to establish fast communication channels, share data and resources, and be ready to contribute value in collaborative logistics (Dicks et al., 2025a, 2025b).	Lev. 1	The company operates in isolation and does not actively engage with ecosystem partners or platform networks.
		Lev. 2	The company participates selectively in network activities, but engagement is limited, reactive, or transactional.
		Lev. 3	The company actively participates in a platform ecosystem, engaging with multiple actors to create shared value.
Value co-creation management	Ability to identify, allocate, and utilise resources, responsibilities, and capabilities to co-create value within the ecosystem (Dicks et al., 2025b; von Stamm et al., 2024b).	Lev. 1	Value creation is handled internally with no structured collaboration with external partners.
		Lev. 2	Some collaborative value creation exists, but it is informal, project-based, or inconsistently managed.
		Lev. 3	Value co-creation with partners is actively managed through defined practices, enabling mutual benefits across the ecosystem.
Neutrality and equitable access assurance	Ability to operate within the platform ecosystem while respecting neutral usage principles and fair access for all participants (Dicks et al., 2025a; von Stamm et al., 2024b).	Lev. 1	The company prioritises its own interests without considering the interests of stakeholders in the ecosystem.
		Lev. 2	There is awareness of neutrality and fairness principles, but behaviour and practices are inconsistent.
		Lev. 3	The company consistently respects platform neutrality and supports equitable access, fostering trust and long-term ecosystem stability.

One key characteristic of this capability is *network participation*, which reflects the organisation's ability to actively engage in the platform ecosystem through communication, data exchange, and resource sharing (Dicks et al., 2025a, 2025b). At low maturity, the company operates in isolation, with little meaningful partner or platform engagement. At medium maturity, participation is selective, reactive, or transactional. At high maturity, the company actively engages in the platform ecosystem, collaborating with multiple actors to create and capture shared value.

A second characteristic is *value co-creation management*, referring to the organisation's ability to deliberately organise and manage collaborative value creation (Dicks et al., 2025b; von Stamm et al., 2024b). At low maturity, value creation is internal, with little structured partner collaboration. At medium maturity, some co-creation occurs, but informally or inconsistently. At high maturity, value co-creation is actively managed through defined practices, with clear resources and responsibilities enabling mutual ecosystem benefits.

The third characteristic is *neutrality and equitable access assurance*, which captures the organisation's ability to operate within the platform while respecting neutral usage principles

and fair access for all participants (Dicks et al., 2025a; von Stamm et al., 2024b). At low maturity, the company prioritises its own interests with little regard for other stakeholders. At medium maturity, neutrality and fairness are recognised but applied inconsistently. At high maturity, the company consistently upholds platform neutrality and equitable access, fostering trust, long-term collaboration, and ecosystem stability.

The **organisational resilience** capability is essential for effective participation in ReMuNet because the platform operates within highly interconnected logistics networks in which disruptions can propagate rapidly across organisational and geographical boundaries (table 21). To fully exploit ReMuNet's real-time data, visibility, and collaborative coordination mechanisms, companies must be able not only to detect and manage disruptions internally but also to respond in a coordinated manner with ecosystem partners (Dicks et al., 2025b). Strong organisational resilience enables continuity of operations, limits cascading failures, and supports stable logistics performance during periods of uncertainty.

One core characteristic of organisational resilience is the ability to *create and implement recovery plans* (Dicks et al., 2025a; Kulkarni et al., 2024; Zöttl et al., 2024), which refers to developing, coordinating, and executing structured responses that restore operations after disruptions. At low maturity, no formal recovery plans exist, and responses are improvised. At medium maturity, basic plans cover selected scenarios but are incomplete or rarely tested. At high maturity, structured recovery plans are regularly reviewed and effectively implemented, ensuring rapid, coordinated recovery from disruptions.

A second characteristic is the capability to *quickly identify the location of disruptions* (Zöttl et al., 2024) within operations or the wider network. At low maturity, disruptions are recognised late and their sources remain unclear. At medium maturity, some are detected earlier, but pinpointing the source is slow or limited. At high maturity, disruptions are quickly detected and precisely located, enabling timely, targeted responses.

The third characteristic concerns the ability to *absorb disruption consequences* (Kulkarni et al., 2024; Zöttl et al., 2024), meaning the organisation's capacity to withstand and manage disruption impacts without severe loss of performance. At low maturity, disruptions cause major breakdowns and long recovery times. At medium maturity, minor disruptions can be absorbed, but larger ones still impair operations. At high maturity, disruptions are effectively managed, maintaining core operations and service continuity even under adverse conditions.

Organisational resilience depends on the ability to *communicate solutions to partners* (Dicks et al., 2025b; Zöttl et al., 2024) in a clear and timely manner. At low maturity, disruption communication is delayed or unclear, limiting coordination. At medium maturity, communication occurs but is reactive or inconsistent. At high maturity, recovery actions are communicated clearly and promptly to partners, enabling coordinated responses and minimising disruption impacts.

Table 21: Organisational capability – Organisational resilience

Characteristic	Description	Maturity	
Create and implement recovery plans	The company's capability to develop, coordinate, and execute plans that restore operations quickly and effectively after disruptions, ensuring continuity and resilience (Dicks et al., 2025a; Kulkarni et al., 2024; Zöttl et al., 2024).	Lev. 1	No formal recovery plans exist. Responses to disruptions are improvised and uncoordinated.
		Lev. 2	Basic recovery plans exist for selected scenarios but are incomplete or not regularly tested.
		Lev. 3	Structured recovery plans are in place, regularly reviewed, and can be effectively implemented when disruptions occur.
Quickly identify disruption location	The company's ability to rapidly detect and pinpoint where disruptions occur within operations or the network, enabling timely and targeted responses (Zöttl et al., 2024).	Lev. 1	Disruptions are recognised only after they have affected multiple areas. The source or location of the disruption is unclear.
		Lev. 2	Some disruptions are identified with partial knowledge of their location. Pinpointing the exact source is slow or limited to specific processes.
		Lev. 3	Disruptions are quickly detected, and their exact location within operations or the network is accurately identified, enabling targeted and timely response.
Absorb disruption consequences	The company's capacity to withstand and manage the impact of disruptions without severe loss of performance, maintaining stability and continuity of operations (Kulkarni et al., 2024; Zöttl et al., 2024).	Lev. 1	Disruptions cause severe operational breakdowns and prolonged recovery times.
		Lev. 2	The company can absorb minor disruptions, but larger events significantly affect operations.
		Lev. 3	The company can absorb and manage disruption impacts, maintaining core operations and service continuity.
Communicate solutions to partners	The company's ability to quickly and clearly share response plans and solutions with partners, enabling coordinated action and minimizing disruption impacts (Dicks et al., 2025b; Zöttl et al., 2024).	Lev. 1	Communication with partners during disruptions is delayed, unclear, or absent.
		Lev. 2	Some communication occurs, but it is inconsistent, reactive, or limited to key partners.
		Lev. 3	Solutions and recovery actions are communicated clearly and promptly to partners, enabling coordinated responses across the network.

4.1.2 Role-specific Business Capability Maps

The following subchapters introduce the role-specific business capability maps for the digital ReMuNet platform ecosystem to understand the changes within the dimensions triggered by the new platform, using new and adapted BMs from Dicks et al. (2025a). Depending on the intended usage of the platform, only a subset of the business capabilities described in chapter 3 is relevant to a company.

ReMuNet distinguishes four types of users as described in Dicks et al. (2025b) and as summarised in chapter 2.3.3:

1. Service user
2. Service provider

3. Data provider
4. Capacity provider

Each user type encompasses different ecosystem roles as described in Dicks et al. (2025a) and as summarised in chapter 2.3.3. A user can take on multiple user types within the platform ecosystem. In summary, user types can be differentiated in terms of how they use the platform, depending on whether they want to provide assets as input to the platform ecosystem (service provider, data provider, and capacity provider) or whether they want to use assets from the platform ecosystem for their business (service user). Therefore, different sets of capabilities are necessary for the effective use of the digital platform.

The following subchapters describe the corresponding business capability maps for each user type and reasons why specific capabilities are not relevant to that user type.

Service User

The service user utilises the platform to access its services and data to plan, coordinate and optimise transport orders or to plan new ones. This type does not provide any input but solely uses the output data and results of the platform.

Therefore, the service user should focus on capabilities to promote the integration of standardised processes and collaborative value creation (figure 11). Capabilities that are not relevant to the service user include data **quality management** and **organisational resilience**.

Using the offered services on the ReMuNet platform does not require the service user to show high data quality management. The service user does not share data per se but is dependent on high quality data from other platform partners. The output data already comply the platform's data quality requirements, so the data quality management needs to be implemented by providing user types, not the receiving types.

As the platform itself offers services and functionalities to improve the freight transport network's resilience the user of the platform services does not need to show high organisational resilience. The participation in the platform ecosystem itself will increase an organisation's resilience through improved disruption management processes, multimodal shifting options, and efficient resource allocation.

META CAPABILITIES	HUMAN-CENTERED CAPABILITIES	TECHNOLOGICAL CAPABILITIES	ORGANISATIONAL CAPABILITIES
Sensing	Strategic direction and internal alignment	Digital infrastructure management	Sustainability
Seizing	Partnering, collaboration, and platform mindset	Data security and privacy	Regulatory, risk, and compliance
Transforming, reconfiguring, and renewal	Change management and communication	Data exchange, interoperability and compatibility	Operational management and domain knowledge
	Digital literacy	Platform utilisation	Holistic value logic
		Standardised digital processes and automation	

Figure 11: Role-specific capability map – Service user

Service Provider

The service provider is the counterpart to the service user. Service providers offer their logistics services as third party services in the platform ecosystem to be used by and connect other platform participants. The diversity of service providers ensures a broad offering of services and solutions to different challenges and difficulties as identified by von Stamm et al. (2024a).

Service providers should prioritise capabilities that ensure interoperability of their offered services based on the platform and used API standards to enable effective collaboration between all platform participants (figure 12). Details on how the services interact with each other and create shared value is described by Dicks et al. (2025a) and summarised in chapter 2.3.3. Capabilities that are not relevant to the service provider are **change management and communication**, **digital literacy**, and **platform utilisation**.

By offering their services on a digital platform such as ReMuNet, service providers do not necessarily have to change their business model or processes. Therefore, change management and communication are of low relevance as part of participating in the ReMuNet ecosystem as a service provider.

Digital literacy as the human digital expertise focuses on the capabilities towards using technology and digital services, not providing them in relation to ReMuNet. Nonetheless, usability and accessibility should always be considered when developing digital services for the digital ReMuNet platform ecosystem.

As described in chapter 3, platform utilisation is characterised by the employee participation and the employee engagement and motivation towards platforms. The provision of digital services does not necessarily require participation or engagement, even if the offering is targeted at a digital platform. Value is mainly created by the interaction between users of the services. Nonetheless, service providers should always engage with users for troubleshooting, but not necessarily in the means of platform interaction.

META CAPABILITIES	HUMAN-CENTRED CAPABILITIES	TECHNOLOGICAL CAPABILITIES	ORGANISATIONAL CAPABILITIES
Sensing	Strategic direction and internal alignment	Digital infrastructure management	Sustainability
Seizing	Partnering, collaboration, and platform mindset	Data security and privacy	Regulatory, risk, and compliance
Transforming, reconfiguring, and renewal		Data exchange, interoperability and compatibility	Operational management and domain knowledge
		Data quality management	Holistic value logic
		Standardised digital processes and automation	Organisational resilience

Figure 12: Role-specific capability map – Service provider

Data Provider

Data providers do not offer or use any service in the digital ReMuNet platform ecosystem. They contribute to the shared value creation by providing data and information that can be accessed and used by users and services. This data includes traffic information, weather data, or infrastructure status updates.

By offering data as raw digital information, data providers do not engage in processes or transport planning. They enable the effective use of digital services realising transparent decision making and high-quality results of algorithms and machine learning tools. The value of digital services relies on the quality of the provided data: larger data sets result in higher accuracy and more alternatives in the event of a disruption. Therefore, data providers should focus on standardised data formats, quality management, and automated topicality of their data (figure 13). Capabilities that are not relevant to data providers are **sensing, transforming, reconfiguring and renewal, change management and communication, digital literacy, and platform utilisation**.

Since sensing refers to the ability to detect and interpret changes in the environment, this capability is not relevant to data provider that offer their data to be used within the platform ecosystem. They only take on a very passive role, which is essential for the provision of services, but does not require the same high degree of integration as the other user types.

For the same reasons, the degree of reconfiguration and renewal for data providers is very low. The provision of data will most likely have no impact on the core value proposition of the data provider and therefore will not change the business processes of these players.

If there is no change in business processes, change management and communication is as well of low relevance for data providers.

As already explained in relation to service providers, digital literacy is more important for users than for providers. Data providers should ensure to provide data in standardised readable formats and check for quality and topicality.

Data providers are most likely to focus on core businesses other than digital platforms. For this reason, platform utilisation is not relevant for data providers that support platform services and contribute to overall value creation by providing the data needed to solve challenges and difficulties.

META CAPABILITIES	HUMAN-CENTRED CAPABILITIES	TECHNOLOGICAL CAPABILITIES	ORGANISATIONAL CAPABILITIES
Seizing	Strategic direction and internal alignment	Digital infrastructure management	Sustainability
	Partnering, collaboration, and platform mindset	Data security and privacy	Regulatory, risk, and compliance
		Data exchange, interoperability and compatibility	Operational management and domain knowledge
		Data quality management	Holistic value logic
		Standardised digital processes and automation	Organisational resilience

Figure 13: Role-specific capability map – Data provider

Capacity Provider

Capacity providers make their transport capacities, such as containers, time slots or other resources, available on the digital ReMuNet platform so that others can book them via the service providers' digital transport services.

Like data providers, capacity providers should focus on the availability and quality of data on the capacities offered (figure 14). Transparency regarding available capacities can significantly improve disruption management. Transport orders can be rescheduled and routes recalculated in a timely manner. Capacity providers therefore have a direct influence on the resilience of the freight transport network. Capabilities that are not relevant to capacity providers are **transforming, reconfiguring and renewal, change management and communication, digital literacy, platform utilisation, and standardised digital processes and automation.**

The reasoning behind the relevance of business capabilities is analogous to that of data providers and service providers.

META CAPABILITIES	HUMAN-CENTRED CAPABILITIES	TECHNOLOGICAL CAPABILITIES	ORGANISATIONAL CAPABILITIES
Sensing	Strategic direction and internal alignment	Digital infrastructure management	Sustainability
Seizing	Partnering, collaboration, and platform mindset	Data security and privacy	Regulatory, risk, and compliance
		Data exchange, interoperability and compatibility	Operational management and domain knowledge
		Data quality management	Holistic value logic
			Organisational resilience

Figure 14: Role-specific capability map – Capacity provider

4.2 Practical Guidance for Transformation

The following chapter presents practical guidance for transformation for each business capability described in chapter 3. The guidance for improvement is derived from academic literature and fulfil a universal character. The recommendations are aimed at all stages of maturity. In general, following the approach by Schuh et al. (2017), consistency in maturity should be achieved within a capability before striving for the next level of maturity.

4.2.1 Meta Capabilities

Improvements in **sensory perception** can be achieved by institutionalising systematic environmental awareness and promoting a culture that supports learning and exploration (table 22). Organisations strengthen sensing when they move from reactive, fragmented observation towards continuous and structured monitoring of market, technological, and ecosystem developments. Embedding clear responsibilities, regular reflection routines, and structured dialogue supports the consistent interpretation and use of external signals for strategic and operational adaptation. At the same time, cultivating an organisational climate that encourages curiosity, experimentation, and open exchange of ideas enhances the ability to recognise emerging opportunities and risks. Leadership support for learning-oriented behaviour and psychologically safe interaction further reinforces this dynamic. Together, structured scanning and an exploratory mindset form mutually reinforcing foundations for a robust sensing capability (Acosta-Prado, 2020; Day & Schoemaker, 2005; Edmondson, 1999).

Table 22: Practical guidance for sensing

Characteristic	Guidance for improvement
Market scanning and platform awareness	Market scanning can be developed through systematic routines for reviewing market signals and ecosystem developments, supported by clear responsibility for information collection and interpretation. Structured forums for discussing insights and translating them into strategic or operational actions help institutionalise scanning as an organisational practice rather than an ad hoc activity (Acosta-Prado, 2020; Day & Schoemaker, 2005; Edmondson, 1999).
Openness and exploratory mindset	Openness and an exploratory mindset can be developed by fostering an environment that supports experimentation, learning and the questioning of existing practices. Explicit leadership encouragement of curiosity, tolerance for small-scale experimentation without negative consequences, and systematic reflection on and sharing of lessons learned help normalise exploration and embed it in everyday organisational work (Acosta-Prado, 2020; Day & Schoemaker, 2005; Edmondson, 1999).

In terms of the ability to **seize** opportunities, improvements can be achieved by strengthening the organisation's ability to translate identified opportunities into coordinated and timely action (table 23). This requires structural and procedural flexibility that allows rapid adjustment of workflows, decision-making processes, and resource allocation in response to changing conditions. Regular reflection on and adaptation of organisational arrangements supports sustained responsiveness and strategic alignment. At the same time, the ability to mobilise and share assets, data, and capabilities across organisational boundaries strengthens collective action and value realisation. Clear coordination mechanisms, defined responsibilities, and trust-based collaboration provide the foundation for effective resource mobilisation. Together, organisational flexibility and collaborative resource integration form mutually reinforcing pillars of a strong seizing capability (Dyer & Singh, 1998; Loebbecke et al., 2016; Worley & Lawler, 2010).

Table 23: Practical guidance for seizing

Characteristic	Guidance for improvement
Organisational agility	Organisational agility can be developed through the deliberate design of structures, roles and processes that support flexibility and rapid response. Reducing rigid hierarchies, enabling lateral coordination across organisational units, and establishing processes that can be readily reconfigured as conditions change help sustain organisational responsiveness. Regular diagnosis and adjustment of organisational design elements support the organisation's ability to act on emerging opportunities (Dyer & Singh, 1998; Loebbecke et al., 2016; Worley & Lawler, 2010).
Resource sharing	Resource sharing can be developed through clear coordination mechanisms and shared routines that enable the systematic exchange of assets, data and capabilities across organisational boundaries. The definition of common rules, clarification of roles and responsibilities, and the establishment of governance structures supporting collaboration with internal units and external partners underpin effective sharing. Relational processes such as regular interaction, joint problem-solving and trust-building further facilitate efficient and reliable resource sharing (Dyer & Singh, 1998; Loebbecke et al., 2016; Worley & Lawler, 2010).

Within the scope of the ability to **transform, reconfigure and renewal**, improvements can be achieved by systematically embedding adaptation and innovation into organisational processes (table 24). This involves continuously reviewing and redesigning processes to ensure alignment with evolving digital and ecosystem requirements and institutionalising successful changes so that they become part of everyday operations. In parallel, structured

approaches to generating, testing, and implementing new ideas strengthen the organisation's capacity for sustained innovation rather than isolated experimentation. Furthermore, the ability to adapt and refine the business model in collaboration with partners enhances long-term relevance and value creation. Ongoing engagement with ecosystem actors and iterative adjustment of value propositions and revenue mechanisms support continuous renewal. Together, process integration, systematic innovation, and collaborative business model adaptation reinforce the organisation's long-term transformative capacity (Abeygunasekera et al., 2022; Kringelum & Frederiksen, 2025; Nagano et al., 2014; Plattfaut & Grisold, 2025).

Table 24: Practical guidance for transforming, reconfiguring, and renewal

Characteristic	Guidance for improvement
Integration of new processes	Integration of new processes can be developed through systematic mapping of existing workflows and the involvement of cross-functional teams in the co-design of new ways of working. Piloting redesigned workflows, embedding successful practices through documentation and training, and establishing mechanisms for continuous improvement support effective integration. Treating process innovation as an ongoing discipline helps ensure that workflows remain adaptable and aligned with evolving digital opportunities (Abeygunasekera et al., 2022; Kringelum & Frederiksen, 2025; Nagano et al., 2014; Plattfaut & Grisold, 2025).
Innovation management	Innovation management can be developed through structured processes for the generation, evaluation, testing and implementation of ideas. Formal channels for idea submission, the involvement of diverse perspectives, and iterative experimentation support the refinement of promising concepts. Embedding innovation practices within regular workflows, supported by clear roles and feedback loops, enables systematic testing and adoption and strengthens the organisation's capacity to sustain innovation over time (Abeygunasekera et al., 2022; Kringelum & Frederiksen, 2025; Nagano et al., 2014; Plattfaut & Grisold, 2025).
Business model adaptability and co-creation	Business model adaptability and co-creation can be developed through the active engagement of partners, customers and other ecosystem actors in collaborative workshops to explore and test alternative value propositions, revenue mechanisms and delivery approaches. The use of structured frameworks to visualise and experiment with business model options supports incremental learning and adjustment. Ongoing collaboration with ecosystem actors enables adaptation as conditions evolve and strengthens the organisation's capacity to co-create new value (Abeygunasekera et al., 2022; Kringelum & Frederiksen, 2025; Nagano et al., 2014; Plattfaut & Grisold, 2025).

4.2.2 Human-centred Capabilities

Within the **Strategic direction and internal alignment** capability, strengthening requires the deliberate alignment of vision, leadership behaviour, and organisational roles (table 25). A clearly articulated strategic direction, consistently communicated and supported through visible resource allocation and leadership engagement, reinforces organisational focus and commitment to digital and platform-related initiatives (Kusanke et al., 2024; Popova et al., 2024; Silva et al., 2025). At the same time, structured communication mechanisms and shared goal setting across hierarchical levels foster mutual understanding, coordination, and trust, ensuring that strategy is enacted coherently throughout the organisation (Alshwayat et al., 2021; Popova et al., 2024). Clarifying the organisation's role within the broader platform ecosystem further enhances alignment by defining its specific value contribution and responsibilities in relation to other actors (Brea, 2023; Hein et al., 2020; Sorri et al., 2019).

Systematic reflection and periodic adjustment of this role support sustained coherence between internal operations and external collaboration (Volz et al., 2025). Together, leadership clarity, cross-level trust, and explicit role definition create the conditions for coordinated action and effective platform integration.

Table 25: Practical guidance for strategic direction and internal alignment

Characteristic	Guidance for improvement
Leadership clarity and commitment	Leadership clarity and commitment can be developed through the articulation of a clear digital vision, consistent communication of priorities, and the allocation of resources to digital initiatives. Direct engagement by leaders with organisational teams reinforces alignment and focus, strengthening shared understanding and commitment to digital transformation efforts (Kusanke et al., 2024; Popova et al., 2024; Silva et al., 2025).
Cross level alignment and trust	Cross-level alignment and trust can be developed through structured communication channels, opportunities for joint problem-solving, and the alignment of goals across teams and leadership levels. Consistent enactment of the shared vision through managerial actions, decisions and communication reinforces credibility and trust (Alshwayat et al., 2021; Popova et al., 2024).
Definition of own role within the platform ecosystem	Definition of the organisation's role within an ecosystem can be developed through systematic mapping of relevant actors, activities and interdependencies to identify areas of distinctive value contribution. Clearly defining and communicating this role internally and externally, and consistently enacting it in day-to-day interactions, supports effective collaboration. Regular review and adjustment of the role as the ecosystem evolves help maintain alignment with governance arrangements, interdependencies and emerging strategic opportunities, enabling joint value creation (Brea, 2023; Hein et al., 2020; Sorri et al., 2019; Volz et al., 2025).

Within the **Partnering, collaboration, and platform mindset** capability, strengthening depends on cultivating stable, trust-based and mutually beneficial relationships within the ecosystem (table 26). Trustful interaction with stakeholders can be enhanced through shared objectives, regular communication, and repeated collaborative activities that reinforce reliability and transparency (Singal, 2022; Volz et al., 2025). Structured joint planning and problem-solving routines deepen relational ties and facilitate knowledge exchange across organisational boundaries (Chen et al., 2014; Ouden, 2012; Volz et al., 2025). Openness to share data is reinforced through clear governance arrangements, mutually agreed rules on data use, and secure, interoperable exchange mechanisms that position data sharing as a strategic enabler of collective value rather than a source of risk (Jacobides et al., 2019; Lefebvre et al., 2025). Sustained commitment to the platform is further supported when participation is embedded in strategic objectives, backed by dedicated resources, and reinforced through continuous engagement and visible shared outcomes (Engert et al., 2023; Singal, 2022). Together, these elements foster a collaborative orientation that enables coordinated action and long-term value creation within the platform ecosystem.

Table 26: Practical guidance for partnering, collaboration, and platform mindset

Characteristic	Guidance for improvement
Trustful interaction with other stakeholders	Trustful interaction with stakeholders can be developed through the establishment of shared goals, frequent communication and sustained relationship-building. Common objectives and joint activities foster a sense of shared purpose, while regular information exchange and dialogue reinforce reliability. Ongoing collaborative practices, including joint planning, shared problem-solving and transparent information sharing, support the gradual development of trust and enable deeper collaboration and knowledge exchange across the network (Chen et al., 2014; Ouden, 2012; Singal, 2022; Volz et al., 2025).
Openness to share data	Openness to share data can be developed through clear agreements with partners regarding the scope and use of shared data, supported by defined governance policies and secure, interoperable exchange mechanisms. Regular dialogue with partners helps align mutual needs and benefits, reduces data-related concerns, and fosters transparency and collaboration by positioning data as a strategic asset rather than a risk (Jacobides et al., 2019; Lefebvre et al., 2025).
Commitment to platform	Commitment to the platform can be developed through sustained engagement supported by the allocation of dedicated resources, the integration of platform objectives into organisational strategy and performance measures, and the establishment of regular collaboration routines with ecosystem partners. Demonstrating value through shared outcomes and continued contributions reinforces long-term commitment and supports sustained participation within the ecosystem (Engert et al., 2023; Singal, 2022).

Within the **Change management and communication** capability, strengthening depends on the organisation's ability to deliberately reshape established patterns of action and to create shared understanding regarding the purpose of change (table 27). The capacity to change entrenched routines can be enhanced by increasing transparency around existing workflows, encouraging reflection on current practices, and legitimising experimentation with alternative ways of working (Schuh et al., 2017). By reinforcing effective new practices and gradually phasing out outdated ones, organisations institutionalise adaptive behaviour and reduce resistance to transformation (Feldman & Pentland, 2003). At the same time, effective communication of the necessity of change is reinforced through the consistent articulation of strategic intent, clear explanation of implications for daily work, and the use of multiple, dialogical communication channels (Rafferty et al., 2013). Such structured and participatory communication reduces uncertainty, fosters shared understanding, and strengthens employee engagement in transformation processes (Shrivastava et al., 2022).

Table 27: Practical guidance for change management and communication

Characteristic	Guidance for improvement
Changing entrenched routines	The ability to change entrenched routines can be developed by making existing workflows transparent, encouraging open communication about how work is performed, and allowing variation in task execution to test alternative practices. Reflection on established routines, the legitimisation of constructive deviation, and the reinforcement of effective new practices support the gradual replacement of outdated habits and strengthen the organisation's capacity for change over time (Feldman & Pentland, 2003; Schuh et al., 2017).
Communication of necessity of change	Communication of the necessity of change can be developed through the consistent articulation of why change is required, its linkage to strategic objectives, and clarification of its implications for employees and operations. The use of multiple communication channels and the facilitation of two-way dialogue help reduce uncertainty, build shared understanding, and support employee engagement and acceptance of change (Rafferty et al., 2013; Shrivastava et al., 2022).

Within the **Digital Literacy** capability, strengthening relies on developing employees' ability to effectively use digital tools and platforms to support operational and collaborative activities (table 28). Human digital expertise can be enhanced by assessing current skill levels, providing targeted, practice-oriented training, and embedding learning opportunities directly into daily work through application, coaching, and feedback (Azevedo & Almeida, 2021). Encouraging ongoing skill development within a supportive environment builds confidence with digital technologies and ensures that digital competencies are consistently applied, enabling employees to leverage platforms and data effectively for operations, decision-making, and collaboration (Carvalho et al., 2023).

Table 28: Practical guidance for digital literacy

Characteristic	Guidance for improvement
Human digital expertise	Human digital expertise can be developed through the assessment of existing skill levels, the provision of targeted and practice-oriented training, and the embedding of learning opportunities into everyday work through application, coaching and feedback. Encouraging continuous development within a supportive environment helps build confidence with digital technologies and ensures that digital skills are applied consistently and effectively in daily activities (Azevedo & Almeida, 2021; Carvalho et al., 2023).

4.2.3 Technological Capabilities

The **digital infrastructure management** capability is strengthened through the systematic enhancement of reliability, data integration and secure access (table 29).

Table 29: Practical guidance for digital infrastructure management

Characteristic	Guidance for improvement
Reliable IT systems	Reliable IT systems can be developed through the implementation of automated monitoring and response mechanisms that enable early detection of issues and reduce downtime. Continuous performance monitoring, alerting for deviations, and rapid incident response support operational stability. The integration of proactive monitoring with infrastructure management practices, including predictive detection and optimisation, strengthens system resilience and contributes to secure and dependable IT operations (Misal, 2024).
Operational data integration management	Operational data integration management can be developed through the implementation of systematic frameworks and tools that unify data from multiple sources. Automated integration pipelines, the standardisation of data formats and semantics, the resolution of inconsistencies, and ongoing monitoring support data accuracy, completeness and availability for decision-making and operational use (Gujar, 2025; Liu & Yoon, 2024).
Core digital service access management	Core digital service access management can be developed through the strengthening of identity and access management systems, the implementation of robust authentication mechanisms, and the reduction of access friction. Ensuring secure and seamless access across locations and devices enhances reliability, security and user experience for employees and external partners (Davis, 2025; Glöckler et al., 2024).

Reliable IT systems can be developed through automated monitoring and response mechanisms that enable early detection of issues and reduce downtime, thereby supporting operational stability and resilience (Misal, 2024). Operational data integration management reinforces this capability through structured integration frameworks, standardised data formats and continuous monitoring, ensuring data accuracy and availability (Gujar, 2025; Liu & Yoon, 2024). Core digital service access management complements these mechanisms

by strengthening identity and access management systems and implementing robust authentication, thereby enhancing security and user experience (Davis, 2025; Glöckler et al., 2024).

Data security and privacy depend on embedding protective and governance mechanisms into organisational routines (table 30). Sensitive data protection and management can be developed through continuous monitoring, intrusion detection and regular security awareness training (Cavusoglu et al., 2005; Khando et al., 2021). Data regulatory compliance management requires the integration of regulatory requirements into structured data governance and ongoing audits (Adebayo et al., 2024). User access and permission management strengthens security through role-based access control and regular access reviews (Sandhu et al., 1996).

Table 30: Practical guidance for data security and privacy

Characteristic	Guidance for improvement
Sensitive data protection & management	Sensitive data protection and management can be developed through the implementation of continuous monitoring and intrusion detection mechanisms, complemented by regular employee security awareness training (Cavusoglu et al., 2005; Khando et al., 2021).
Data regulatory compliance management	Data regulatory compliance management can be developed by embedding regulatory requirements into structured data governance processes and continuously monitoring compliance through audits and control mechanisms (Adebayo et al., 2024).
User access & permission management	User access and permission management can be developed through the implementation of role-based access control models, supported by regular access reviews to ensure that permissions remain aligned with user responsibilities and security requirements (Sandhu et al., 1996).

Data exchange, interoperability, and compatibility is strengthened through technical standardisation and coordinated workflows (table 31). System compatibility can be developed via interoperable architectures and standardised data models that enable seamless data exchange (Gujar, 2025; Spaeth & Niederhöfer, 2022). Cross-actor workflow integration further enhances interoperability by harmonising inter-organisational processes using shared standards and digital integration mechanisms (Jung et al., 2006).

Table 31: Practical guidance for data exchange, interoperability, and compatibility

Characteristic	Guidance for improvement
System compatibility	System compatibility can be developed through the adoption of standardised data models and interoperable system architectures, such as service-oriented or API-based approaches, to enable seamless data exchange across organisational and ecosystem boundaries (Gujar, 2025; Spaeth & Niederhöfer, 2022).
Cross-actor workflow integration	Cross-actor workflow integration can be developed through the harmonisation of inter-organisational processes and the synchronisation of workflows using shared process standards and digital integration mechanisms (Jung et al., 2006).

Platform utilisation is reinforced when employees perceive digital platforms as useful and are motivated to adopt them (table 32). Employee platform participation can be enhanced through structured digital adoption and training tools (Handrich & Otterbach, 2024). Employee engagement and motivation are strengthened by fostering positive attitudes towards digital transformation and perceived digital readiness (Abhari, 2025).

Table 32: Practical guidance for platform utilisation

Characteristic	Guidance for improvement
Employee platform participation	Employee platform participation can be developed through the implementation of structured digital adoption and training tools that enhance perceived usefulness and ease of use, thereby increasing employees' intention to integrate platform-based systems into their daily work practices (Handrich & Otterbach, 2024).
Employee engagement & motivation	Employee engagement and motivation can be developed by fostering positive attitudes towards digital transformation and enhancing perceived digital readiness, as favourable predispositions towards digitalisation increase employees' willingness to participate in digital initiatives (Abhari, 2025).

The **data quality management** capability relies on continuous monitoring and structured performance evaluation (table 33). Real-time operational data monitoring enables automated detection of data issues, supporting accuracy and timeliness (Peixoto et al., 2025). Performance and KPI tracking enhances transparency through standardised indicators and real-time dashboards, facilitating informed decision-making (Singh et al., 2023).

Table 33: Practical guidance for data quality management

Characteristic	Guidance for improvement
Real-time operational data monitoring	Real-time operational data monitoring can be developed through the deployment of streaming data quality metrics and continuous assessment frameworks that enable automated detection and evaluation of data issues, supporting data accuracy, consistency and timeliness for effective decision-making (Peixoto et al., 2025).
Performance & KPI tracking	Performance and KPI tracking can be developed through the adoption of standardised indicators and real-time data architectures that integrate operational data streams into dashboards. This enables earlier detection of trends, anomalies and performance deviations, supporting faster and more informed decision-making (Singh et al., 2023).

Standardised digital processes and automation capability is strengthened through the identification of repetitive tasks and the introduction of automation solutions (table 34). Formalised processes and embedded automation technologies reduce variability and enhance efficiency and scalability (Moreira et al., 2024).

Table 34: Practical guidance for standardised digital processes and automation

Characteristic	Guidance for improvement
Process standardisation and automation	Process standardisation and automation can be developed through the systematic identification of repetitive and manual activities and the introduction of appropriate digital automation solutions. The formalisation of processes and the embedding of automation technologies into routine operations reduce variability, improve consistency, and enhance efficiency and scalability as digitalisation progresses (Moreira et al., 2024).

4.2.4 Organisational Capabilities

The **Sustainability** capability requires integrating environmental considerations into decision-making (table 35). Performance transparency can be developed through standardised emission measurement and real-time monitoring (Grant, 2023). Sustainability processes and tools are reinforced through formalised environmental management systems (BSI, 2015; Xia et al., 2022). Sustainability preferences can be operationalised by embedding environmental criteria into planning and optimisation models (Dekker et al., 2011; Grant, 2023).

Table 35: Practical guidance for sustainability

Characteristic	Guidance for improvement
Performance transparency	Performance transparency can be developed through the systematic measurement of logistics-related emissions using standardised indicators and the integration of real-time operational data into decision-support systems. This enables consistent monitoring and comparison of performance across transport activities (Grant, 2023).
Sustainability processes and tools	Sustainability processes and tools can be developed through the formalisation of environmental management procedures and the embedding of digital monitoring tools into operational planning, supporting consistent execution and continuous improvement (BSI, 2015; Xia et al., 2022).
Sustainability preferences	Sustainability preferences can be operationalised by explicitly defining environmental criteria for asset selection and routing decisions and systematically integrating these criteria into transport planning and optimisation processes (Dekker et al., 2011; Grant, 2023).

Regulatory, risk, and compliance is strengthened by embedding legal and risk management requirements into operational workflows (table 36). Process regulatory compliance management relies on continuous monitoring (Aven, 2020; Remmerbach & Krumme, 2020). Risk identification and prioritisation are developed through structured assessment frameworks (Hopkin, 2017), while implementation verification ensures effective controls (Alfina & Utama, 2025). Compliance coordination requires clearly defined roles and governance structures (ISO, 2021; Remmerbach & Krumme, 2020).

Table 36: Practical guidance for regulatory, risk, and compliance

Characteristic	Guidance for improvement
Process regulatory compliance management	Process regulatory compliance management can be developed through the systematic embedding of legal and regulatory requirements into operational workflows and the establishment of continuous monitoring mechanisms to support proactive compliance (Aven, 2020; Remmerbach & Krumme, 2020).
Risk identification and prioritisation	Risk identification and prioritisation can be developed through the application of structured risk assessment frameworks that systematically identify, evaluate and rank operational and IT-related risks, enabling proactive mitigation (Hopkin, 2017).
Implementation verification	Implementation verification can be developed through the establishment of regular, documented audits and control mechanisms to ensure that compliance and risk mitigation measures are effectively implemented and maintained (Alfina & Utama, 2025).
Compliance coordination	Compliance coordination can be developed through the clear definition of roles and responsibilities and the alignment of compliance processes across internal units and external partners, supported by formal governance structures (ISO, 2021; Remmerbach & Krumme, 2020).

Strengthening **operational management and domain knowledge** requires alignment between strategy, processes and data governance (table 37). Strategic goal alignment links objectives with operational indicators (Hammer, 2015; Kaplan & Norton, 2006), while project management ensures structured execution (PMI, 2021). Responsibilities and processes are reinforced through clear process ownership and continuous improvement (Hammer, 2015). Data standardisation (Otto, 2011), structured information architectures (Henderson & Earley, 2017) and data completeness mechanisms (Batini & Scannapieco, 2016) enhance data reliability. Detection, resolution and accountability mechanisms ensure structured responses to deviations (Costa et al., 2024; Sicard, 2019; Zhang et al., 2022).

Table 37: Practical guidance for operational management and domain knowledge

Characteristic	Guidance for improvement
Strategic goal alignment	Strategic goal alignment can be developed by translating strategic objectives into operational targets and performance indicators and systematically linking planning and execution through integrated management systems (Hammer, 2015; Kaplan & Norton, 2006).
Project management	Project management can be developed through the application of standardised project management frameworks with clearly defined roles, milestones and monitoring mechanisms to ensure consistent execution across initiatives (PMI, 2021).
Responsibilities and processes	Responsibilities and processes can be developed through the appointment of dedicated process owners accountable for end-to-end process performance, quality assurance and knowledge management. Clearly defined process designs specifying tasks, workflows and performance standards enable systematic monitoring, learning, the sharing of best practices, the identification of deviations and continuous improvement, supporting integrated execution, accountability and sustained organisational performance (Hammer, 2015).
Data standardisation	Data standardisation can be developed through the definition of common data models, formats and definitions, and the enforcement of their consistent use across systems and organisational units (Otto, 2011).
Data structure	Data structure can be developed through the organisation of operational data within well-defined information architectures that support interoperability, accessibility and reuse across digital systems (Henderson & Earley, 2017).
Data completeness	Data completeness can be developed through the implementation of systematic data quality management practices that monitor, validate and correct missing or inconsistent operational data (Batini & Scannapieco, 2016).
Detection and assessment	Detection and assessment can be developed through the establishment of continuous monitoring mechanisms and structured evaluation procedures that enable early identification of deviations and assessment of their operational impact (Costa et al., 2024; Sicard, 2019; Zhang et al., 2022).
Resolution	Resolution can be developed through the standardisation of corrective action processes and their embedding into operational routines, supporting timely and consistent recovery from disruptions (Costa et al., 2024; Sicard, 2019; Zhang et al., 2022).
Accountability and process ownership	Accountability and process ownership can be developed through the clear assignment of decision rights and escalation responsibilities, ensuring that disruptions are managed consistently and transparently (Costa et al., 2024; Sicard, 2019; Zhang et al., 2022).

Holistic value logic is strengthened through ecosystem-oriented collaboration (table 38). Network participation enhances platform viability (Gawer & Cusumano, 2014), while value co-creation management enables coordinated collaboration (Ranjan & Read, 2016). Neutrality and equitable access assurance support trust and long-term stability through transparent governance (Bostoen, 2018; Ranjan & Read, 2016).

Table 38: Practical guidance for holistic value logic

Characteristic	Guidance for improvement
Network participation	Network participation can be developed through active engagement in platform ecosystems and a shift towards collaborative value co-creation with multiple partners, strengthening network effects and supporting long-term platform viability (Gawer & Cusumano, 2014).
Value co-creation management	Value co-creation management can be developed through the systematic coordination of shared resources, roles and capabilities with ecosystem partners, enabling structured collaboration and joint value creation beyond isolated or project-based initiatives (Ranjan & Read, 2016).
Neutrality and equitable access assurance	Neutrality and equitable access assurance can be developed through the implementation of transparent participation rules, the avoidance of preferential treatment, and systematic compliance monitoring. Stakeholder engagement in the definition and review of these practices supports trust and long-term platform stability (Bostoen, 2018; Ranjan & Read, 2016).

Organisational resilience is reinforced through structured preparedness and response mechanisms (table 39). Recovery planning can be developed through formal scenario-based planning and testing (Ambulkar et al., 2015; Duchek, 2020). Rapid disruption identification relies on real-time monitoring (Wu et al., 2025), while resilience is enhanced through redundancy and adaptive capacity (Duchek, 2020; Ponis & Koronis, 2012). Clear communication with partners ensures coordinated recovery actions (Can Saglam et al., 2022).

Table 39: Practical guidance for organisational resilience

Characteristic	Guidance for improvement
Create and implement recovery plans	The ability to create and implement recovery plans can be developed through the establishment of formal, scenario-based plans with clearly defined roles and actions, supported by regular testing and updating. This enables coordinated and effective responses that restore operations promptly during disruptions (Ambulkar et al., 2015; Duchek, 2020).
Quickly identify disruption location	The ability to quickly identify disruption locations can be developed through the implementation of real-time monitoring and analytics across operations, enabling the rapid detection of anomalies and the precise localisation of disruption sources to support timely and targeted responses (Wu et al., 2025).
Absorb disruption consequences	The ability to absorb disruption consequences can be developed by strengthening operational resilience through the build-up of redundancy, flexibility and adaptive capacity. Measures such as cross-training staff, maintaining resource buffers and regularly testing contingency plans support the continuity of core operations and services during disruptions (Duchek, 2020; Ponis & Koronis, 2012).
Communicate solutions to partners	Communication of solutions to partners can be developed through clear, timely and high-quality communication practices that support coordinated action during disruptions. Open channels for sharing response plans and updates, the use of reliable tools for real-time information exchange, and the delivery of consistent, concise and actionable messages facilitate rapid understanding and adoption of recovery actions across the network (Can Saglam et al., 2022).

5 Fit4ReMuNet Online Tool

The following chapter describes the structure and functionality of the Fit4ReMuNet online tool, which will be developed and published in the next phase of the project. Building on the methodological and theoretical foundations established in the preceding chapters, in particular the transformation approach outlined in chapter 4, the focus now shifts to the practical implementation of the assessment and guidance concept.

Fit4ReMuNet is an open access online assessment tool that supports organisations in evaluating their readiness to participate in the ReMuNet ecosystem. The Fit4ReMuNet tool is neither a prerequisite nor an exclusion criterion for participation in the ReMuNet ecosystem or its platform. Rather, it serves as a supporting instrument intended to assist organisations, particularly small and medium-sized enterprises, in identifying development needs and strengthening relevant capabilities to make effective use of ReMuNet services and platform benefits.

The tool does not require the provision of personal data. All information entered by users is processed solely for the purpose of conducting the assessment and generating the final report and is not stored beyond this process. Consequently, while users can navigate forwards and backwards between pages, no persistent save function is provided.

Throughout the Fit4ReMuNet tool, Back and Next buttons are available on each page, allowing users to navigate between the different stages of the assessment and to review or adjust their inputs at any time.

In accordance with the Fit4ReMuNet transformation methodology, the tool integrates two core elements: a readiness assessment for ReMuNet and practical guidance for transformation. The readiness assessment consolidates the results of a role-specific influence analysis. Building on these results, the tool provides structured guidance to support organisations in their further development towards participation in the ReMuNet ecosystem.

This chapter is structured as a user journey that follows the overall logic of the Fit4ReMuNet online tool (figure 15). The process begins with a landing page providing general information, followed by the identification of the organisation's intended user type within the ReMuNet ecosystem. The actual assessment starts with the readiness assessment page, where organisations evaluate their capabilities and maturity levels. Based on these inputs, subsequent views present the assessment results, including the visualisation of readiness and relevance as well as identified improvement potentials, which are further structured within a development roadmap. The mock-ups shown represent possible visualisations, which may differ from the technical implementation.

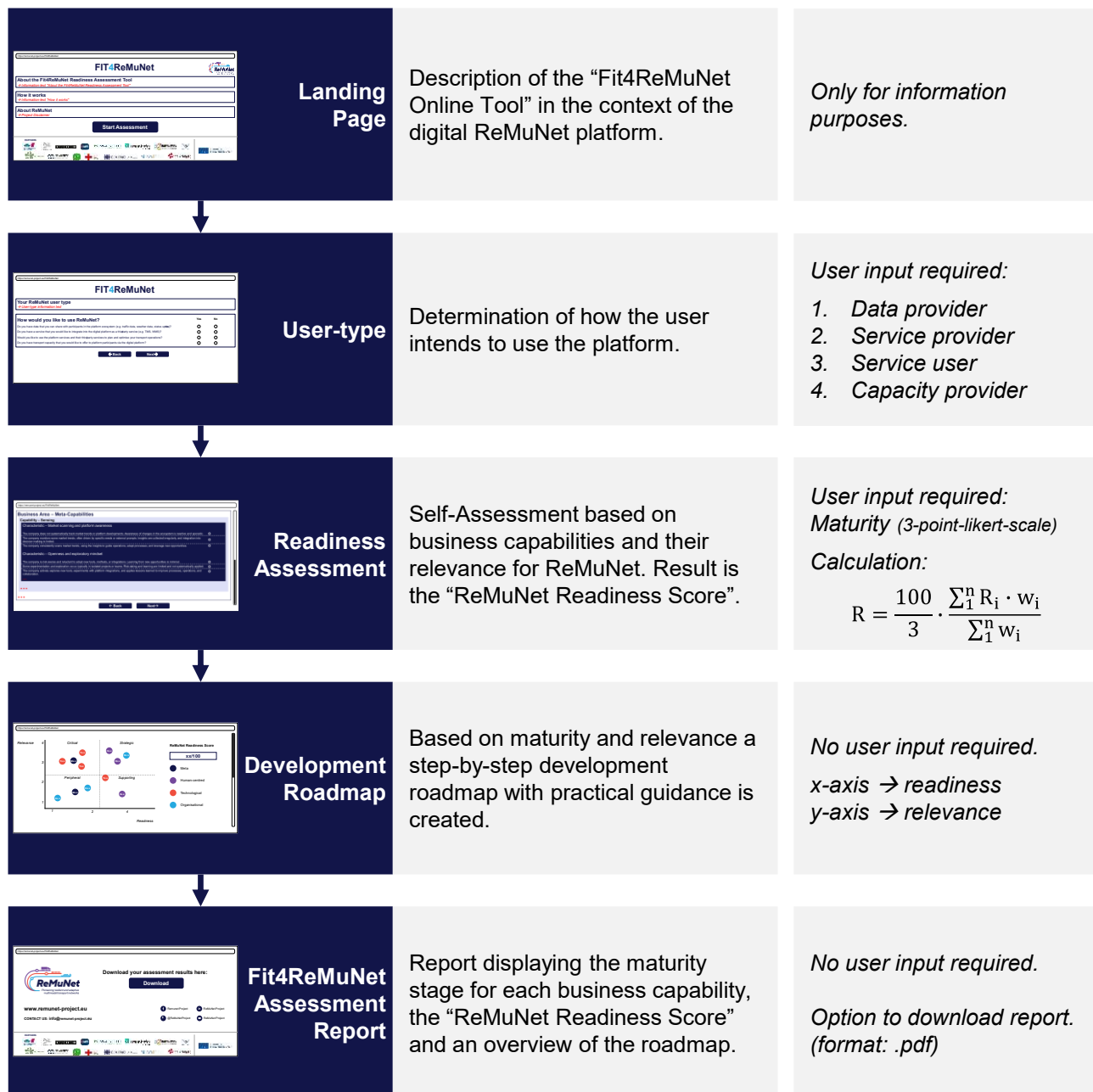


Figure 15: Fit4ReMuNet online tool – Flow chart (own illustration)

5.1 Readiness Assessment

Based on the methodological description in chapter 4.1, this subchapter describes the functional and visual implementation of the readiness assessment in the Fit4ReMuNet online tool.

5.1.1 Landing Page

When users access the Fit4ReMuNet tool, they are initially presented with a landing page that provides general information about the online tool and the broader ReMuNet project (figure 16). The page serves an informational purpose only and does not require any user input at this stage.

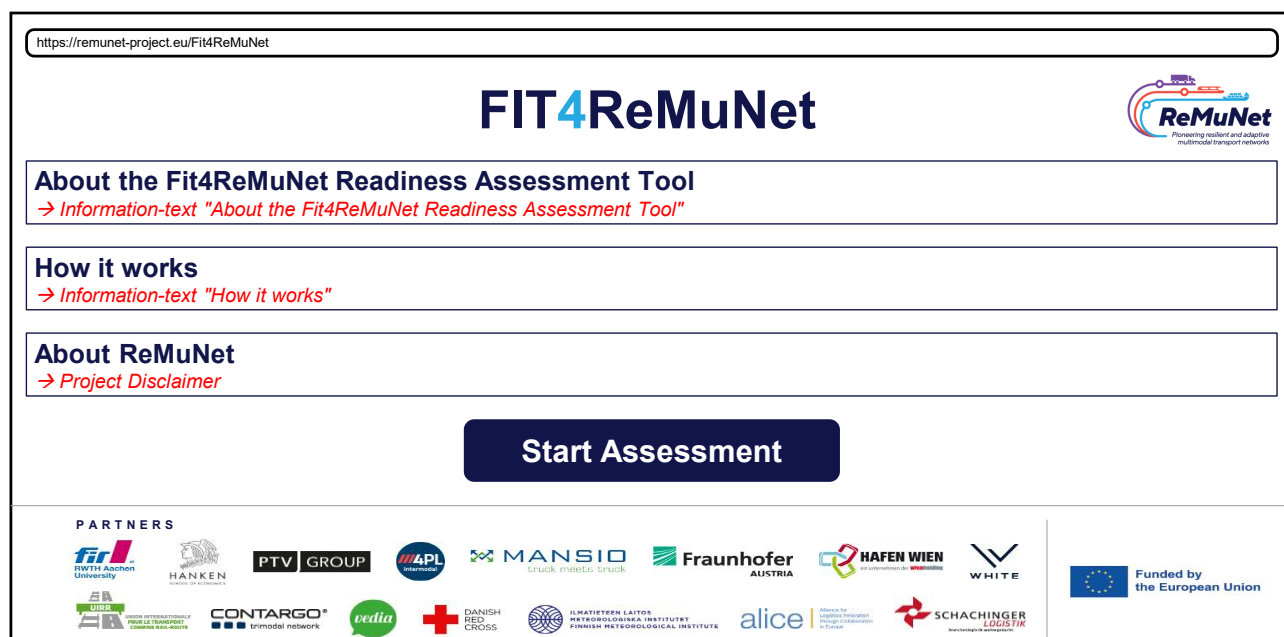


Figure 16: Fit4ReMuNet online tool – Landing page (own illustration)

Table 40 provides the contents for the informational texts displayed on the landing page as visualised in figure 16.

Table 40: Fit4ReMuNet online tool – informational texts landing page

Information-text ‘About the Fit4ReMuNet Readiness Assessment Tool’

The Fit4ReMuNet Readiness Assessment Tool evaluates a company's maturity with regard to integrating ReMuNet and participating in its digital platform ecosystem. Based on the maturity of the relevant business capabilities, this tool calculates readiness for ReMuNet and proposes an individual transformation roadmap for developing the necessary capabilities.

The scope of this tool is limited to the ReMuNet ecosystem. It should be under-stood as a tool to help gain an overview and obtain suggestions for the development of business capabilities relevant to ReMuNet.

Further information on the ‘Fit4ReMuNet transformation methodology’ can be found in the ReMuNet Deliverable 3.5, which is available at <https://remunet-project.eu/deliverables/>.

Information-text ‘How it works’

1. The readiness assessment determines the maturity of your company to integrate ReMuNet. The calculated maturity level is a guideline value and does not rule out a participation in the ReMuNet ecosystem. It is much more of an aid to identifying the business capabilities that should be improved to use the digital platform and its functions as effectively as possible. You will need to indicate your individual readiness based on the characteristics of the listed capabilities from 1 (low maturity) to 3 (high maturity).
2. Based on your readiness and the relevance of the characteristics for ReMuNet, the tool calculates a matrix that structures the characteristics into four sectors: ‘Critical’, ‘Peripheral’, ‘Strategic’ and ‘Supportive’. Each sector resembles a priority of development for the different business capabilities and highlights strengths and weaknesses. In addition, recommendations are made for the development of individual characteristics and ranked according to the sector in which the characteristic occurs.
3. At the end of the tool, you have the option to export a report with a detailed overview of your readiness assessment results and the resulting transformation roadmap.

Information-text 'About ReMuNet'

ReMuNet identifies and signals disruptive events and assesses their impact on multimodal transport corridors. It reacts quickly and seamlessly upon disruptive events in real-time. It supports TMS providers to improve route planning resilience. ReMuNet communicates alternative, pre-defined, multimodal transport routes to logistics operators and subsequently to truck drivers, locomotive drivers and barge captains. Through this, it enables a faster and adaptive multimodal network response. ReMuNet orchestrates route utilisation, suggests transshipment points and optimises capacity allocation, minimising damage and shortening the recovery time. What is ReMuNet's core objective? As trailblazer for the Physical Internet, ReMuNet pursues the vision to enable and incentivise synchro-modal relay transport on European rail, road, and inland waterways to increase the holistic net-work resilience. It significantly reduces emissions and boosts freight transport corridor efficiency in case of disruptive events. stakeholders to ensure Europe-wide practicability and acceptance. ReMuNet is funded by the European Union under GA number 101104072.

Coordinator: FIR an der RWTH Aachen

5.1.2 User Type Selection

After proceeding from the landing page, users are directed to a page that determines the role in which the organisation intends to participate in the ReMuNet ecosystem.



https://remunet-project.eu/Fit4ReMuNet

FIT4ReMuNet

Your ReMuNet user type
→ *User-type information text*

How would you like to use ReMuNet?	Yes	No
Do you have data that you can share with participants in the platform ecosystem (e.g. traffic data, weather data, status updates)?	☐	☐
Do you have a service that you would like to integrate into the digital platform as a third-party service (e.g. TMS, WMS)?	☐	☐
Would you like to use the platform services and their third-party services to plan and optimise your transport operations?	☐	☐
Do you have transport capacity that you would like to offer to platform participants via the digital platform?	☐	☐

← Back
Next →

Figure 17: Fit4ReMuNet online tool – User type selection (own illustration)

Table 41 provides information on the ReMuNet user type based on the descriptions in chapter 2.3.3.

Table 41: Fit4ReMuNet online tool - information text 'User-type'

Information-text 'User-type'

The readiness to integrate ReMuNet depends on how you want to use the platform. The platform comprises four types of users: 'data providers', 'service providers', 'service users' and 'capacity providers'. Please use the following questions to indicate which type you belong to. It is possible to take on multiple roles.

As described in chapters 2.3.3 and 4.1.2, the readiness assessment depends on the intended way of using the digital ReMuNet platform. This short questionnaire aims to identify the specific user-type of the user of the tool. Each user type is assigned a question regarding platform usage. It is possible to answer several questions in the affirmative:

Data provider:

Do you have data that you can share with participants in the platform ecosystem (e.g. traffic data, weather data, status updates)?

Service provider:

Do you have a service that you would like to integrate into the digital platform as a third-party service (e.g. TMS, WMS)?

Service user:

Would you like to use the platform services and their third-party services to plan and optimise your transport operations?

Capacity provider:

Do you have transport capacity that you would like to offer to platform participants via the digital platform?

5.1.3 Self-Assessment

On the following page, the actual readiness assessment is carried out. This page constitutes the central element of the assessment and forms the basis for the evaluation of readiness for ReMuNet.

The page is structured according to the hierarchical dimensions of the ReMuNet business capability map, as described in chapter 3 (figure 18).

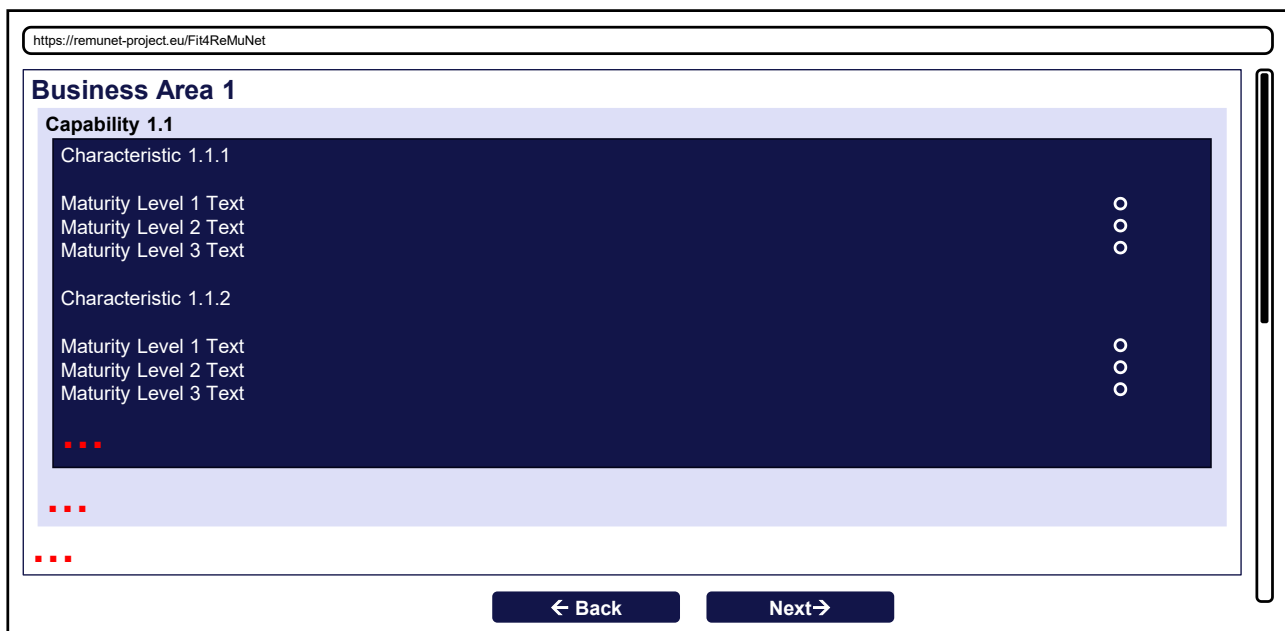


Figure 18: Fit4ReMuNet online tool – Self assessment (own illustration)

For each capability, predefined maturity levels are displayed in accordance with the framework introduced in Chapter 3. Users select the level that best reflects their current situation. Short explanatory texts clarify the meaning of each level and reduce ambiguity in interpretation. Limiting the selection to one maturity level per capability ensures consistency in the

assessment and allows the results to be aggregated in a coherent manner across the different business areas.

The content of this page is displayed in a role-specific manner. Based on the previously identified user type(s), only those business areas, capabilities, and characteristics that are relevant to the organisation's intended role within the ReMuNet ecosystem are shown. Given the potentially large number of capabilities, the page allows for vertical scrolling, enabling users to review and complete the assessment step by step.

5.2 Practical Guidance for Transformation

The practical guidance for transformation evaluates the results of the readiness assessment and puts them into context based on the descriptions in chapter 4.2. Based on the maturity and relevance of each capability and its characteristics, a matrix is visualised and a transformation road map is derived. The following sections describe and illustrate the functionalities of the online tool regarding the practical guidance for transformation.

5.2.1 Matrix and Transformation Roadmap

The first section of the practical guidance for transformation features an assessment matrix and the ReMuNet readiness score (figure 19).

The assessment matrix visualises the readiness assessment results along two dimensions: readiness for each capability's characteristics on the horizontal axis and relevance for ReMuNet on the vertical axis. Based on the combination of these dimensions, four sectors are distinguished, reflecting different constellations of readiness and relevance and indicating varying degrees of development priority: critical, peripheral, strategic, and supporting.

Within the matrix, individual characteristics are displayed rather than the capabilities themselves. Each characteristic is assigned an index to ensure a clear reference to its corresponding capability. The characteristics are colour-coded according to the defined business areas. The assessment matrix offers a quick overview of business areas that should be focused on when developing a company's business capabilities depending on the sector the characteristics are in.

The ReMuNet score provides a consolidated indication of the organisation's current level of readiness and is calculated using the following formula:

$$R = \frac{100}{3} \cdot \frac{\sum_1^n R_i \times w_i}{\sum_1^n w_i}$$

where R_i denotes the maturity level of a characteristic and w_i its respective relevance factor. The formula represents a weighted average across all assessed characteristics, normalised to a scale of 0 to 100.

The score serves as a general orientation value. It is not interpreted further within the tool and does not constitute a prerequisite or exclusion criterion for participation in the ReMuNet ecosystem. Its function is limited to providing a concise summary of the assessment results and could be expanded to include additional purposes in future tool enhancements.

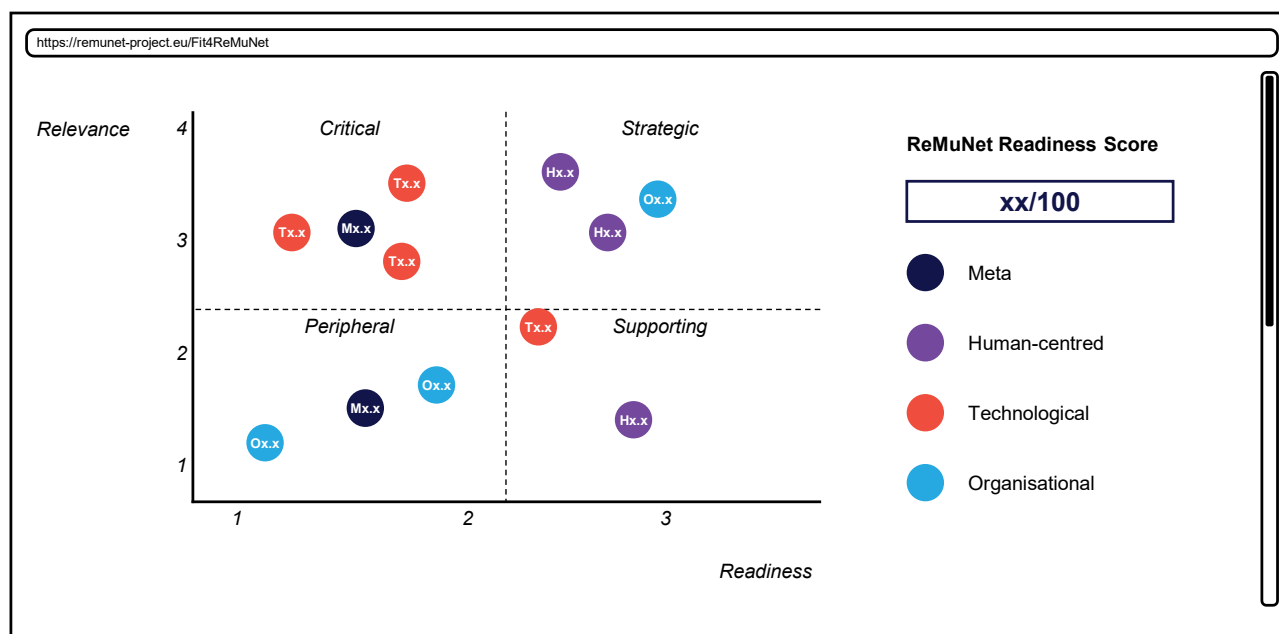


Figure 19: Fit4ReMuNet online tool – Matrix (own illustration)

Further down the page, the four matrix areas are presented again in a structured list (figure 20). Characteristics are grouped according to their position within the matrix's sectors and displayed using the same indices and colour scheme. This arrangement allows users to identify areas requiring attention, particularly where high relevance coincides with lower readiness.

For each characteristic, specific improvement measures are provided. The conceptual basis and derivation of these measures are described in Section 4.2. Within the online tool, they are presented in condensed form for practical application. Measures relating to characteristics of higher relevance contribute more substantially to an increase in overall readiness than those associated with areas of lower relevance.

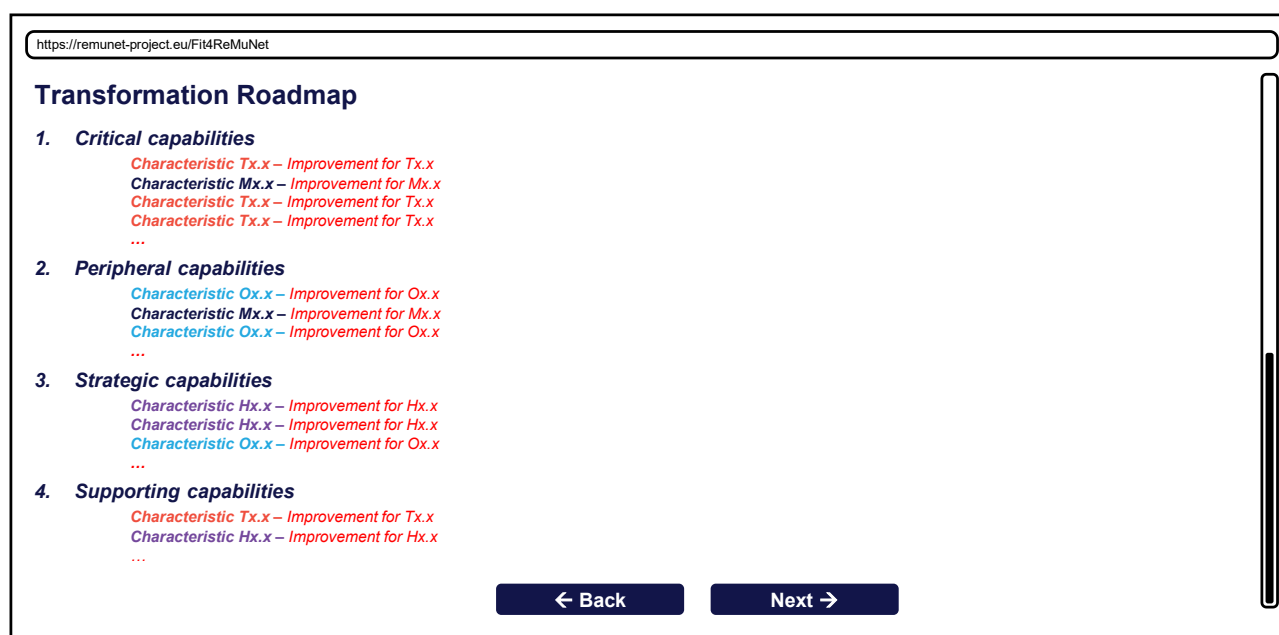


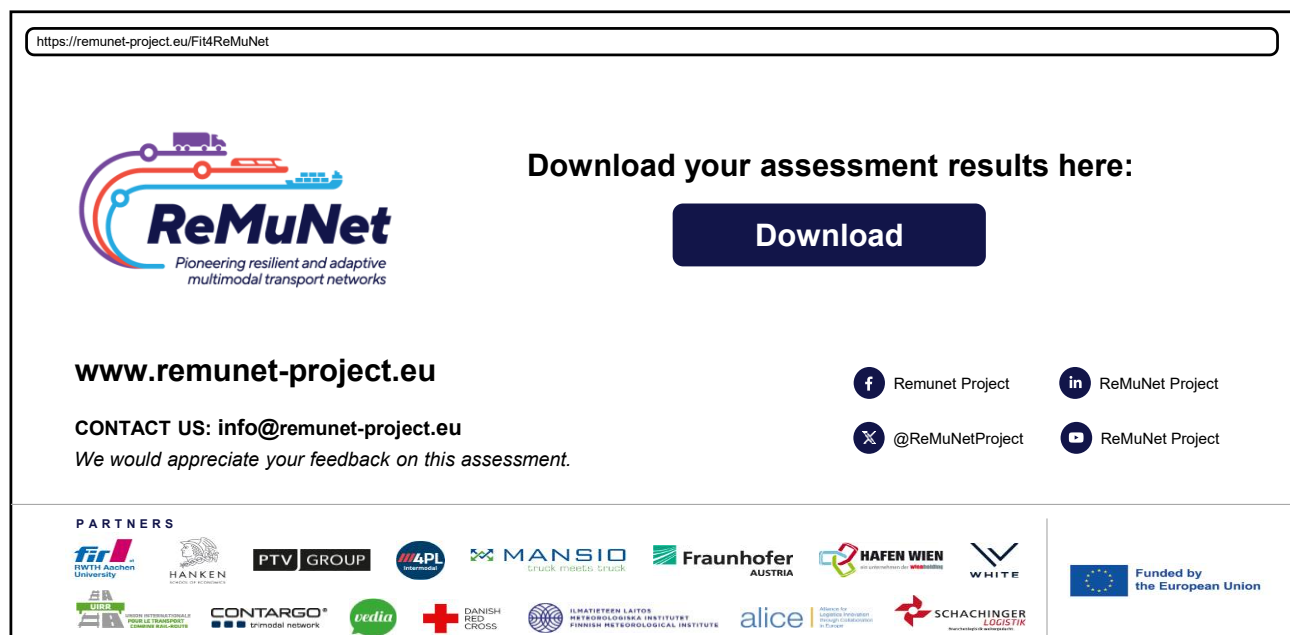
Figure 20: Fit4ReMuNet online tool – Transformation roadmap (own illustration)

5.2.2 Exit Page

The final page presents the ending of the Fit4ReMuNet readiness assessment (figure 21). On this page, users can download a consolidated report containing the results of the complete assessment.

The report follows a standardised structure and is provided in the Appendix (A3). It begins with an assessment summary, presented in tabular form. The table is organised by business area, capability, characteristic, description, selected maturity level, and the corresponding maturity description. This section provides a complete overview of the assessed capabilities and their assigned maturity levels. Below the summary table, the overall ReMuNet Readiness Score is displayed.

The report then includes the development roadmap, corresponding to the assessment matrix shown in figure 19. The positioning of characteristics within the matrix is presented, forming the basis for prioritisation. The characteristics are subsequently listed according to their classification within the matrix. The section on critical capabilities is presented first and includes a table structured by business area, capability, characteristic, and recommended improvement measures. The same structure is applied to the sections on peripheral, strategic, and supporting capabilities.



The screenshot shows the 'Exit Page' of the Fit4ReMuNet online tool. At the top, the URL <https://remunet-project.eu/Fit4ReMuNet> is displayed. The main content area features the ReMuNet logo on the left, which includes the text 'Pioneering resilient and adaptive multimodal transport networks'. To the right of the logo, the text 'Download your assessment results here:' is followed by a large blue 'Download' button. Below the logo, the website address www.remunet-project.eu is shown, along with contact information: 'CONTACT US: info@remunet-project.eu' and a request for feedback: 'We would appreciate your feedback on this assessment.' To the right of the contact information, there are four social media icons: Facebook (Remunet Project), LinkedIn (ReMuNet Project), Twitter (@ReMuNetProject), and YouTube (ReMuNet Project). At the bottom of the page, a 'PARTNERS' section displays logos for various organizations, including fir, HANKE, PTV GROUP, 4PL, MANSIO, Fraunhofer AUSTRIA, HAFEN WIEN, WHITE, URS, CONTARGO, vedia, DANISH RED CROSS, ELIATIEREN LAYON, HETEROLOGICAL INSTITUTE, FINNISH METEOROLOGICAL INSTITUTE, alice, and SCHACHINGER. On the far right, the European Union flag is shown with the text 'Funded by the European Union'.

Figure 21: Fit4ReMuNet online tool – Exit page (own illustration)

6 Conclusion and Outlook

The Deliverable 3.5 presents the Fit4ReMuNet transformation methodology. The methodology encompasses a readiness assessment and practical guidance for transformation for logistic companies to participate in the ReMuNet platform ecosystem. Additionally, functional and visual descriptions for an open access online assessment tool are described.

The methodology builds on existing frameworks like the 'Industrie 4.0 maturity index' by Schuh et al. (2017) and the 'Business Transformation Canvas' by Gudergan et al. (2022). It operationalises key insights from previous Deliverables of the ReMuNet project as well as a project related master thesis by Bareuther (2026).

The readiness assessment is designed to be role-specific depending on the user-type within the ReMuNet platform ecosystem as described in chapter 2.3.3. For each user-type business capability maps were derived. The business capability maps are structured in three hierarchical levels. The first level follows the HTO principle encompassing a meta dimension, a human-centred dimension, a technological dimension, and an organisational dimension. The second level includes relevant business capabilities for the participation in ReMuNet. A third level with characteristics detailing each capability ensures understanding and clarity. The maturity of each capability and its characteristics is evaluated with a three-point scale representing low, medium, and high readiness.

A role-specific gap analysis results in practical guidance for transformation. Based on the readiness scores from the assessment and the relevance of each capability to ReMuNet, a transformation roadmap with strategic development guidelines for each capability is provided.

The Deliverable is concluded by a functional and visual description of an open access online assessment tool operationalising the Fit4ReMuNet transformation methodology. The online assessment tool and its results represent assistance in developing business capabilities in relation to ReMuNet. Completing the assessment is not a criterion for participation in the ReMuNet platform ecosystem.

As its core value proposition states, "ReMuNet aims to be a digital, AI-powered, open and collaborative platform that strengthens the sustainability, efficiency and resilience of multimodal European freight transport networks against disruptive events" (Dicks et al., 2025a, p. 51). The platform has limited capabilities to achieve the stated goals at the network level. It depends on the participation of key actors and the availability of data. The methodology presented and the online tool to be developed are intended to provide another tool for developing and strengthening the core capabilities of efficiency, resilience, and sustainability of the multimodal freight transport ecosystem from within, to effectively exploit the potential of the digital platform.

The online tool developed provides the methodological basis for future development opportunities. Possible approaches for further development are described below.

The maturity of a capability is based on a three-point scale for each characteristic. The three-level assessment could be significantly improved by a more rigorous assessment, which

would lead to a better evaluation of one's own abilities and provide a clearer picture of the scope of transformation efforts required.

The assessment attempts to include all companies of different sizes and scopes in its design. Since the maturity of a company, particularly in terms of digitalisation and platform use, also depends on its own resources, the assessment could be improved if not only role-specific assessments, but also size-dependent assessments were carried out.

The readiness assessment considers relevance to ReMuNet and maturity of a capability's characteristics. The effort to develop a specific capability might be very different from company to company and directly impacts the prioritisation of capabilities in a transformation roadmap. Future extension of methodology and online tool should consider effort as a new variable next to relevance and maturity to improve the prioritisation of capabilities to be developed.

The calculated ReMuNet readiness score is only a rough general assessment of a company's maturity in relation to ReMuNet and its digital platform. The significance of the score in relation to different maturity levels and stage-dependent guidelines should be further developed in future extensions. Also, a minimum requirement based on the readiness score could be considered but should not restrict the platform's openness and fairness.

Finally, the effectiveness of the developed practical guidance to develop a company's business capabilities should be validated and verified in practice. This could include KPIs measuring a company's participation in the ReMuNet platform ecosystem to evaluate the improvements due to capability development based on the Fit4ReMuNet transformation methodology.

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Appendix

A1: ReMuNet Business Capability Map

META CAPABILITIES	TECHNOLOGICAL CAPABILITIES	ORGANISATIONAL CAPABILITIES	
Sensing	Digital infrastructure management	Sustainability	Holistic value logic
Market scanning and platform awareness	Reliable IT systems	Performance transparency	Network participation
Openness and exploratory mindset	Oper. data integration management	Sustainability processes and tools	Value co-creation management
Seizing	Core digital service access management	Sustainability preferences	Neutrality and equitable access assurance
Organisational agility	Data security and privacy	Regulatory, risk, and compliance	Organisational resilience
Resource sharing	Sensitive data protection & management	Process regulatory compliance management	Create and implement recovery plans
Transforming, reconfiguring, and renewal	Data regulatory compliance management	Risk identification and prioritisation	Quickly identify disruption location
Integration of new processes	User access & permission management	Implementation verification	Absorb disruption consequences
Innovation management	Data exchange, interoperability and compatibility	Compliance coordination	Communicate solutions to partners
BM adaptability and co-creation	System compatibility	Operational management and domain knowledge	
HUMAN-CENTRED CAPABILITIES	Cross-actor workflow integration	Strategic goal alignment	
Strategic direction and internal alignment	Platform utilisation	Project management	
Leadership clarity and commitment	Employee platform participation	Responsibilities and processes	
Cross-level alignment and trust	Employee engagement & motivation	Data standardisation	
Definition of own role within an ecosystem	Data quality management	Data structure	
Partnering, collaboration, and platform mindset	Real-time operational data monitoring	Data completeness	
Trustful interaction with other stakeholders	Performance & KPI tracking	Detection and assessment	
Openness to share data	Standardised digital processes and automation	Resolution	
Commitment to platform	Process standard. and automation	Accountability and process ownership	
Change management and communication			
Changing entrenched routines			
Communication of necessity of change			
Digital literacy			
Human digital expertise			

A2: Relevance of the Business Capabilities

Business Area	Capability	Characteristic	ID	Relevance (x/4)
Meta capabilities	Sensing	Market scanning and platform awareness	M1.1	3,00
		Openness and exploratory mindset	M1.2	3,13
	Seizing	Organisational agility	M2.1	2,75
		Resource sharing	M2.2	3,14
	Transforming, reconfiguring, renewal	Integration of new processes	M3.1	3,38
		Innovation management	M3.2	2,50
		Business model adaptability and co-creation	M3.3	2,88
Human-centred	Strategic direction and internal alignment	Leadership clarity and commitment	H1.1	2,50
		Crosslevel alignment and trust	H1.2	3,25
		Definition of own role within the platform ecosystem	H1.3	2,50
	Partnering, collaboration, platform mindset	Trustful interaction with other stakeholders	H2.1	3,75
		Openness to share data	H2.2	3,13
		Commitment to platform	H2.3	2,88
	Change management and communication	Changing entrenched routines	H3.1	2,88
		Communication of necessity of change	H3.2	3,00
	Digital literacy	Human digital expertise	H4.1	2,63
Techno-logical	Digital infrastructure management	Reliable IT systems	T1.1	3,50
		Operational data integration management	T1.2	3,38
		Core digital service access management	T1.3	3,00
	Data security and privacy	Sensitive data protection & management	T2.1	3,86
		Data regulatory compliance management	T2.2	3,88
		User access & permission management	T2.3	3,00
	Data exchange, interoperability and compatibility	System compatibility	T3.1	3,38
		Cross-actor workflow integration	T3.2	2,50
	Platform utilisation	Employee platform participation	T4.1	3,13
		Employee engagement & motivation	T4.2	2,88
	Data quality management	Real-time operational data monitoring	T5.1	2,88
		Performance & KPI tracking	T5.2	2,38
	Standardised digital processes and automation	Process standardisation and automation	T6.1	2,75

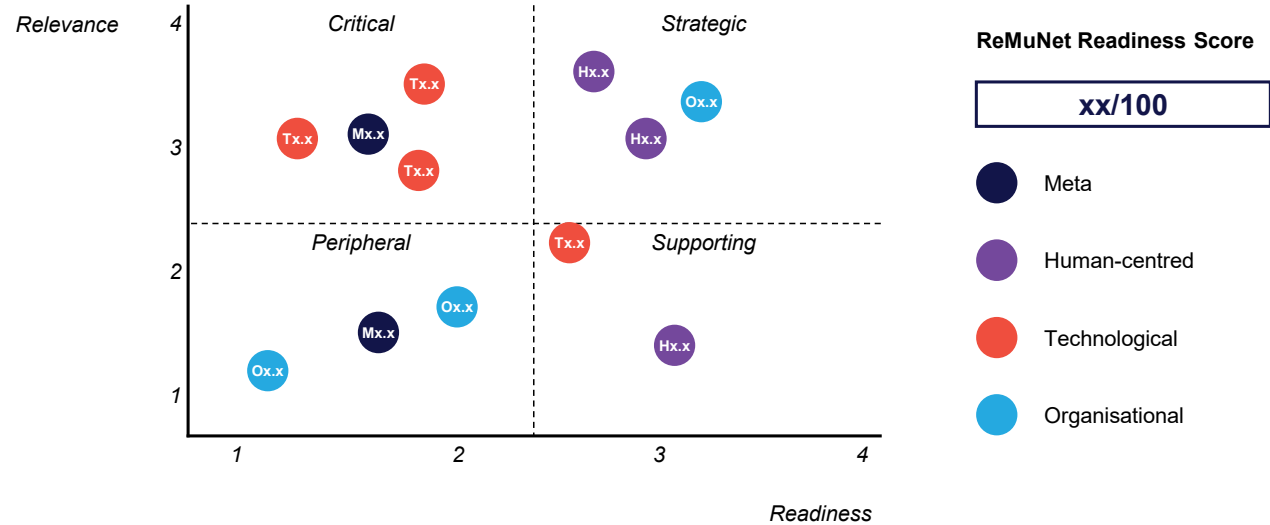
Business Area	Capability	Characteristic	ID	Relevance (x/4)
Organisational	Sustainability	Performance transparency	O1.1	2,63
		Sustainability processes and tools	O1.2	2,88
		Sustainability preferences	O1.3	2,88
	Regulatory, risk and compliance	Process regulatory compliance management	O2.1	3,29
		Risk identification and prioritisation	O2.2	3,43
		Implementation verification	O2.3	3,14
		Compliance coordination	O2.4	2,86
	Operational management and domain knowledge	Strategic goal alignment	O3.1	3,00
		Project management	O3.2	2,75
		Responsibilities and processes	O3.3	3,13
		Data standardisation	O3.4	3,75
		Data structure	O3.5	3,88
		Data completeness	O3.6	3,88
		Detection and assessment	O3.7	2,75
		Resolution	O3.8	3,00
		Accountability and process ownership	O3.9	3,75
	Holistic value logic	Network participation	O4.1	3,75
		Value co-creation management	O4.2	2,75
		Neutrality and equitable access assurance	O4.3	3,38
	Organisational resilience	Create and implement recovery plans	O5.1	3,38
		Quickly identify disruption location	O5.2	3,38
		Absorb disruption consequences	O5.3	3,13
		Communicate solutions to partners	O5.4	3,63

A3: Readiness Assessment Report

Assessment Summary

Business Area	Capability	Characteristic	Description	Level	Maturity Description
				X / 3	
				X / 3	
...					
REMUNET READINESS SCORE				XX / 100	

Development Roadmap



Critical capabilities

Business Area	Capability	Characteristic	Improvement

Peripheral capabilities

Business Area	Capability	Characteristic	Improvement

Strategic capabilities

Business Area	Capability	Characteristic	Improvement

Supporting capabilities

Business Area	Capability	Characteristic	Improvement

The project

ReMuNet identifies and signals disruptive events and assesses their impact on multimodal transport corridors. It reacts quickly and seamlessly upon disruptive events in real-time. It supports TMS providers to improve route planning resilience. ReMuNet communicates alternative, pre-defined, multimodal transport routes to logistics operators and subsequently to truck drivers, locomotive drivers and barge captains. Through this, it enables a faster and adaptive multimodal network response. ReMuNet orchestrates route utilization, suggests transshipment points and optimizes capacity allocation, minimizing damage and shortening the recovery time. What is ReMuNet's core objective? As trailblazer for the Physical Internet, ReMuNet pursues the vision to enable and incentivize synchro-modal relay transport on European rail, road, and inland waterways to increase the holistic network resilience. It significantly reduces emissions and boosts freight transport corridor efficiency in case of disruptive events. stakeholders to ensure Europe-wide practicability and acceptance.

Coordinator: FORSCHUNGSINSTITUT FUER RATIONALISIERUNG (FIR)

PARTNER		SHORT NAME
	FORSCHUNGSINSTITUT FUER RATIONALISIERUNG	FIR
	SVENSKA HANDELSHOGSKOLAN	HANKEN
	PTV PLANUNG TRANSPORT VERKEHR GmbH	PTV
	4PL INTERMODAL GMBH	INT
	MANSIO GMBH	MAN
	FRAUNHOFER AUSTRIA RESEARCH GMBH	FHA
	HAFEN WIEN GMBH	HWI
	WHITE RESEARCH SRL	WRE
	UNION INTERNATIONALE DES SOCIETES DE TRANSPORT COMBINE RAIL-ROUTE SCRL	UIR
	CONTARGO GMBH & CO KG	CON
	VEDIAFI OY	VED

 RØDE KORS	DANSK RODE KORS (DANISH RED CROSS)	DRC
	ILMATIETEEN LAITOS	FMI
 Alliance for Logistics Innovation through Collaboration in Europe	ALLIANCE FOR LOGISTICS INNOVATION THROUGH COLLABORATION IN EUROPE	ETP-ALICE
 SCHACHINGER LOGISTIK Branchenlogistik weitergedacht.	SCHACHINGER IMMOBILIEN UND DIENSTLEISTUNGS GMBH & CO OG	SCH

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