NON-STOP Webinar:
Digitalization Opportunities for Port Management

Digital Readiness Index for Ports

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Agenda

- Connect2SmallPorts Project
- Digital Readiness Index for Ports – DRIP
- First Results from Digital Audits
- Recommendations

Connect2SmallPorts Project

South Baltic Small Ports as Gateways towards Integrated Sustainable European Transport System & Blue Growth by Smart Connectivity Solutions

General Information:

- Total project budget: EUR 2,005,600.00
- ERDF financing: EUR 1,653,235.00
- Project implementation period: July 2018 to December 2021
- Involved countries: Germany, Sweden, Denmark, Poland, Lithuania, Estonia

Project Activities:

- Digital auditing in small & medium-sized ports (SMPs) of Baltic Sea Region (BSR)
- Elaboration of Blockchain & Internet-of-Things strategy for SMPs in BSR
- Evaluation of strategies & direct transfer of knowledge & experience within BSR & beyond

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Connect2SmallPorts Project – Five Pillars

Mobilise & integrate supply & demand side

Connect small ports' operators, authorities, transport infrastructure and ICT planners and managers to develop cluster strategy

Learn & Exchange

Integrate all actors to exchange, do peer learning, learn from core ports, be trained as well as apply best practices

Design & Confirm

Pilot improvement solutions designed in targeting technical and ITC interoperability, improved co-modality / hinterland accessibility as well as port management systems

Test & Future Transfer

Implementation of designed pilot solution, testing and transferring the results in the network

Sustain & Internationalise

Organisation of roadshows and sharing of best practices from the implemented pilots in the region; Developing potential transfer plans and internationalisation actions

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- **Digital Readiness Index for Ports – DRIP**
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Access to the DRIP self-assessment:
https://ww2.unipark.de/uc/Connect2SmallPorts-DRIP/

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Digital Readiness Index for Ports – DRIP

Dim.	Weight	Indicator (* = PPI)	Scale
Management	20%	Digitalisation Strategy	Implementation status: 1) Not existing 2) Pilot initiatives are planned 3) In development phase 4) Formulated and defined 5) Is in implementation phase 6) Is implemented
		Digital Business Model	
		Innovation Cooperation	
		Investments in Digitalisation	Share of digital investments, Proportion of employees with IT background: 1) x ≤ 10% 2) 10% < x ≤ 20% 3) 20% < x ≤ 30% 4) 30% < x ≤ 40% 5) 40% < x ≤ 50% 6) x > 50%
Human Capital	20%	IT Knowledge & Skills*	
		IT Capabilities*	Level of #capabilities, Scope of training, Adequacy of integrated communications, Accuracy of information regarding status of shipment, Provision of on-time of information, Compatibility of operating system, Degree of process adaptability in meeting customer requirements, Degree of IT security: 1) Very bad 2) Bad 3) Rather bad 4) Rather good 5) Good 6) Very good
		IT Training & Education Opportunities*	
Functionality (IT)	25%	Integrated Communications Infrastructure*	
		Information regarding Status of Shipment*	
		On-time of Information*	
		Operating System*	
		Processes*	
		Security	

Dim.	Weight	Indicator	Scale
Technology	30%	Smart ERP System	Degree of usage: 1) Technology/System not known 2) No use case available 3) Usage not planned 4) Usage is planned 5) In specific projects implemented 6) Comprehensive usage
		Smart WMS System	
		Smart PCS System (incl. Electronic SCM System)	
		Web-based Communication Platform	
		Mobile Data Access for Employees	
		Mobile Data Access for Customers	
		IoT (incl. M2M)	
		Cloud Computing	
		Localisation Technologies	
		Sensors	
		Big Data & Predictive Analytics	
		Blockchain & Smart Contracts	
		AI	
		Robotics	
		Drones	
		Autonomous Solutions – CPS	
		Digital Twinning, Augmented & Virtual Reality	
Information	5%	Personal Network	Degree of information procurement: 1) Very low 2) Low 3) Rather low 4) Rather high 5) High 6) Very high
		Printed Media	
		Internet	
		Social Media Resources	
		Fairs	
		Conferences	
		Associations	
		Scientific Institutions	

Table 1. Digital Auditing Tool for Ports
Source: Philipp et al. (2020) & Philipp (2020)

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Digital Readiness Index for Ports – DRIP

Dim.	Indicator	Valencia	Klaipeda	Karlskrona	Wismar	Stralsund	Mean
Technology	Smart ERP System	5	5	3	5	4	4.4
	Smart WMS System	5	5	3	5	4	4.4
	Smart PCS System (incl. Electronic SCM System)	6	6	4	5	3	4.8
	Web-based Communication Platform	6	6	5	5	3	5.0
	Mobile Data Access for Employees	6	6	5	5	4	5.2
	Mobile Data Access for Customers	6	5	4	5	3	4.6
	IoT (incl. M2M-Communication)	5	5	4	4	3	4.2
	Cloud Computing	5	4	4	5	3	4.2
	Localisation Technologies	5	6	4	4	4	4.6
	Sensors	6	5	3	4	4	4.4
	Big Data & Predictive Analytics	5	4	3	3	4	**3.8**
	Blockchain & Smart Contracts	4	4	4	4	3	**3.8**
	Artificial Intelligence	4	4	4	4	3	**3.8**
	Robotics	4	5	3	4	3	**3.8**
	Drones	4	4	4	4	4	4.0
	Autonomous Solutions – CPS	4	5	3	4	3	**3.8**
	Digital Twinning, Augmented & Virtual Reality	4	4	4	4	3	**3.8**
Results per Dim. (mean without weighting)	Management	5.5	5.5	1.5	2.3	2.0	
	Human Capital	4.9	4.4	3.1	2.9	4.0	
	Functionality (IT)	5.5	4.8	3.3	4.0	5.0	
	Technology	4.9	4.9	3.8	4.4	3.4	
	Information	5.1	4.3	4.1	3.5	5.1	
DRIP Score		**5.2**	**4.9**	**3.1**	**3.5**	**3.7**	

Access to the DRIP self-assessment: https://ww2.unipark.de/uc/Connect2SmallPorts-DRIP/

Table 2. DRIP Assessment
Source: Philipp (2020)

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Digital Readiness Index for Ports – DRIP

Class	Characteristics	Strategy description	DRIP Score
Smart port	• Completely connected via a communications network • Fully integrated with its environment + other ports & logistics actors around globe • Scheduling of transport modes is optimised • Real time cargo tracking with all players involved is enabled	• Merge physical & digital worlds • Steady improvement by continuous development of sustainable & innovative business cases	5.5 ≤ x ≤ 6.0
Developer port	• Port & hinterland connected = single digital environment • Advantages of previous stages extended to more stakeholders • Additional advantages expected in planning & scheduling • Port targets on continuous improvement	• Use digitalisation to create competitive advantage • Maintain competitive advantage by targeting on sustainable integration & ongoing enhancements • New businesses should be generated • Ecosystem partnerships must expand	4.5 ≤ x < 5.5
Adopter port	• Port & immediately involved organisations started to integrate their (information) systems • Small single digital environment will be created • Advantages as better coordination & reduction of waiting times for all transport modes achieved • Environment is perceived	• Prioritisation of customer relationships depending on own processes & service structure • Strategic decisions should be driven by analytics • Act on environmental changes & consider in decision making process • New business opportunities should be identifiable	3.5 ≤ x < 4.5
Monitor port	• Individual automations might emerge • Authority, operator & organisations in near proximity maintain own processes & databases + started to digitalise individually • Information & relevant data capture across specific nodes • Environment is monitored • Customers: statistics driven policy is driven	• Focus & improve adaptive capacities • Skills & knowledge should be enhanced (outsourcing strategy = alternative) • Change observer role to more pro-active role	2.5 ≤ x < 3.5
Analog port	• Automation do not exist • Has no or less knowledge about digitalisation • Do not know how to change or is not willing • Performs usually landlord functions • Customers: first-come-first-serve policy is usually applied	• Change attitude by getting awareness of benefit & added value from digital transformation • Start sensing & shaping	1.0 ≤ x < 2.5

Table 3. Strategic Graduation Model towards Smart Port Development
Source: Philipp (2020)

Access to the DRIP self-assessment: https://ww2.unipark.de/uc/Connect2SmallPorts-DRIP/

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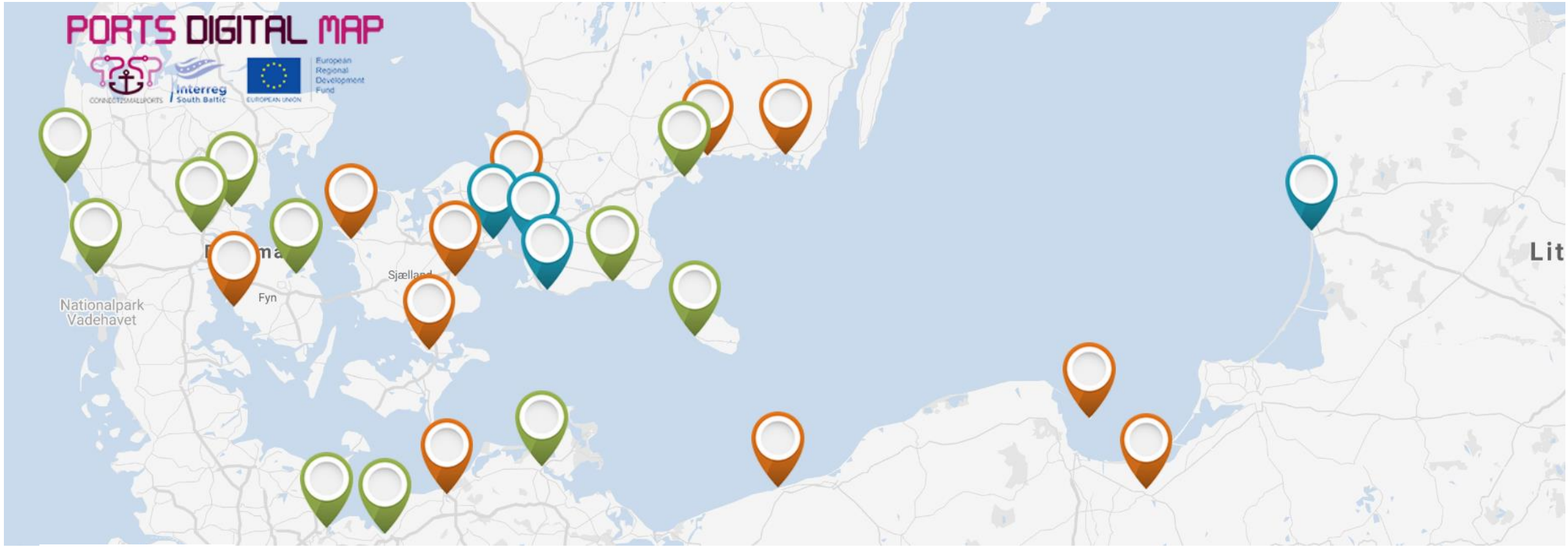
First Results from Digital Audits



Smart Port
Developer Port
Adopter Port
Monitor Port
Analog Port

Figure 1. Digital Port Map
Source: https://www.portsdigital.eu/

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First Results from Digital Audits

Management

- SMPs = low digital readiness in case of:
  - Digitalisation Strategy
  - Digital Business Model
  - Innovation Cooperation
  - Investments in Digitalisation

Human Capital

- Generally low digital readiness regarding IT Knowledge & Skills (Education)
- IT Capabilities, SMPs = deficits:
  - Automation technology
  - Data analytics
  - Development of / application of assistance systems
  - Non-technical skills such as systems thinking and process understanding

Functionality (IT)

- No grave backlogs
- Port representatives = satisfied with efficiency of their internal port processes in relation to functionality of their IT systems
- DRIP indicators collected in form of qualitative data → subjective evaluations?

Technology

- SMPs = low digital readiness in case of:
  - IoT
  - Big Data & Predictive Analytics
  - Blockchain
  - AI
  - Robotics
  - Autonomous Solutions – CPS
  - Digital Twinning, Augmented & Virtual Reality
  - Etc.

Information

- In case of SMPs, less used procurement sources are:
  - Social Media Resources
  - Fairs
  - Scientific Institutions

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First Results from Digital Audits

30 audited ports:

- No Analog port
- Great majority of Monitor ports = small ports / Non-TEN-T ports
- Great majority of Adopter ports = medium-sized ports / comprehensive ports
- All Developer ports = large ports / core ports
- No Smart Port

Statistical dependence between classification of digital readiness & TEN-T classification:

- Cramer‘s V → statistical significant relationship at 0.01 level
- The better the digital readiness class, the greater the importance of or larger the port

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Recommendations

- A sustainable development of ports, nowadays, significantly depends on the digital performance of ports
- SMPs should initiate or expand their digital measures and thus, enhance their digital performance, in order to improve their competiveness and impel their sustainable development
- SMPs have to take measures to overcome their backlogs concerning Human Capital and Management (Philipp, 2021):
  - Without a clear “Digitalisation Strategy”, “Innovation Cooperation” activities, “Investments in Digitalisation”, the necessary “IT Knowledge & Skills”, as well as “IT Capabilities”, the digital transformation will not be safeguarded
  - Functionality of IT processes and services can be ensured through an effective and appropriate deployment of digital technologies and solutions, both of which can only be efficaciously tackled if the basic conditions – regarding Human Capital and Management – are adequately met

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THANK YOU FOR YOUR ATTENTION

- Connect2SmallPorts. Digital Readiness Index for Ports – DRIP Online Survey. https://ww2.unipark.de/uc/Connect2SmallPorts-DRIP/
- Connect2SmallPorts. Project Webpage. https://connect2smallports.eu/
- Connect2SmallPorts. Digital Port Map. https://www.portsdigital.eu/
- Philipp, R., Gerlitz, L., & Moldabekova, A. (2020). Small and Medium-Sized Seaports on the Digital Track: Tracing Digitalisation across the South Baltic Region by Innovative Auditing Procedures. In: Kabashkin I., Yatskiv I., Prentkovskis O. (eds.) Reliability and Statistics in Transportation and Communication. RelStat 2019. Lecture Notes in Networks and Systems, vol 117, pp. 351–362. Springer, Cham. https://doi.org/10.1007/978-3-030-44610-9_35
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