

DIGINNO Policy White Paper

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Executive Summary

This Policy White Paper summarises policy related observations and findings from the work related to digital transformation of industry (WP2) and cross border e-services for businesses (WP3) carried out in the DIGINNO project. DIGINNO explores and promotes digitalisation and new ways of transnational collaboration in digital innovation and is implemented 2017-2020 among nine countries in the Baltic Sea Region (BSR), co-funded by Interreg BSR programme.

Even though the BSR countries generally are digitally advanced, the majority of small and medium enterprises (SME's) are still not using digital technologies. Also they are not necessarily aware of the opportunities and added value of an increased ICT uptake or digital transformation. Furthermore, many companies experience obstacles when they want to expand or trade across borders due to non-harmonized regulation and a lack of adequate cross-border e-services provided by public sector, the so-called G2B services.

Through joint analysis and interactive discussions between representatives of industry, government agencies and knowledge institutions the project partners have developed concrete tools and services that can support companies in their journey towards digital transformation and inspire public agencies to provide more efficient cross-border solutions for business.

The suggested solutions are accompanied by ideas and proposals to how policy – via transnational initiatives and actions - can support increased ICT uptake among SME's and improve cross-border interoperability in the BSR and beyond.

A multitude of policy measures and support programmes are provided at the EU and national level. However, there are indications of certain gaps and inadequacies when it comes to the effect for the companies of these policy instruments. The ideas and recommendations in the White Paper aim to address these gaps and inadequacies in the existing policy framework. They are developed and evaluated in discussions with companies, industry associations, ministries and innovation experts within and outside the project.

We hope the White Paper can inspire a more committed transnational approach based on policy agreements that are enabled and vitalised through practical experience.

Introduction

DIGINNO project

The countries in the Baltic Sea Region¹ (BSR) are frontrunners in many aspects of the digital economy. With a developed digital infrastructure, advanced public digital services and high skilled citizens and companies that are quick to embrace new technologies. Also, most BSR countries are small, open economies with strong innovation capacities and developed cross-border networks. All together a good starting point for this first EU macro-region to become digitally integrated and inspire a European Digital Single Market.

The BSR countries share digital potentials but also digital challenges. Challenges that may increase gaps and lead to fragmentation. But due to their similarities they are able to learn from each other and develop common solutions and common approaches to digitalisation.

The DIGINNO project² is an example of how methods for this transnational learning can be developed and tested. An example of how public and private partners can join forces across borders to explore how challenges for businesses related to digital transformation and lack of cross-border interoperability can be solved through collaboration based on concrete cases and commitments. DIGINNO provides an informal, bottom-up regional approach as a complement to the ongoing digital collaboration between the BSR countries and in the EU.

DIGINNO runs Oct 2017–Dec 2020 and is co-funded by EU's Interreg BSR programme. Project partners are national ministries and agencies, ICT industry associations and knowledge institutions in nine countries in the BSR; 14 full partners and 12 associated partners.

It is a main aim of the DIGINNO project to support institutional capacity development in industry and government institutions. It is done by involving these stakeholders in the concrete project activities and facilitating a strong dialogue with potential end-users throughout the project.

The Policy White Paper

This Policy White Paper is a part of this dialogue. As a main output of the project's WP4 (policy work) the Paper

- outlines challenges for an increased ICT uptake among SME's in the BSR and cross-border e-mobility for business
- suggests potential solutions through policy initiatives based on transnational learning and joint action

¹ In this context BSR countries are: Norway, Sweden, Finland, Denmark, Estonia, Latvia, Lithuania, Poland, Germany which are also the countries represented in DIGINNO

² <https://www.diginno-bsr.eu/>

The Paper is based on policy related implications of the work in WP2 and WP3, qualified through joint analysis and discussions with practitioners in SME's, industry associations and policymakers.

We hope the ideas in the White Paper can inspire the policy work at national and EU level as well as among industry associations and SME's in the BSR and beyond. We welcome comments and other views on the proposals in the paper.

The Policy White Paper is structured as follows:

Part A deals with policy related aspects of industry digitalisation in the BSR (DIGINNO WP2). After a short introduction (Chapters A1, A2) key challenges for SME digitalisation are introduced and discussed in Chapter A3. Chapter A4 presents trends and observations on ICT uptake and digital awareness from a business perspective, based on surveys and interviews with industry. Chapter A5 gives examples of policies introduced to support industry digitalisation, followed by Chapter A6 with ideas for how transnational policy solutions and joint initiatives can help solving the challenges.

Part B deals with policy related aspects of cross-border interoperability for business in the BSR (DIGINNO WP3). Chapter B1 introduces the landscape of cross-border digital services and the development of thematic showcases for e-services together with industry. Chapter B2 goes in depth with the specific challenges and potential solutions explored within each of the e-services. The existing policy framework and its unreleased potential is introduced in Chapter B3, followed by Chapter B4 with proposals and recommendations for policy initiatives that can improve cross-border interoperability and e-mobility for business in the BSR. Finally, Chapter B5 gives examples of new and upcoming BSR collaboration initiatives related to interoperability.

The Policy White Paper is elaborated by the WP4 team at Aalborg University Copenhagen:

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Section A: SME digitalisation in the BSR

A1. DIGINNO Work Package 2 (WP2)

WP2 of the DIGINNO project aims to increase the innovation capacity of industrial SMEs, ICT associations, industry associations, and public authorities in the area of industry digitalisation. Among main WP2 outputs are³:

- *A company digitalisation toolkit for SMEs*, to combine examples of best practices, a self-assessment tool to evaluate the level of digitalisation of the company and identify the gaps and a roadmap to further digitalisation.
- *An informal, active cross-sectoral BSR industry digitalisation community*, a network with the aim to raise knowledge and awareness of digitalisation success cases, opportunities and benefits. The community will enhance the capacity of industrial SMEs by providing a chance for peer-to-peer learning and exchange of experiences.

The project has a focus on institutional capacity building. WP2 aims at providing inputs for industry associations to use in serving their member companies and acting as their representatives and lobbyists on the policy level. They will gain new knowledge on how to approach industry digitalisation issues, how to motivate their member companies to prioritise digitalisation and how to better act as intermediaries connecting concrete business needs and policy-level discussions. The capacity of policymakers dealing with the national Industry 4.0 agendas is expected to *“rise by an exchange of experience and best practice, policy coordination, discussing and developing common positions”* (from DIGINNO application).

To support and complement the company digitalisation toolkit for SME’s a so-called Business Needs Assessment (BNA)⁴ has been conducted by Aalborg University Copenhagen (AAU): *“To make the project’s outcome practical the toolkit needs to be based on real business needs”* (DIGINNO application).

The policy proposals of WP2 are based on analysis of trends, observations and statements collected in the BNA elaboration and follow-up discussions with industry and policy representatives in selected BSR countries as well as two policy seminars with participation of all project partners and special invited guests.

³ <https://www.diginnoobsr.eu/wp2-outcomes>

⁴ [BNA](#)

A2. Industry digitalisation in the BSR

- *A diversified picture*

The most recent data on integration of digital technologies by business in the EU were collected just prior to the Covid 19 pandemic as part of the annual Digital Economy and Society Index (DESI), a composite index that summarises relevant indicators on Europe’s digital performance and tracks the evolution of EU Member States in digital competitiveness.

This data (DESI 2020)⁵ showed large variations depending on company size, sector and Member State. Enterprises were becoming more and more digitised, with large companies taking the lead. 39 % of large companies relied already on advanced cloud services and 33 % were using big data analytics. However, the vast majority of SMEs reported that they were not yet using these technologies, with only 17% of them using cloud services and only 12% big data analytics. Top EU performers in digitalisation of businesses are Ireland, Finland, Belgium and the Netherlands.

Within the BSR, the Nordic countries (excl. Norway) and Lithuania are top performers within integration of digital technologies as well as Digital Intensity Index, with Estonia and Germany in the middle and Latvia in the lower end (fig 1 and 2). This confirms a general West-East gap in the BSR to be bridged by transnational initiatives like DIGINNO.

However, there are nuances in this picture: *“...the gap between countries in the BSR is not constant. The picture is one of heterogeneity where different countries have strengths within different aspects of the digital economy”*⁶. This complementary between the countries gives way to mutual inspiration and valuable learnings across the borders. This is a key fundament of the DIGINNO project.



⁵ DESI 2020, Integration of digital technology, EC 2020 <https://ec.europa.eu/digital-single-market/en/integration-digital-technology>

⁶ “State of the Digital Region 2017” by think tank Top of Digital Europe, BDF and Microsoft 2017; <http://topofdigital.eu/publications/>

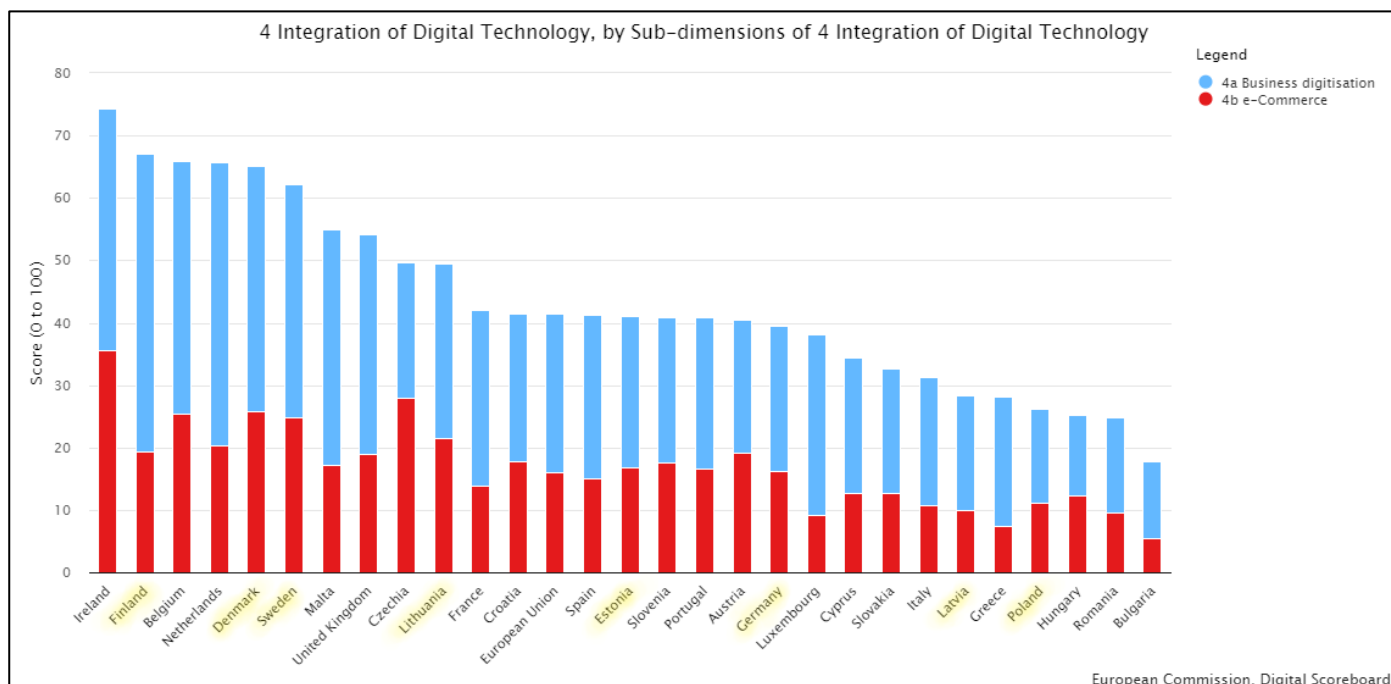


Fig 1. Source: DESI 2020

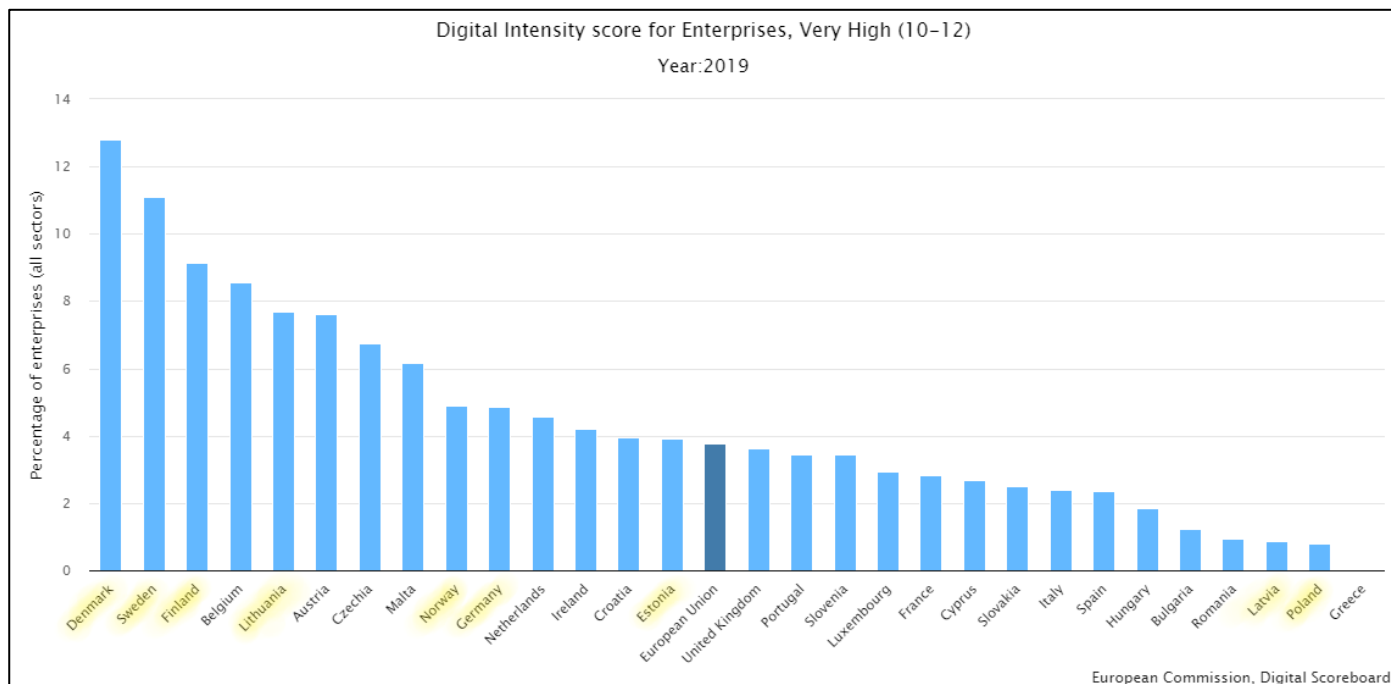


Fig 2. Source: DESI 2020

A3. Key challenges to SME digitalisation in the EU and the Baltic Sea Region (BSR)

- *An evaluation of challenges affecting or slowing SME digitisation in the EU and BSR based on data from DG GROW's Advanced Technology for Industry*

This chapter describes key challenges faced by SMEs in the digital transformation process. The insights from this chapter is based on evaluation made on data extracted from the European Commission DG Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) Advanced Technology for Industry portal. The aim of this chapter is to describe the digital transformation related challenges in the EU and the Nordic Baltic Region. In the next chapter, similar challenges identified via the activities within DIGINNO will be presented and discussed.

The descriptions presented in this chapter are based primarily on data graphs extracted from the ATI country indicator dashboard. The indicators provide an overview on the state of SME digitisation in the EU. The indicators are presented based on a set of parameters for evaluating SME digitisation. These parameters are modified from those of the previous Digital Transformation Monitor (DTM) which was the predecessor of the ATI. The DTM framework had two dimensions: (1) digital transformation enablers and (2) digital transformation outputs. The parameters for evaluating the enablers consisted of Digital infrastructure, Investments and access to finance, Supply and demand of digital skills, E-leadership, entrepreneurial culture. The outputs were: Integration of digital technology and Changes in the ICT start-up environment.

The DTM has been replaced by the Advanced Technologies for Industry (ATI). In the ATI the parameters for assessing digital transformation of SMEs now include technology generation, technology uptake, skills, investments, innovation, infrastructure, entrepreneurship, collaboration and Impacts. Based on these parameters, it is possible to assess the state of SME digitisation in Europe Readers are asked to consult the methodological report⁷ to gain more understanding on the methodology used by the ATI towards the gathering, aggregation and presentation of data.

Data from the ATI is supplemented with data from OECD.Stat and Eurostat. The purpose of using the ATI and the supplementary data sources in this report is not to compare the progress in SME digitisation in each EU member state. Rather the purpose is to identify problems and challenges facing SME digitalisation in the Baltic Sea Region (BSR). These challenges and problems are identified by comparing different data output from different ATI parameters. Inferences to the compared data output were made based on the observation of patterns between different data outputs from the data sources. The inferences on the observable patterns were also influenced by the experience and research of the developers of this report on SME digitalisation in Europe.

⁷ ATI has provided the methodology behind the data and graphs used in this section at [EU ATI 2020](#)

The chapter outline are as follows. Section 3.1 provides a description of Advanced technologies and how it relates to the digital technologies considered in DIGINNO. Section 3.2 describes the BSR SME digitisation challenges identified and patterns that led to the conclusions.

A 3.1 Advanced Technologies

Advanced technologies are basically advanced digital technologies that support SME digitisation. The ATI framework includes digital technologies used in advanced manufacturing; as well as Advanced material, Artificial Intelligence (AI), Augmented reality/Virtual reality, Big data, Blockchain, Connectivity, Cloud computing, IOT, Industrial Biotechnology, Micro and nano electronics, Mobility, Photonics, Robotics, and Security.

In DIGINNO, the view towards Advanced Technology is similar but with a minor difference. Every technology mentioned in the ATI except, industrial Biotechnology, Advanced material, Mobility, Micro and nanotechnologies are considered Advanced Technologies in DIGINNO. However, one could say that the Advanced Technologies considered in DIGINNO, such as Block chain, automation, augmented reality etc. are used in advanced manufacturing. Hence one could say that DIGINNO focus on aspects of advanced manufacturing.

Therefore, despite the minor differences in the views towards Advanced Technologies, the challenges identified in this chapter are within the same ecosystem as DIGINNO. Hence the challenges listed in this chapter will complement those in chapter A4.

A 3.2 Challenges to SME digitalisation in the BSR

During the evaluation of SME digitalisation in the BSR countries using the ATI framework, the following challenges facing SMEs were identified. These were:

- Lack of infrastructure
- Lack of skills or competences
- Lack of financial investment

The observations that led to the identification of the challenges are described next.

A 3.2.1 Lack of infrastructure

Infrastructure in this context refers the technological set-up, within the SME, needed to facilitate production and/or service delivery efficiency and scalability. The challenge as it pertains to the lack of infrastructure varies from country to country. In the BSR there seems to be some correlation between the local production of Advanced Technologies and its level of uptake on a national level.

The correlation is not observable in all EU member states. But the trend is observable in the BSR. This observation is based on the ATI data on the generation and uptake of Advanced Technologies.

Observation 1

Generally, as seen in fig. 1, Advanced Technologies are developed in all EU 27 countries.

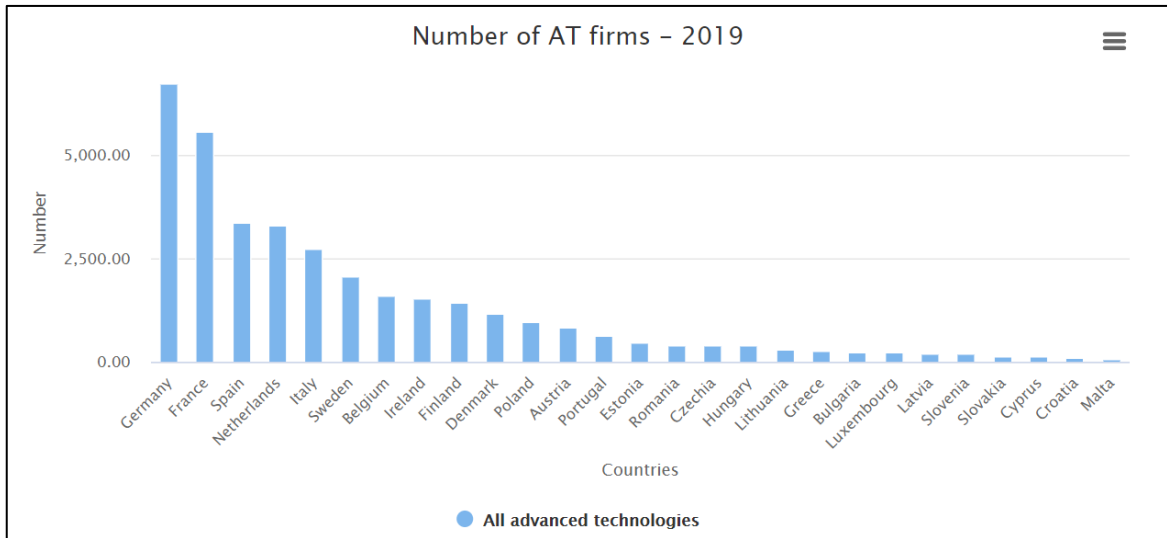


Fig 1. Source: [EU ATI 2020](#)

However, the number of companies producing the Advanced Technologies vary at the national level. The ATI uses the composite scoring approach to generate number of firms developing Advanced Technologies per country. The greater the number of AT firms, the greater the level of business activity warranting the use of Advanced Technologies in such a country. Seen in the figure above, there are countries with either a high or low number of Advanced Technology companies. It is not very clear, from the ATI, what could be the reason behind either the high or low level of activity in these countries.

If one examines the figure above, there is no generic direct correlation between either GDP or population to increase in the number of companies developing Advanced Technologies in the EU. For example, the respective population size of Denmark, Finland and Estonia are less than the respective population size of Romania, Czech Republic and Hungary. But there are more companies developing Advanced Technologies in the former than the latter. Although one could say that Denmark and Finland have a higher National GDP than Romania, Czech Republic and Hungary, it is difficult to follow through with it. That is because Romania and Czech Republic have a higher National GDP than Estonia. On the other hand, from a non-generic observation, one could say that there could be a correlation between the national GDP of Germany, France and Spain to the number of advanced technology firms in those countries.

Nevertheless, in the BSR, Sweden, Finland, Denmark and Poland have more companies producing these technologies than the Baltic countries. The companies producing these Advanced

Technologies in the BSR countries are less than the number of companies producing the same technologies in Germany (above 6704), France (5577), Spain (3364), Netherlands (3295), and Italy (2735). Among DIGINNO partner countries Sweden has the highest number of companies with 2073 companies followed by Finland (1449), Denmark (1161), Poland (967), Estonia (467), Lithuania (295), while Latvia has the lowest number with 212 companies. Hence one could also see a dichotomy between the amount of companies developing Advanced Technologies in the Nordic countries (Finland, Denmark, Sweden), Poland and the Baltic states.

Observation 2

The ATI does not have comprehensive data on the uptake of Advanced Technologies in the EU. The two data sets they have are based on surveys and text mining. The data based on Text mining is presented in the figure below.

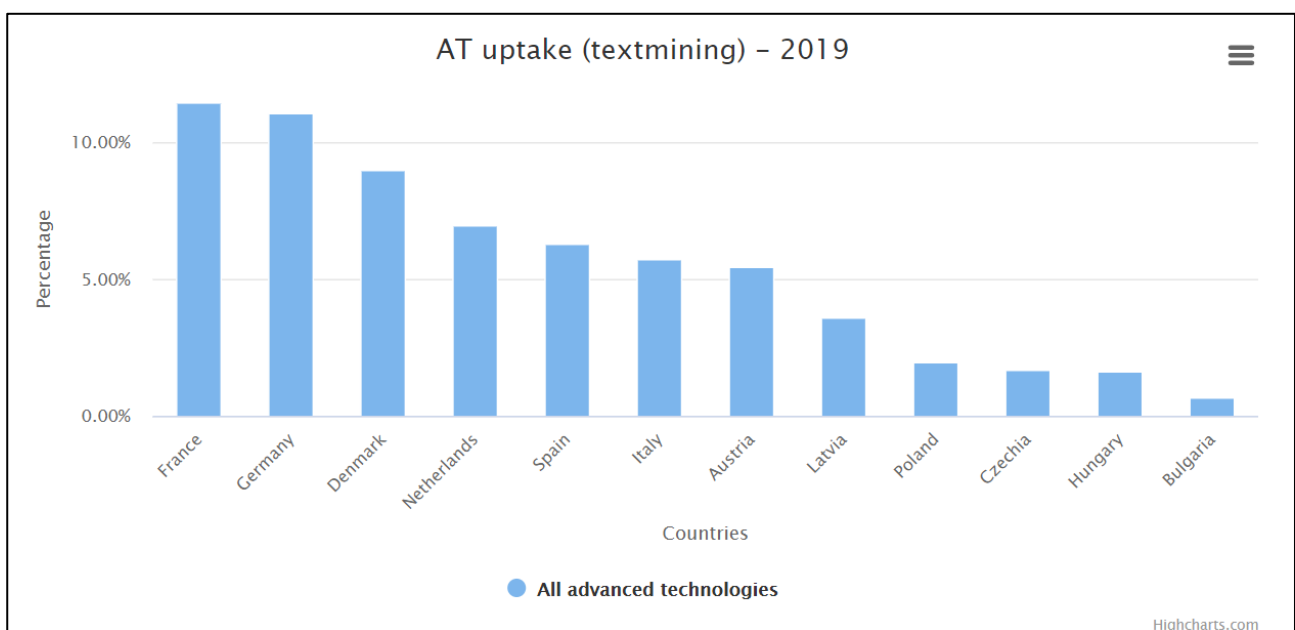


Fig 2. Source: [EU ATI 2020](#)

Fig.2 indicates that the uptake of Advanced Technologies in the EU is very low. If this figure is compared to the figure in observation 1, it is evident that countries that record a high number of companies developing Advanced Technologies also record higher uptake than other countries with low numbers of companies. However, in order to ascertain if this could be the case across the EU, another data from the ATI was consulted. This data is part of the set of data presented for technology uptake. It presents an overview of the percentage of products and services launched using advanced solutions by SMEs at each EU member state.

The trend observed is somewhat similar to the assessment made in observation 1 and fig. 3 on the utilisation of digital technologies. The assessment being that there is a dichotomy in the development of the technology between the Nordics, Poland and the Baltic states. In the figure below, the utilisation of digital technologies is higher in Denmark, Finland and Sweden respectively as compared to Lithuania, Estonia, Latvia and Poland respectively. There is at least 75% utilisation

of digital technologies by SMEs in the Nordics; 66.44% utilisation in Lithuania and less than 50% utilisation in Estonia, Latvia and Poland.

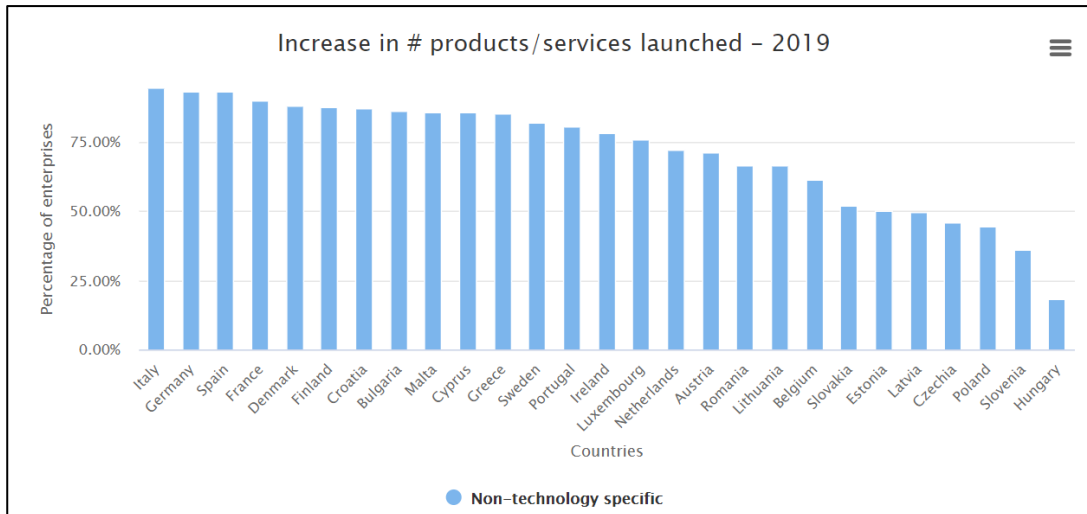


Fig 3. Source: [EU ATI 2020](#)

In the Baltics, the minor difference is that the uptake by the Lithuanian SMEs are more advanced in the uptake than SMEs in Estonia, where there are more companies producing the technology. Similarly, the Danish and the Finnish companies are more advanced in the uptake of the Advanced Technologies than the Swedish where more companies are producing the technology.

In the Baltics, the plausible reason is the competitive nature of SMEs. Based on an interaction with the Lithuanian Engineering Industry Association (LINPRA) during the DIGINNO Business Needs Analysis (BNA) Delphi process⁸. The competition is driven by the influx of foreign competitors. This has forced Lithuanian SMEs to adopt digitisation as a way of becoming competitive. Aside that there are state interventions for SME digitisation in Lithuania. In Estonia, based on feedback from Estonian stakeholders in DIGINNO, the state aid has not been continuous and there are interest rate barriers in facilitating loans from banks.

However, in the Nordics, one reason Sweden is a bit behind is that there are much more SMEs in Sweden than in Denmark and Finland. This implies that the percentages of companies in Denmark and Finland respectively using Advanced Technology to deliver their products and is high. However the actual number of such companies will be smaller than the actual number of companies in Sweden utilising Advanced Technologies. But the Swedish percentage is lower because there are much more of such companies in Sweden.

Inference

Based on the observations made, it could be inferred that the challenge as it pertains to lack of infrastructure is real. In countries where the Advanced Technologies are locally available, accessible

⁸ “Delphi” type meetings with industry representatives in selected BSR countries, see also chapter A4

and affordable, the level of utilisation of the technology to develop products and services is high. In countries where the level of local production of the advanced technology is low, the level of utilisation of advanced technology to deliver products and services is low. Some factors that could account for the low utilisation of such Advanced Technologies could be its availability; the cost of purchase, deployment and implementation; purchasing power; and or understanding the need for such technology. Hence the owners of the SME might not find it necessary to beef up the infrastructure needed to scale up production.

Another reason for the potential low uptake of advanced digital technologies could be that there is no local producer of such a technology. In such a situation there could either be a middleman that delivers the technology as a cloud service or the technology does not exist.

What is not clear however from the ATI data is the breakdown in technology selection. This would aid in understanding the set of technologies that exist or otherwise in countries where the adoption utilisation of the infrastructure is relatively low. Either way, based on the observations made there is the challenge in lack of infrastructure.

Nevertheless, it is clear based on the EU survey that the lack of locally produced infrastructure for these advanced digital technologies is an issue. What is relevant here could be how to support more local advanced technology firms.

A 3.2.2 Lack of work force

Lack of workforce is a serious problem for SMEs in the BSR and in the EU. This is because of the low availability of personnel with competence to either develop, deploy, or utilise the technology in the production and service delivery processes in the SME. Data from the ATI that points to this problem are those that relate to the supply of ATI professionals and the supply of STEM graduates at the national level.

A. Low supply of Advanced technology professionals

The implementation and utilisation of advanced technology in SME processes require specialized engineering, computer science and analytical skills. Examples of such skills include machine learning skills, automation skills, advanced programming skills and advanced data analytics skills etc. However, there is a low supply of professionals with some of these skills, among others in the EU. As seen in fig. 4, the supply of relevant professionals is low across the board.

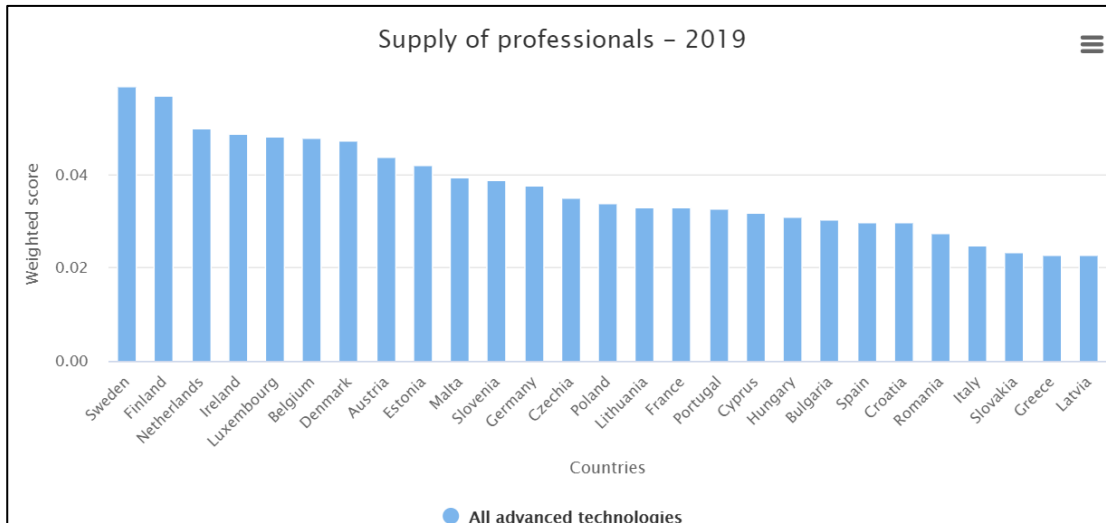


Fig 4. Source: [EU ATI 2020](#)

The data highlights the share of professionals per country with competences in any advanced technology. ATI extracts this data from LinkedIn by tagging advanced technology professionals, from each country, based on their documented skills and qualifications on LinkedIn. As there are professionals without LinkedIn profiles, the ATI adopts a weighted score method to determine the possible number of advanced technology professional in each country. The weighted score was applied to correct the representativeness of the sample. Hence the weigh score provides an insight in the share of professional, relative to the total advance technology workforce at the national level.

Based on the weight score, the supply of advanced technology professionals to SMEs at the national level is low in the BSR and in the EU. However, based on the methodology used, one can also see the dichotomy between the Nordics that has more Advanced Technology professionals than Poland and the Baltics. As the highest weighted score ascribed to Sweden is 0.06 (weight score of 6%) and Denmark 0.05 (weight score of 5%). Latvia has the lowest in the continent and in the BSR with 0.02 (weight score of 2%).

There are some reasons for this dichotomy.

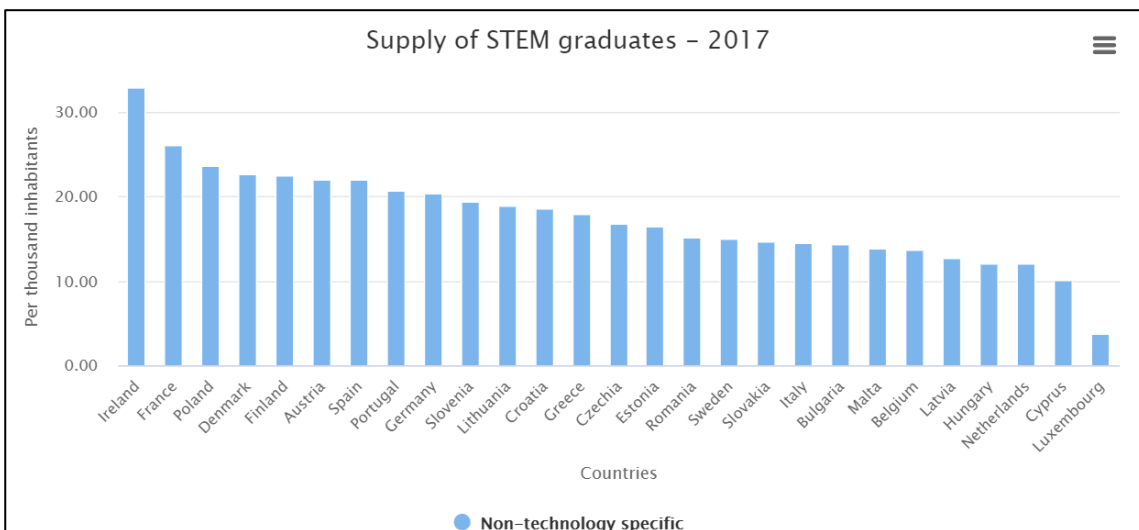
- One possible reason could be that there are more SMEs that utilise Advanced Technologies in the Nordics than in the Baltics and Poland.
- Secondly, being that LinkedIn is used as a source of data, it does not imply that the professional accounted for per country is either a citizen or trained in that country. Hence the professional could be a migrant worker. Based on this point of view, the reason for low supply of professionals could be that there is increasing migration of professionals into the Nordics compared to the Baltic countries and Poland.
- The third reason could be the fact that wages are higher in the Nordics than in Poland and the Baltics. Hence that factor becomes an attraction for professionals who seek higher wages for their competences.
- The fourth reason could be the low supply of stem graduates per country. More on this reason is discussed on the next point.

B. Low supply of STEM University graduates per country

Science, Technology, Engineering and Mathematics (STEM) are the basic foundation towards the development of competences and skills in Advanced Technologies. Hence in order to supply the workforce needed to implement Advanced Technologies in SMEs, there is the need for STEM Graduates. Although becoming a STEM graduate opens up the possibility for that graduate to be employed in an advanced technology. However, studying the right stem course required by industries in one or more sectors of the can be challenging. This is because university courses evolve at a much slower pace than the Advanced Technologies required by industry. Hence one could be a STEM graduate but lack the competence needed by the SME at a particular point in time. This is where there is a challenge as it relates to lack of workforce.

Nevertheless, the production of STEM graduates in the EU has been low for many years according to data from EuroStat⁹. According to Eurostat, in 2014, 2015 and 2016 the EU produced and estimate 18.5, 19.0 and 18.70 STEM graduates respectively per 1000 inhabitants of population aged, 20 to 29. Eurostat did not provide the estimates for 2017. However, the estimated the figure for 2018 was 19.6 STEM graduates per 1000 inhabitants. These estimates on the number of STEM graduates per thousand is very low. This also implies that most graduates at EU universities are not STEM graduates. Hence on a continental level, one could surmise that there is shortage of specialised STEM graduates for the roughly 25 Million SMEs¹⁰ in Europe.

To understand how the situation affected the BSR, the graph in fig. 5 provided by ATI (extracted from Eurostat) presents the situation at the national level for 2017. Although Eurostats has the figures for 2018, some of the figures are estimated. This leaves us with the 2017 figures which are definite at least for that point of time.



⁹ http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=educ_uae_grad04&lang=en

¹⁰ <https://www.statista.com/study/47942/small-and-medium-sized-enterprises-smes-in-europe/>

Fig 5. Source: [EU ATI 2020](#)

Data from the graph signifies that there are fewer STEM Graduates within the sampled population in each EU member state in the year 2017. Ireland had the highest number of STEM graduates with 32.7 per thousand inhabitants of population of Irish students aged 20-29. In the BSR the number of STEM graduates per 1000 inhabitants at the national level were lower than that of Ireland. In 2017, Poland had the most STEM graduates with 23.60 per thousand graduates. They were followed by Denmark with 22.60 per thousand graduates; Finland with 22.40 per thousand graduates, Lithuania with 18.90 per thousand graduates, Estonia with 16.50 per thousand graduates, Sweden with 15 per thousand graduates and Latvia with 12.70 per thousand graduates.

In order to have an insight into the actual number of graduates per (this time not necessary limited to age 29), the OECD factsheet was consulted. Based on the OECD, the total number of STEM graduates from tertiary institutions in the BSR was 188 451 STEM graduates compared to 670 029 Graduates overall. The country breakdown is presented in Table 1.

Table 1: Total number of STEM graduated from Universities in the BSR

	STEM Bachelor Graduates	ALL Bachelor Graduates	STEM Master Graduates	All Master Graduates	STEM PHD Graduates	All PhD Graduates	Total STEM Graduates	Total all graduates
Poland	62,196	200746	46,902	208789	1263	3196	110,361	412,731
Denmark	7475	43579	6672	26149	915	2232	15162	71960
Finland	9239	36475	5350	18531	743	1853	15,332	56,859
Lithuania	5321	19515	1639	9031	166	329	7126	28875
Estonia	1540	6056	1283	3755	138	253	2961	10064
Sweden	16849	34373	16849	39303	2384	3585	36082	77261
Latvia	822	7283	560	4845	45	151	1427	12279
Total							188 451	670,029

Source: OECD.STAT 2017

Hence based on the actual population of graduates as presented in Table 1 less than 30% of graduates from Universities in the BSR, at the national level, were STEM graduates. Hence the OECD data also points the low supply of STEM graduates produced in 2017.

To understand the impact of this low number of STEM graduates on SME digitisation, the number of STEM graduate in the table above were placed side by side with the number of SMEs per country in the BSR. The outcome is presented in Table 2.

Table 2. Comparison between the total number of STEM graduates and the total number of SME's

	Total STEM Graduates	Total number of SMEs	Total number of micro companies	Total number of small companies	Total number of medium sized companies
Poland	110,361	1,729,233	1,664,944	49,890	14389
Denmark	15162	227,102	200,849	21,977	4276
Finland	15,332	228,562	208,440	17,163	2,959
Lithuania	7126	197,788	184,523	11,147	2,118
Estonia	2,961	76,856	70,344	5,500	10,12
Sweden	36,082	738,624	699,377	33,441	5,806
Latvia	1,427	114,131	104,705	7,976	1,450

Sources: 2019 SBA Factsheets Poland, Denmark, Finland, Lithuania, Estonia, Sweden and Latvia¹¹.

In the table it is evident that the total number of STEM graduates produced in 2017, which was not very different from those produced between 2016 and 2018 is far lower than the total number of SMEs per country. In a scenario where the evolution of advanced technology is slow one could say that the accumulation of STEM graduates overtime will solve the challenges posed by the low supply of work force. Unfortunately that is not the case. That is because the rapid evolution of advanced technology makes it possible for certain class of newer graduates to be armed with new knowledge and techniques that previous batches lack.

However, the situation becomes serious when one compares the amount of micro companies to the total number of graduates per year. In the EU micro companies are those with 10 staff members or less¹². In all BSR countries, as seen in Table 2, they constitute at least 90% of SMEs. As these companies are encouraged to digitise via clusters, innovation hubs and public policy initiatives such as the move towards Real Time Economy etc, they will need personnel to support their digitisation activities. The competences they will need will vary ranging from competences needed to operate machinery to that needed to facilitate digitised service delivery. Furthermore, new micro companies are being established at different rates in different BSR countries¹³, as indicated in the different SBA Factsheets.

Not only are the number of graduates not enough for micro-companies they have to compete with small companies (companies with less than 50 employees) and medium sized companies (companies with less than 250 employees) to attract the existing competences. As mentioned earlier, in some cases some STEM graduates do not possess the competences in areas needed by

¹¹ <https://ec.europa.eu/>

¹² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3An26026>

¹³ <https://ec.europa.eu/>

the company. Hence the competence pool becomes smaller. Graduates with the needed competence would then opt to work for either large companies, Medium sized companies or small companies where they can afford a competitive salary based on the specialisation.

Nevertheless, as described in chapter A4 there have been different national initiatives aimed at solving this problem. But it seems the problem with access to workforce is complex. One of the reasons for such complexity is the migration of workforce. The migration could be either in search for better wages, better work experience with reputable large or medium sized companies or it could be for other personal reasons. This makes it challenging for micro and small companies to attract and retain workforce, especially if such companies lack the requisite resources to do so. Hence there is the need for policy solutions that will ensure that different micro and small enterprises, in different countries, are able to access, attract and retain a sizable percentage of workforce. In this case more cross-border policy approaches are required to supplement the national policy approach in order to deal with these problems. Examples of such cross-border approaches are described in chapter A6.

A 3.2.3 Lack of access to finance

Aside the lack of workforce the ATI framework highlights lack of access to financing and inadequate financing options as a challenge. The challenges of lack of finance ranges from the inability to access bank loans due to unfavourable interest rates to the inability to attract investors as well as venture capital. The challenge, related to inadequate financing options observed in the ATI, is the existence of funding initiatives that are not accessible to all SMEs” In this section both challenges are explained.

A. Lack of access to investment

Attracting investors to fund ideas can be a daunting and demanding task. This is because one has to convince the investors that the idea they possess is viable and would generate a Return on Investment. The challenge however is that industry players are unwilling to invest in Advanced Technologies. This is evident in the graph presented in Fig.6 that indicates the level of investment provided by venture capitals and equity investors in the development of advanced technology per country in the EU. The figure indicates that there is either low or almost no access to venture capital or no substantial equity investment in some countries. In the BSR, there is a dichotomy with regards to access to investment.

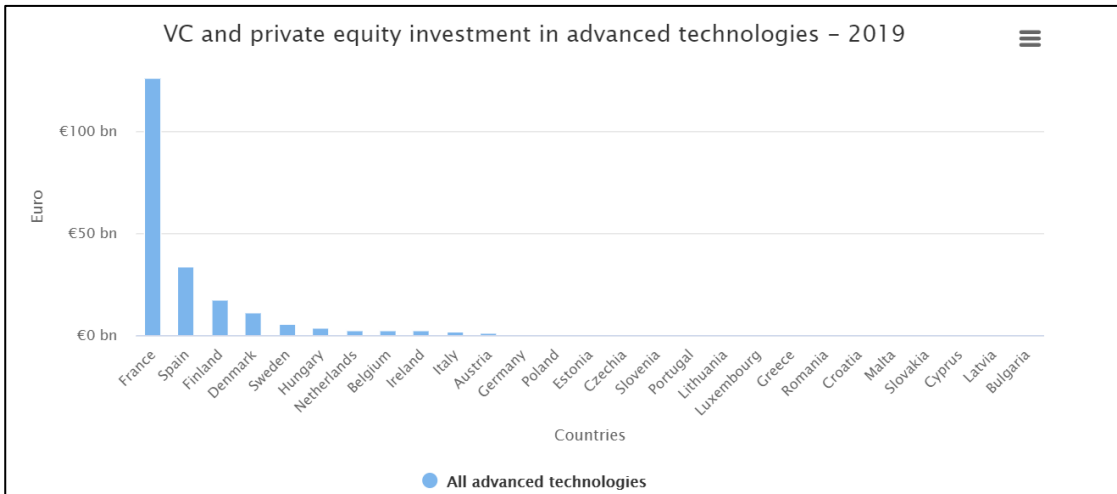


Fig 6. Source [EU ATI 2020](#)

There is little or no investment in Lithuania, Estonia, Latvia and Poland, compared to the Nordics where there are some investments by venture capital and equity investors. In the EU France stands out as the country with the most venture capital and equity investment in the development of Advanced Technologies.

One of the reasons for the low investment is that most Advanced Technologies require the development of hardware alongside the software. Developing software solutions alone is often cheaper than the development of hardware. This is because software is an intangible product which can be easily distributed in the market, compared to hardware. In the current situation where the level of demand for services requiring Advanced Technologies is low there is the risk of not earning a return on investment is high. Another reason equity investors find it challenging to develop in Advanced Technologies is the threat of substitution due to the rapid evolution of advanced technology. SMEs developing patents, product and services are faced with competing patents, products and services. This implies that the SMEs adopting these technologies have the possibility of choice. Hence the developer of the advanced technology should have a sound plan to cater for the risk of substitution.

Finally but not the least is the risk of regulatory uncertainty. Tariffs, taxes and the sourcing of raw materials are some areas that can be impacted by different forms of regulation. Regulation on import tariffs and taxation will obviously have an impact on the production of Advanced Technologies. With respect to raw materials, currently there is a push in the EU towards environmentally sustainable production processes. Although there are certain areas within a product life cycle and value chain where this can be achieved, there are other areas where this could be challenging. An example could be that the raw material used in developing the hardware is not environmentally friendly, but it enables the development of the hardware at a cost that will not erode profit margins. However, if the hardware were to be developed with an environmentally friendly material, the cost of producing it will result in an expensive hardware in which SMEs may neither afford nor buy. This would be especially if there is the threat of substitution in the market.

These are examples of some of the risks that could impede on venture capitals and equity investors from investing into companies developing Advanced Technologies. Although these supply risks exist, there is hope on the demand side which could have an indirect effect on the supply side. That is the fact that SMEs adopting Advanced Technologies are embracing the platform economy. Furthermore, these platforms be they technical or organisational (e.g. clusters, digital innovation hubs) exist at the national level and also on a cross-border level.

Channelling financing via these structures could be a way of bringing the demand and supply component together. So that developers of Advanced Technologies could be financed to tailor these technologies to meet the needs of SMEs. Additionally, coupled with innovative business modelling there could be a circular flow of income sustaining the use of such technologies within clusters. This would require not only national policy initiatives in this regard but cross-border policies as well. Policy recommendations and examples of how this can be approached in Chapter A6.

B. Inadequate financing options

In the BSR, every country has SME financing regime. Some of these regimes are mentioned in A4. However, these financing regimes are competitive and some SMEs are either unwilling to compete or do not have the resources to compete for these regimes. Nevertheless, in the ATI it was interesting to see that a growing number of SMEs act on procurements and that they also have possibilities to access EU structural funds.

Public procurement

Although acting on procurement can be seen as a revenue stream for an SME it is an inadequate financing option towards SMEs as most SMEs are unable to compete here as well. Hence most SMEs that utilise Advanced Technologies to deliver their services have to rely on generating revenue by competing in the market.

The challenge with procurement is presented in Fig.7. It shows the share of enterprises which sold innovative goods and services under public procurement contracts.

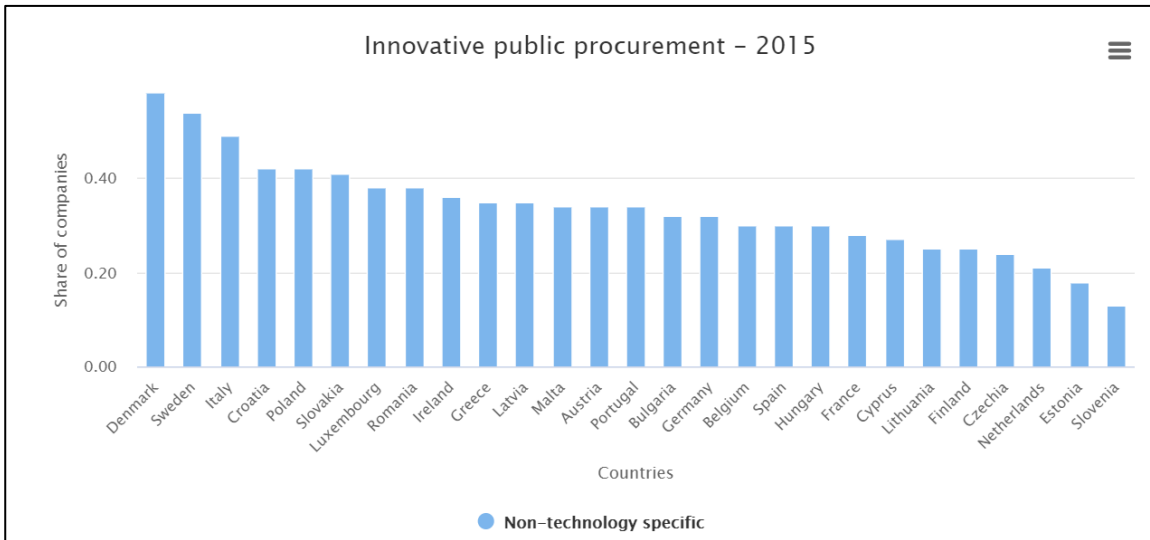


Fig 7. Source: [EU ATI 2020](#)

In the BSR, more than 20% of SMEs act on public procurement. As seen in Fig.7, 50% of Swedish and Danish companies take part in public procurement. 42% of Polish companies and less than 40 % of Finnish companies take part in public procurement as well. While in the Baltics, 35% of Latvian SMEs act on public procurement, while 25% and 18% of Lithuanian and Estonian SMEs respectively are involved in innovative public procurement. However, the demand for the solutions procured is often far lower than the number of SMEs that can supply the procured solutions. Although SMEs collaborate to bid for the procured solutions, it is only viable for SMEs with a good track record in service delivery to public authorities. This implies that SMEs that are not involved in the procurement processes have to find other ways and means of financing their operations. Hence public procurement is inadequate although it provides a source of revenue and financing for SMEs.

EU Structural funds

The European Structural Investment Funds provides another avenue for SMEs to access finance in order to develop market solutions. Obviously these are SMEs that deliver solutions in the focus areas of the Structural funds. The fund supports five focus areas:

- research and innovation
- digital Technologies
- supporting the low-carbon economy
- sustainable management of natural resources
- small businesses

The funds are jointly managed by the Member States and the EU. There are five funding schemes in this initiative.¹⁴ These are:

- European Regional Development Fund (ERDF) – promotes balanced development in the different regions of the EU.
- European Social Fund (ESF) - supports employment-related projects throughout Europe and invests in Europe’s human capital – its workers, its young people and all those seeking a job.
- Cohesion Fund (CF) – funds transport and environment projects in countries where the gross national income (GNI) per inhabitant is less than 90% of the EU average. In 2014-20, these are Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.
- European Agricultural Fund for Rural Development (EAFRD) – focuses on resolving the particular challenges facing EU's rural areas.
- European Maritime and Fisheries Fund (EMFF) – helps fishermen to adopt sustainable fishing practices and coastal communities to diversify their economies, improving quality of life along European coasts.

Fig.8 highlights the various budgets agreed upon between each member state and the EU based on the project they would implement between 2014 and 2020. The challenge, however, is that there is a great disparity on the amount of funding per country. This is because the member states develop their priority areas needed for the seven year period in agreement with the EU. They enter an agreement with the EU on the funding needed to develop the selected areas within the different ESIF funds. This disparity can be seen in the figure.

¹⁴ https://ec.europa.eu/info/funding-tenders/funding-opportunities/funding-programmes/overview-funding-programmes/european-structural-and-investment-funds_en

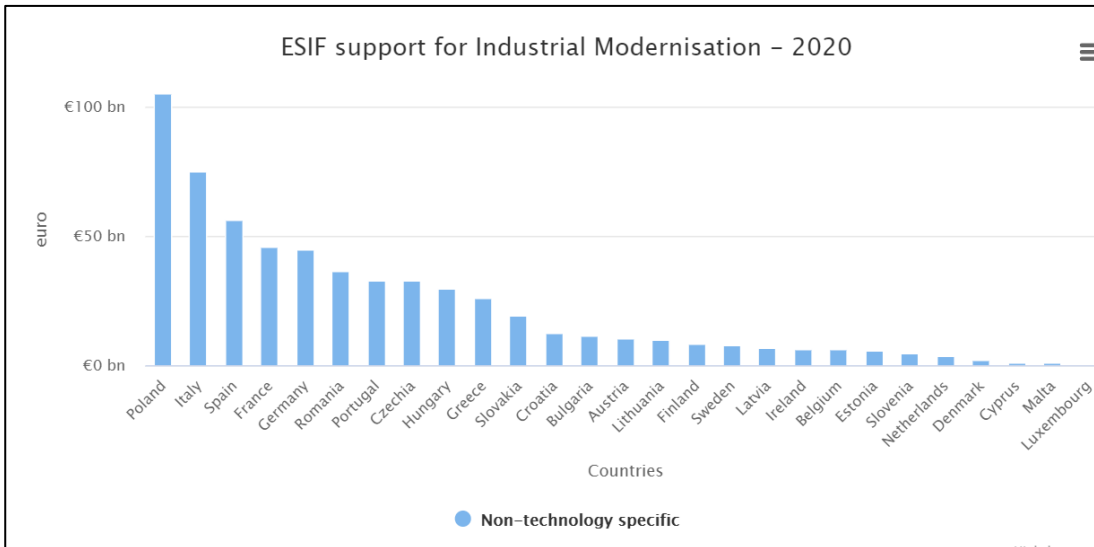


Fig 8. Source: [EU ATI 2020](#)

In the BSR, Poland has been the major beneficiary followed by Lithuania, Finland, Sweden, Latvia, Estonia and Denmark. The fund, however, is not geared towards funding advanced technology only. Therefore, it is not a readily available financing solution or most SMEs aiming at either developing or delivering products and services using advanced digital technologies. On the other hand, SMEs that are lucky to be located in countries with more initiatives do have some form of possibility to access the structural funds. But still, the funds are competitive and SMEs whose advanced technology is not seen as relevant to the solutions in the national priority will be left out.

Structural funding, though an inadequate funding source, is flexible within the priority areas. It is a tool that if designed properly can enable SMES to develop Advanced Technologies to enable the priority areas as well as use Advanced Technologies to sustain the initiatives in the policy area. What is needed in is the re-imagination of the national priority areas in such a way that it will enable SMEs meet real market needs using Advanced Technologies. Therefore, there is the need for solutions at the national level aimed at helping SMEs develop, deploy and/or deliver services using Advanced Technologies.

As highlighted in chapter A2 there are various EU and national policies aimed at solving these challenges. Some of these policies are drafted within the EU smart specialisation processes. However, the existence of these three challenges slows down the advancement of solutions proposed in the different EU policies. As alluded to in this chapter, some of these challenges require cross-border collaboration between different relevant public agencies to solve the problems identified.

DIGINNO has served as a test bed on how cross-border challenges related to SME digitisation can be solved. DIGINNO was funded as a platform to provide practical solutions to some of these problems. In independent investigations made by DIGINNO partners, similar challenges, as identified in this chapter, and more are identified. The work involved discussions with policymakers, industry associations SMEs and knowledge institutions within the BSR.

A4 Business needs and challenges: Trends and observations

This chapter gives insight in some of the trends and challenges related to uptake of digital technologies in the BSR from a company perspective as well as policy issues ¹⁵regarding uptake and use of digital technologies to improve business performance in the BSR.

The chapter builds on the following DIGINNO activities:

- *Business Needs Assessment (BNA) published Sept 2019 providing insight in the uptake of ICT among SME's in the BSR*
- *Discussions at policy seminars 18 Nov 2019 and 19 June 2020*
- *"Delphi-type" meetings with industry representatives, Feb-Apr 2020*

A 4.1 Status based on the BNA surveys

In the Business Needs Assessment (BNA) the different activities were based on different methodologies and setups. The idea was to get information on the digitalisation process including views on policies/ policy formulation from different perspectives. The input from the different activities are summarised in trends and the concluding observations below where the prioritisations are done by the project based on the inputs.

The BNA provided the basic knowledge on the level and character of digitalisation in the countries included in DIGINNO and was in that sense also the basis for the other activities. It included a quantitative survey and qualitative interviews among SME's where respondents were asked to rate the importance of 14 different ICTs¹⁶ today and in the coming 5 years as well as the importance of selected business environment factors. The respondents were asked to indicate the importance of the different ICTs on a scale from 1 to 5 – with 5 as the most important. The BNA had input from Denmark, Estonia, Finland, Latvia, Lithuania, Poland and Sweden. Given its character, the BNA does not give the full picture and it was therefore supplemented by Delphi-type discussions with informed stakeholders who generally confirmed the trends identified in the BNA.

Overall, it is concluded that the uptake of digital technologies in the BSR is high, however, there are some differences between countries, which were also analysed in the BNA based on the qualitative interviews. It seems to be a general trend that in Finland, Sweden and Denmark digitisation

¹⁵ The term 'policy issues' is conceptualised as broader than just policies by public authorities; it also includes initiatives by industry associations and other general initiatives to promote the implementation and use of ICTs for improving business performance.

¹⁶ Sensor technologies, Wireless technologies, Automation technologies, Database (Data Acquiring) technologies, Big data/analytics, Machine Learning/AI, Augmented Reality /Virtual Reality/Mixed Reality, Cloud computing, Block chain, Security/encryption, Data visualisation, Virtualisation/simulation, Robotics, Drones

initiatives in the public service play a major role; and the take-up of the technologies are at a higher level than in the other DIGINNO countries where there is no conclusive difference in take-up. In Lithuania the uptake is mainly driven by internal and external competition from abroad, while in Estonia and Latvia, the uptake is driven by the activities of industry associations and the presence of demand.

Even if there are slight differences in the level of take-up of technologies between the countries, the take-up pattern among the technologies is very similar – almost identical. There is a high take-up of more established, well-known technologies, whereas the take-up of more Advanced Technologies as AI, Blockchain, robotics, and drones, is low. The pattern of the expectations for the next five years is quite similar both with respect to countries and to the technologies, meaning that, e.g., the take-up of the Advanced Technologies will remain relatively low. Among researchers there is agreement that these Advanced Technologies will have great impact in the coming years, implying that this pattern in expectations calls for attention from organisations and policy makers.

There are some structural differences among the BSR countries in relation to the ICT take-up, but there are also commonalities among the SMEs in the region opening for potentials in collaboration and coordination. These commonalities are summarised below:

- Trend towards the combination of technologies for service delivery and production.
- Trend towards Demand-Based production.
- Trend towards forging partnerships outside the EU.
- Trend towards common adoption of platform technologies.
- Trend towards less attention to Advanced Technologies

The companies were further asked about the importance of the following business environment factors:

- Regulation and legislation
- Taxation (disregarding income taxation considered out of the scope here)
- Physical infrastructure
- IT infrastructure
- Awareness raising activities
- Networking activities
- Financial instruments
- Access to workforce

In the analysis of the answers provided by the respondents in the qualitative interview, three areas stand out as the most important issues in the general environment. These are Taxation; Upgrade of the infrastructure; and Competence development including networks and education.

It is generally stated that taxes, including VAT on the procurement of the technologies, are cumulatively high for some operators with low budget and small market size.

The need for upgrade of (physical and IT) infrastructure refers in the BNA to the inability to facilitate the scalability in production due to infrastructure constraint. The inability to facilitate infrastructure upgrade is due to inadequacy of resources. However, the potential market for certain products needing upgraded infrastructure is growing. Examples include the growing demand for smart home products, assisted living products, autonomous systems etc. Hence, the inability of the operators to upgrade their infrastructure will result in small-scale production and it may hamper the growth of the operators in the BSR.

The lack of competence is a common problem in all countries surveyed. It is evident that in the BSR, more human resources with competences within the digital technologies are needed. These competences are needed to create the avenue for new innovations as well as for expanding current activities.

In the quantitative survey, the lack of IT infrastructure, the lack of physical infrastructure to support the operators and awareness and low level of networking activities were identified as the most common challenges.

It comes out from the analyses that in the partner countries there is a general openness to the adoption of new ICT technologies and that the level of adoption of the technologies is largely at a similar level despite some differences between the countries. The adoption is generally driven by either the ability of the technology to support operational processes or as a means to added value in product/service development.

Some of the challenges for SME's in BSR seem to be related to the expected low level of usage of Advanced Technologies like AI and Blockchain as well as lack of access to skills related to Advanced Technologies. However, the potentials in these technologies may currently be seen as still too immature to be deployed in most SMEs and rather candidates to follow for evaluation of when and how they might be applied. Financial incentives at BSR level to adopt these technologies when appropriate could be a way forward, together with a road map for external knowledge acquisition and transnational education initiatives to match different competences.

In general, SME's are focused on learning from peers and day-to-day business in their home region or country. They are not necessarily aware of the opportunities in doing business with neighbouring countries with cultural similarities although it would give them valuable experience and access to bigger markets. Success stories and best practice use case scenarios provided at BSR level could serve as eye-openers and help utilising the complementarities between the countries. DIGINNO has selected a number of examples of best practices¹⁷.

These common problems were identified on the basis of the responses:

- Lack of access to work force/shortage of labour force.
- Need for upgrade of ICT infrastructure
- Need for upgrade of networking

¹⁷ <https://www.diginnoBSR.eu/wp2-outcomes>

- Challenges/ barriers created by regulation
- Lack of financial instruments
- Taxation (however, seen as general economic policy and outside the scope of the project)

Business environment factors have been rated for the BSR countries participating in the BNA. Though there obviously are differences between the different countries, the overall picture is that in addition to more “traditional” measures that industry representatives often mention (less regulation, less tax, and better-qualified labour force) much emphasis is on ‘softer’ measures such as networking and cooperation. Also considering that lack of awareness and motivation is recognised as a key barrier in firms doing early stage digitisation.

In general, there is a high adoption of digital technologies in the BSR and a comparable socio-technical regime and development level making it meaningful to discuss challenges and policy initiatives at the BSR level – even if SMEs in each country may encounter different, country specific challenges. Common challenges related to ICT uptake among SME’s in the BSR are identified during the WP2 activities as related to

- Inadequate regulation or implementation
- Lack of access to work force/shortage of labour force.
- Need for upgrade of infrastructure
- Need for upgrade of networking
- Lack of financial instruments providing incentives to adopt new technologies

During the WP2 activities the following four areas were discussed as a way to meet the common challenges:

- Harmonisation of legislation and regulation, and development of common digital standards
- Platforms for industry cooperation across borders
- Collaboration between industry and educational institutions
- Access to qualified labour power

A 4.2 Additional observations

Drawing on experiences and learnings from the involved countries, sub-issues on each area are presented below as potential ways to meet the challenges and as input for policy suggestions. The following statements are results from informal meetings and discussions with project partners, industry stakeholders and policymakers organised in WP2:

Harmonisation of legislation and regulation, and development of common standards

- Regulative barriers are often discussed and this is important; however, it is also important to discuss how regulations can facilitate ICT development

- Regulation can be a barrier as well as a driver for digitalisation. Regulation should be an enabler, but different national rules can be a barrier for ICT uptake
- Harmonisation of legislation will help developments in many different fields, e.g. self-driving cars where the legal setup is complicated and cross border activities are immanent
- It is easier to harmonise regulation between BSR countries than in the entire EU. BSR could be in the forefront with regard to harmonisation as DIGINNO may encourage ICT development in general
- Financial regulation can be used to create a competitive advantage. The public sector should get inspiration from neighbouring countries. Estonia has for example gained inspiration from Lithuania on how to support industry
- Common standards across borders can be developed case by case. For instance Estonia and Finland have developed common standards on medical prescriptions.

Platforms for industry cooperation across borders

- Strengthened cooperation is needed between national Industry 4.0 platforms; there are already platforms in the individual countries. Projects like DIGINNO could be one of the vehicles for this kind of cooperation
- Institutionalised collaboration among countries with regard to digitalisation efforts have so far focused on the public sector and cross border government services for businesses such as eCMR and E-receipts¹⁸. This collaboration should be extended to digitalisation of the private sector.
- Collaboration among industries in digital transformation is reasonably well developed¹⁹, but the links between SME's and academic institutions need to be strengthened.
- Intensifying collaboration between national innovation hubs seems useful

Transnational collaboration between industry and educational institutions

- Links between industries/companies and academic institutions are relatively weak and need to be upgraded
- National innovation hubs are one of the means to improve this kind of collaboration.
- There is an actual interest from SMEs in participating in digital innovation hubs with cooperation between Higher Education Institutions and SMEs – this needs to be supported

Access to qualified labour power

- The lack of ICT qualified labour power in the region could be tackled by for example collaboration on training and education programmes
- Educating new labour power combined with increased mobility between BSR countries, for example

¹⁸ Section B

¹⁹ For example Latvia and Estonia collaborate on increasing SMEs skills in digitalisation by creating different platform models to help SMEs to implement digitalisation.

- In Lithuania, initiatives have been taken to facilitate immigration of specialists
- Poland has launched initiatives to attract more female studies to ICT studies
- Many IT engineers from the BSR are working outside BSR; initiatives to encourage relocation seem relevant
- BSR countries compete with each other on attracting talented work force. There is an unexploited potential for exchange of ideas on, e.g., how to recruit talents and upgrade competences

In Chapter A6 the observations summarised above are taken as inputs to a discussion of common/transnational policies to promote digitalisation.

A5. Policy framework: EU and national policy initiatives

- *Examples of existing and upcoming policies and strategic initiatives in industry digitalisation that are aimed at encouraging, promoting and supporting ICT uptake and digital transformation of SME's*

At national as well as EU level numerous policy initiatives are launched regarding digitalisation of industries as well as societies in general. Most of the BSR countries are small, open economies with a business structure dominated by SME's. Nevertheless, they have different policy approaches to promoting ICT uptake of SME's and different experiences regarding the impact of the policies as well as the accept and efficiency of the instruments launched.

A 5.1 EU industry digitalisation policies

The Europe 2020 flagship initiative "**A digital agenda for Europe**" was launched in 2010. In 2015 the Commission launched the strategy to achieve a Digital Single Market (DSM), including improving industrial digitalisation in areas such as the data economy, Internet of Things (IoT), cloud computing, standards, skills and e-government.

In 2016, the Commission launched the "**Digitising European Industry**" (**DEI**) initiative as part of the DSM strategy²⁰. DEI builds on and complements various national and regional initiatives for digitalising industry. It serves as a coordination framework for collaborations between member states and their national digitalising initiatives by identifying challenges that need to be addressed at EU level, exchanging experiences and best practices, triggering collaboration, boosting co-investments, and exploring common approaches to regulation, skills and jobs.

DEI aims at mobilising more than €50 billion of financial investments during 2016-2020 and is structured around five main pillars (fig 1). The common European platform of national initiatives to digitalise their industries is supported by four themes:

- **DIH**: Mainstreaming digital innovation across all sectors through, for example, establishing Digital Innovation Hubs (DIHs) and facilitating investment and financing;
- **Digital Industrial Platforms**: Strengthening leadership in advanced digital technologies inter alia through establishing pilots, test beds and PPPs, and promoting collaborations and platforms, i.e. industrial platforms implemented as, for example, test beds and industrial data spaces;
- **Skills**: Preparing people for the digital age through training for advanced skills;
- **Regulations**: Providing an appropriate regulatory framework inter alia for free flow of data, safety, and liability of autonomous systems and IoT.

²⁰ <https://ec.europa.eu/digital-single-market/en/pillars-digitising-european-industry-initiative>



Fig 1. Source: DEI

In 2018 EC presented this overview of progress within DEI main themes²¹:

- The EU is supporting a network of DIHs covering all regions to help companies – especially SMEs – make the most of digital opportunities
- DEI benchmarks national initiatives and brings together the main actors at regular workshops in order to identify and share best practice
- Several EU actions are supporting development of digital skills to ensure all Europeans count with the necessary skills to live and work in an increasingly digital society
- When necessary, EU regulations are being reviewed to make them fit for the digital age

An audit is being prepared by European Court of Auditors (ECA) to analyse how effective the EU has been in supporting national strategies for digitalising industries and the DIHs²².

A 5.2 National strategies and policy initiatives

The DEI initiative will benchmark national policy initiatives on a regular basis. According to the preliminary observations in a 3-year study mandated by the European Commission²³, “*most measures associated with the digitisation of industry have been introduced too recently to assess concrete outcomes*”. The study is a comprehensive overview of initiatives undertaken by the EU member states in the recent years to improve the digitalisation of industry. The analysis is based on detailed information about national programmes for digitalising industry across the EU28 (including the UK), which was gathered through questionnaires and interviews during the course of 2019 and at the beginning of 2020.

²¹ [Digitising European Industry, Progress so far, European Commission 2018](#)

²² [Audit Preview: Digitising European Industry, ECA, Aug 2019](#)

²³ [Study on monitoring progress in national initiatives on Digitising Industry, SMART 2018/0002, May 2020](#)

The country reports

- provide an overview of national strategies and initiatives across the DEI pillars, actions and investments together with related measures for digitalising industry
- assess impacts or outcomes of the initiatives, i.e. DESI performance of the country, the government’s approach to digitalisation and investment in digitalising initiatives

According to the study, all member states have adopted initiatives to support digitalisation of industry but there are differences in the intensity of support and take-up. This suggests that some member states could benefit from increased funding while others could do more to target measures and raise awareness so as to maximise their impact on the diffusion of technology across industry and society. Regarding digitalisation strategies all member states have implemented strategies or action plans to support the digitalisation of industry. Their main focus has been on raising awareness, highlighting opportunities, improving the competitiveness of industry and supporting the development of skills in the workforce. Member states address a wide range of sectors, but the manufacturing sector is the most common sector targeted under national digitalisation initiatives.

The study has analysed how different national strategies address challenges to improve digitalisation of industry. The most addressed challenges are lack of awareness, lack of digital skills and lack of ICT specialists (Fig 2). This corresponds to the observations made in the DIGINNO Business Needs Assessment (BNA) as commented in Chapter A4.

Table 2: Overview of challenges concerning digitisation faced by member states

	AT	BE	BG	CY	CZ	DE	DK	EE	ES	FI	FR	UK	EL	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK
Lack of awareness	-	+	-		*	-	-	*	-			*		-	*	*	*	-					*	-	-	*	*	-
Lack of sufficient business networks													*							-	-							-
Insufficient contribution/ use cases of academics to the innovation of the industry				-	+			*	-	+		-	+	+	+	+			*				+				*	
Lack of private funding for digitisation transformation	*	*									+								+	-			-			+	*	
Lack of R&D related to digital transformation																							-		-			
Insufficient or outdated regulation of data	+	*	*	*	*	*		*	*			*	*	*	*	*	*					*	+		*	*	-	*
Lack of digital skills of employees	+	*	*	*	+	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lack of ICT specialists	*	-	*	*	*	*	+	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	+	-

Source: Survey for Study on monitoring progress in national initiatives on digitising industry 2020, SMART 2018/0002

Fig 2

Also among industry associations at the European level an exchange of best practices is ongoing regarding how to assist SME’s in their digital transformation²⁴.

²⁴ For examples, see: <https://smeunited.eu/news/best-practices-on-assisting-smes-with-the-digital-transformation>

A 5.3 The need for transnational solutions

- from knowledge exchange to joint initiatives

Cross-border cooperation is among the main themes analysed in the above-mentioned study on the DEI effects.

The country reports show that all member states have a bilateral and/or multilateral exchange with other member states, predominantly focusing on knowledge exchange. Hence, the member states do learn from each other and are working on improving their own activities by considering lessons learned from other member states. The implementation of joint activities is, however, less common. Only ten countries were identified as having some kind of joint cooperation, and these activities often concerned R&D.

As industries and value chains operate across borders in a globalised society, there should be, at least in theory, scope to achieve significant benefits from bilateral and multilateral cooperation. Moreover, as some EU member states are at the forefront of digitalisation, there is significant scope to leverage this know-how to achieve benefits across the single market.

However, the analysis suggests that

“...thus far, collaboration between member states has been relatively limited and the benefits have not yet been utilised. Moreover, the focus of existing collaborative activities has been on knowledge exchange rather than on joint activities, which could reap the most significant benefits for the single market.

(...) It seems likely that Europe as a whole could reap dividends by fostering greater knowledge transfer from the most digitalised EU member states and supporting transnational initiatives in areas such as manufacturing which are dependent on the effective functioning of the single market. As digitalisation crosses nations and borders, there is a strong case to further develop pan-European cooperation beyond the current efforts in this regard and monitor good practices”.

This view is supported from industry:

“(...) today activities exist mostly still in silos: cross-border collaboration is scarce, the understanding of industrial strategy diverges across EU countries, and measuring the impact of European initiatives on the ground remains equally challenging”²⁵

These observations and recommendations confirm the relevance of projects like DIGINNO, where partners seek to extend knowledge exchange to joint transnational initiatives. Strengthened cross-border cooperation will help diminishing the digitalisation gap between BSR countries.

It is beyond the scope of the DIGINNO project to analyse in-depth the impact of the existing national policy framework. It seems that policy makers intend to periodically evaluate the

impact of policies and the implemented strategies. Such evaluations would result in either the introduction or modification of new or existing initiatives respectively. It is difficult to provide a silver bullet that would solve every problem arising in the digitalisation of SMEs. Hence, these evaluations are necessary as a way of guiding the SME digitisation process at the national level. It also discussed how to replicate and transfer good practices and lessons learnt, in particular in the work with monitoring national initiatives for the digitalisation of industry²⁶.

Nevertheless, based on inputs and observations of the DIGINNO project, **the inadequacies and shortcomings of existing industry digitalisation policies in the BSR** can be exemplified as follows:

- The effects of the policy initiatives do not always match the intentions.
- There is a need to bridge the gap between policy tools/instruments and the needs of SMEs.
- There is a lack of joint SME/government/research institution projects. They could be aimed at developing welfare technologies, support creation of e-government, or facilitate data-based services.
- The attention of public institutions and the financial support programs have witnessed a slow-down during the past decade
- Support programs have not been sufficiently directed towards SMEs and, as the awareness by SMEs of potential support initiatives has not always been high enough, they have resulted in sub-optimal technology implementation.

Analysis and discussions in the project indicate that some of these challenges can be addressed through transnational initiatives building on the multitude and complementarity of national experiences.

It is one of the key learnings from DIGINNO that

- **businesses are ready and engaged at a cross-border level but government agencies do not necessarily prioritise policies aimed at enabling cross-border delivery of SME services. The primary focus of national authorities/institutions is strengthening digitalisation on a national basis.**

Projects like DIGINNO can serve as platforms for aligning digital policy views at BSR level and developing common expectations to what is required from EU industrial policy. New BSR pilot initiatives could be developed within Digital Innovation Hubs and Smart Specialisation Strategies (S3) to make the BSR countries jointly more competitive. Also transnational projects could be developed within topics like free flow of data (data warehouses), shared public

²⁵ [Digital Europe: A Stronger Digital Industrial Europe, 2020](#)

²⁶ [Study on monitoring progress in national initiatives on Digitising Industry, SMART 2018/0002, May 2020](#)

services and pilots for new designs of policymaking processes. Not only joint projects are needed, but also joint investments, including BSR long term funding for promotion of ICT uptake in SME's.

The DIGINNO discussions point at initiatives that emphasise networking among SMEs and at improved awareness raising are valuable in terms of SME digitalisation. Initiatives within other fields of business environment frameworks are also important as documented in the BNA. However, when looking at the fact that many policy initiatives already have been undertaken during the past 20-25 years, but that these initiatives not always have had as strong an impact as foreseen, it is understandable that focus is turned towards issues regarding implementation: networking of companies, awareness raising and assistance with developing strategies of companies for digitalisation.

BSR countries share many digital challenges, therefore they also share the solutions – even if they have to be modified according to specific national conditions. There is a need for networks like DIGINNO to share ideas and exchange very concrete and practical steps in how to tackle these challenges. Neighbouring countries should be seen as opportunities, complementors and not only as competitors. To effectively implement Industry 4.0, a supportive regulative environment is needed. It has to be discussed how the innovation environment at the macroregional level can be improved.

A6. Policy proposals and recommendations

- *The chapter summarises ideas and proposed policy initiatives to address the challenges identified in the DIGINNO WP2. The focus is on transnational actions releasing the BSR macro-regional potential.*

In this chapter, the focus is on the potential impact of the challenges identified in chapters A.3 and A.4 on SME digitalisation on a transnational level. In the DIGINNO project, the emphasis has been on how the countries in the BSR could work together to deal with the challenges of SME digitalisation:

What are our common challenges? How do they affect the ability of our SMEs to operate across borders? What policy initiatives could be implemented to solve these challenges?

These aspects were identified in the project and macro-regional policy proposals for solving the challenges were discussed. Some of those proposals are described in this chapter.

The proposals provided suggest how the countries in the BSR could work together, learn from each other, and facilitate SME digitalisation. A centralised or top-down approach (at EU level and between countries) should be complemented by a macroregional bottom-up approach, where industry and governments work together across borders to promote SME digitalisation.

Hence, the best way is for the different countries to find ways to somehow work together in a coordinated manner to achieve their objectives. The DIGINNO network is an inspiration towards how public and private partners and stakeholders in different countries could work together to develop common solutions. There is a need for similar, more permanent networks in the BSR.

A 6.1 Overview of the problems

As mentioned in chapter A.4, SME's are increasingly operating across borders. This has been enabled greatly by the freedom of movement policies in the EU, other EU policies and initiatives mentioned in chapter A.2, and by the evolution of digital technologies. Current advanced digital technologies make it easy for SMEs to operate in one EU member state while delivering their services in other EU member states. It also enables them to form service delivery and production partnerships with other SMEs and large corporations in the other EU member states.

Nevertheless, the SMEs encounter similar challenges at the national level. The similar challenges identified in chapters A.3 and A.4 are highlighted in Table 6.1.

Table 6.1 Overview of common challenges identified in chapters A.3 and A.4.

	Challenges identified by the ATI in Ch. A3	Challenges identified within DIGINNO Ch 4
Lack of skills and competences	×	×
Lack of infrastructure/infrastructure upgrade	×	×
Lack of financial instrument	×	×
Need for upgrade of networking/awareness		×
Challenges/ barriers created by regulation		×

Although these are common national-centric challenges, they have cross-border implications. For example regulatory barriers and the low level of availability in skills/competences, lack of proper infrastructure and finance directly hinder the potential of most SMEs towards cross-border service delivery. Low level of networking on the other hand indirectly hinders the potential for SMEs towards delivering their services across borders. Hence there is need for a greater deal of SME networking nationally and off course across borders.

The growing push towards cross-border service delivery by SMEs makes it imperative to seek cross border solutions. Otherwise the recommended solutions would be to solve these challenges at the national level. But as highlighted in chapter A4, the SME digitalisation policies in the BSR are not aligned. They serve national interests and rightly so. This is evident in the variations in issues considered in different national smart specialisation policies, the topical focus of different Digital Innovation Hubs, and the sectors supported by different financial initiatives.

The result is that some countries fare better than others when it comes to the level of SME digitalisation and the selection of advanced digital technologies adopted. As an example, according to the DIGINNO Business Needs Assessment (BNA), SMEs in the Nordic countries and Poland adopt and utilise more digital technologies than SMEs in the Baltic countries. This is because in the Nordic countries and in Poland there are more policy initiatives aimed at adopting advanced digital technologies than in the Baltic countries.

Therefore, calling for more national-centric initiatives to solve the common challenges represented in table 6.1 may not be the best way to go. It is more fruitful to identify cross-border initiatives that can ensure that SMEs operating across border will:

- Have access to skilled labour from any country;
- Leverage cross-border resources to develop or upgrade the infrastructure they need for their cross-border solutions;
- Have access to adequate cross-border financing solutions;
- Build more and better networks with potential partners across borders;
- Experience lower regulatory barriers in the BSR country they wish to operate.

Formulating cross-border solutions for each initiative would imply that there is either a centralised or coordinated multinational approach toward implementing such solutions. The former is problematic as it will result in the creation of new institutions. The latter, on the other hand, is by no means easy but doable. This would call for collaboration and learning from each other. However, the regulatory, organisational, technical and collaborative structures are inadequate at the BSR macro-regional level. At the BSR level, based on the dialogue processes in DIGINNO, these structural challenges were identified as:

- Lack of harmonisation of legislation and regulation, and inadequate development of common standards (regulation, collaboration),
- Lack of platforms for industry cooperation across borders (organisation and technical),
- Inadequate collaboration between industry and educational institutions (collaboration)
- Insufficient access to qualified labour power (collaboration, technical).

As analysed in chapter A4, the solution to these macro-regional challenges holds the key to solving the previously identified national-centric challenges at the cross-border level. Hence, in order to solve the common challenges identified at the national-centric level, the challenges at the macro-regional level have to be dealt with. The links between the national-centric and the macro-regional challenges as adapted from chapter A4 are presented in table 6.2.

Table 6.2 Mapping the macro-regional challenges with national-centric challenges

Problem	Related national-centric challenges	Macro-regional challenges	Possible solution
1	<ul style="list-style-type: none"> • Challenges/ barriers created by regulation • Financial instruments • Lack of infrastructure or infrastructure upgrades 	Lack of harmonisation of legislation and regulation, and inadequate development of common standards	Cross-border Regulatory and collaboration measures
2	<ul style="list-style-type: none"> • Need for upgrade of networking • Lack of financial instruments 	Lack of platforms for industry cooperation across borders	Cross-border networking organisation* and technical ²⁷ platforms
3	<ul style="list-style-type: none"> • *Need for upgrade of networking 	Inadequate collaboration between industry and educational institutions	Cross-border collaborations measures

²⁷ For example blockchain ecosystems where different stakeholders across the region collaborate to deliver a service

4	<ul style="list-style-type: none"> Lack of skills and competences 	Insufficient access to qualified labour power	Cross-border collaboration, regulatory and technical measures
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**Networking with knowledge institutions.*

Hence, as presented in table 6.2, cross-border collaborative regulatory measures will be required to solve problem(s) no 1. Cross-border networking and organisation platforms will be required to solve problem no 2. Cross-border organisation platforms include Industry 4.0 platforms, Digital Innovation Hubs, clusters etc. These are fixed and stable forms of networks. Technologies used to galvanise the networks, share knowledge, and operate these hubs are referred to as technical platforms. The organisational platforms can exist without the technical platforms, but not vice-versa.

Cross-border collaboration measures will be required to solve problem no 3. The word “collaboration” is used here to indicate some form of networking, in this case with knowledge institutions. Cross-border collaboration and technical measures are required for solving problem no 4. Here collaboration is aimed at creating a framework for accessibility of workforce. The technical measures are aimed at creating the accessibility to work force. The specifics of these solutions are discussed in section A 6.3.

A 6.2 Policy inadequacies

As mentioned in A.5 national policy initiatives aiming at promoting SME digitisation exist but initiatives are needed that will increase the effectiveness of existing solutions. This includes policy initiatives on how SMEs can access the existing tools provided for them in such initiatives as well as how to tailor the policies to meet the needs of SMEs Bearing in mind that SMEs in different sectors have different needs and face different market situations, a one dimensional policy approach is not sufficient. There is the need for streamlining SME digitisation policies in different vertical and horizontal sectors of the economy. This will enable SMEs to identify with the existing initiatives and take advantage of them.

Existing policy initiatives on SME digitisation at the EU level and national level do not really cater for cross-border challenges facing SMEs. They promote national centric SME digitalisation initiatives. Although the EU has made an attempt to promote regional Smart Specialisation Strategies, different countries are focused on national smart specialisations. The major challenge here is the lack of a macro-regional vision as well as the lack of SME digitisation policy coordination initiatives at the regional level. Hence there is the need toward fostering greater regional (in this case BSR) cooperation via the creation of a common macroregional vision, the collaborative development and implementation of policy initiatives between members states in the BSR. However, in order to facilitate such collaborations, the state of SME digitisation in

the region and the common needs of SMEs in the region should be identified. This could then form the basis of a common regional vision forged for example via multilateral agreements.

It is also evident that there are different ecosystems, clusters, digital innovation hubs etc. in each country. Currently the EU is working on facilitating cross-border connections between these hubs. The challenge is how to make these different national platforms operate in such a way that they develop technical, business model and ecosystem solutions that will generate an active cross-border market for the SMEs. This will imply that different solutions produced in the ecosystem possess a mass appeal for the end user, be they government, citizens or other business enterprises. It will also imply that members in the ecosystem can collaborate across border to develop regional solutions for the market. For example in DIGINNO, there is a cross-border network developing a cross-border eCMR and KYC utility for the transport sector and financial sector respectively. However, there is the need for policies targeted on the creation of common cross-border platforms that will meet real market needs. Such policies also require a common regional vision of what is expected and how it has to be achieved. Activities within such platforms will promote networking and the awareness of Advanced Technologies as well.

In the EU, there have been different funds (Horizon, CEF etc) that enables knowledge institutions and SMEs to collaborate towards developing innovative solutions. The challenge though is that the network between knowledge institutions and SMEs in that context is short lived. Aside that, at the national level, SMEs and knowledge institutions are often members of the same cluster. The learning from this cluster is that there is a knowledge transfer, personnel networking and the development of common initiatives. Unfortunately, this policy does not work well at the cross-border level.

As mentioned earlier, the relationship between SMEs and knowledge institutions are short lived within projects. This makes it impossible for sustained collaboration, just as it is in national clusters. Hence there is the need for macro-regional policies aimed at universities within the BSR region being able to have collaborate with other SMEs in the region in a sustained manner. The value for the policy is that knowledge institutions will be kept abreast of regional SME needs and channel their research resources in that reaction. This is because knowledge institutions such as universities are constantly interested in training the workforce needed by Industry. For the SMEs, they will have the opportunity to find the right knowledge institution in any country in the region to test their ideas. An example could be access to industry 4.0 laboratories. They will also be able to identify the most relevant institution they could partner with to develop solutions or test run ideas. However, both entities will not know each other, especially if they exist in different countries, unless they are part of the same regional cluster.

Finally, there is a challenge with regards to access to workforce. Currently there are different knowledge institutions training different segments of the workforce. The institutions that train different specialised workforce exist in different countries. Their training approach and curricula differs. This implies that there could be relevant workforce in once country and the SME in need of that workforce is in another country. How do they locate themselves? It is

unfortunately not possible for national policy initiatives to cater for this problem. This also requires a coordinated macro-regional approach.

One would say that many policy gaps are in fact “missing links” caused by the lack of adequate cross-border policies. There is the need for a coordinated macro-regional approach. There is also the need to re-envision the existing EU policies from a regional perspective and to concretise those policies based on the SME needs within the region. In the following section some policy proposals on how to fill these gaps are discussed.

A 6.3 Policy proposals

A 6.3.1 Cross-border Harmonisation of regulation/legislation

Problem 1		
Macro-regional challenges	Common national-centric challenges	Solution
Lack of harmonisation of legislation and regulation Inadequate development of common standards. Fragmented market and less business opportunities	<ul style="list-style-type: none"> Challenges/barriers created by regulation Lack of supporting financial instruments Lack of (physical and ICT) infrastructure/infrastructure upgrades 	Cross-border regulatory measures

Different countries have different regulatory/legislative and policy initiatives aimed at SME digitalisation. However, legislative and transnational policies are not coherent, which impedes on the ability of SMEs to operate across borders. Examples include national and regional technical regulations on goods and services²⁸, tax policies, market entry and exit policies, rules towards access to finance, etc. In order to ensure that SMEs are able to benefit from an enabling cross-border business environment, a BSR inter-ministerial coordination on regulation and legislation is needed, for example for alignment of national regulations and administrative practice in those cases where national differences in legislation or administrative practice have become obstacles for cross-border operations.

Proposals

Specific problems	Regulatory barrier, lack of financial instruments, infrastructure /infrastructure upgrade.
Suggestion	Harmonisation of legislations, policies and technical regulations governing SME digitalisation in BSR countries.

²⁸ https://danishbusinessauthority.dk/sites/default/files/barriers_for_smes_on_the_single_market.pdf

Specific problems	Regulatory barrier, lack of financial instruments, infrastructure/ infrastructure upgrade.
Suggestion	Encourage national agencies to support a coherent, supportive regulative environment for SMEs in the BSR.
Specific problems	Lack of financial instruments, infrastructure/infrastructure upgrade.
Suggestion	Encourage more collaboration between Digital Innovation Hubs in the BSR to facilitate transnational services to SME's
Specific problems	Lack of financial instruments, infrastructure/infrastructure upgrade.
Suggestion	Coordinating the BSR Smart Specialisation Strategies (S3) in order to create possibilities for SMEs operating within an S3 to develop the capacity to operate across borders. This could be via joint projects.
Specific problems	Lack of financial instruments, infrastructure/infrastructure upgrade.
Suggestion	Promoting initiatives, such as access to financial support (financial regulation) and avenues for cross-border infrastructure upgrades that will make SMEs in the BSR competitive, e.g. bilateral and multi-lateral funding initiatives probably geared to joint smart specialisation strategies.
Specific problems	Lack of financial instruments, infrastructure/infrastructure upgrade.
Suggestion	European funding solutions for cross-border activities or, alternatively, opening national and regional support structures and activities also for SMEs operating in other countries and regions, provided that they collaborate with local companies.

Proposal implementation

The suggestion here is for a more committed and developed macro-regional inter-ministerial coordination of national initiatives towards a common BSR SME digitalisation agenda, for example by leveraging existing collaborations. An existing inter-parliamentary body where inter-ministerial coordination is being developed is the Nordic-Baltic digital collaboration (MR Digital) under the umbrella of Nordic Council of Ministers²⁹. The Nordic-Baltic digital cooperation could be considered extended to include Poland and Germany in specific topics related to industry digitalisation, for example in a MoU.

A 6.3.2 Cross-border platforms for cooperation

Problem 2		
Macro-regional challenges	Related national challenges	Possible solution
Lack of platforms for industry cooperation across borders	<ul style="list-style-type: none"> • Need for upgrade of networking • Lack of suitable financial instruments 	Introduction of cross-border networking organisation and technical platform

²⁹ <https://www.norden.org/en/information/about-nordic-council-ministers-digitalisation-mr-digital>

The suggestion here is for more integrative cross-border organisational (DIH, clusters, etc.) and digital BSR platforms.

Proposals

Specific problem	Need for upgrade of networking.
Suggestion	Industry associations in the BSR should collaborate to organise annual expositions where SMEs and platforms can gather to network and share ideas.
Specific problems	Need for upgrade of networking, Lack of financial instrument, Infrastructure upgrade
Suggestion	BSR international platform projects should be encouraged. Here selected companies from one platform in one country could collaborate with other companies from a platform in each BSR country on such projects. Viable projects could be to develop needed digital cloud platforms where other SMEs in the BSR could deliver their services. Such a collaboration has advantages: It helps platforms to know about each other and their capabilities; creates awareness of new digital technologies; results in an innovation that will be useful also to other SMEs; strengthens the links between platforms. Such projects will become a source of finance and infrastructure upgrades for the participating SME's.
Specific problem	Need for upgrade of networking
Suggestion	Platforms should be active in exporting their best practices to platforms in other BSR countries to create awareness of themselves and the practices. Most existing platforms have best practices on SME digitalisation, e.g. DIMECC in Finland has Demo-booster, an innovation service for rapid commercialisation ³⁰ . MADE in Denmark, in collaboration with research institutions, have developed a Strategic Platform for Innovation and Research (SPIR) and a platform MADE Digital ³¹ . In this project, digital solutions are developed to make production more innovative and competitive. In DIGINNO, a digital assessment tool was developed to evaluate the level of digital transformation in a company ³² . There are lots of similar initiatives, but they are not necessarily aware of each other's existence or the collaborative potential.
Specific problem	Need for upgrade of networking
Suggestion	Industry associations in the BSR can collaborate to develop a digital platform that maps different clusters, innovation platforms, hubs, industry associations, etc. in different countries. On this platform, different entities would be able to follow the activities of other entities and communicate with them. The platform could be in the form of an interactive social network. It would enable the

³⁰ <https://demobooster.dimecc.com/>

³¹ <https://www.made.dk/forskning/>

³² <https://www.diginnotool.eu/>

	different entities to become more aware of each other's activities and may lead to closer collaboration between entities and their member companies.
Specific problem	Need for upgrade of networking, Lack of financial instrument
Suggestion	New transnational BSR projects could be developed around topics like free flow of industrial data (data warehouses), shared public services, and pilots for new designs of policymaking processes. The projects could be developed collaboratively by industry associations, public agencies, and SMEs. Such projects would become a viable source of financial income for the SMEs.
Specific problem	Need for upgrade of networking
Suggestion	Transnational BSR collaboration between hubs and clusters from the member states on how to raise SME's awareness about needs to change their business models as value systems and new technologies evolve. This is ongoing to some extent but most SMEs are not part of it. Hence, more awareness initiatives in this regard are needed and systematic exchange of learning between them.
Specific problem	Need for upgrade of networking; Lack of financial instruments
Suggestion	Developing new BSR pilot initiatives within and between Digital Innovation Hubs (DIHs) and Smart Specialisation Strategies (S3) to make them jointly more competitive. Such initiatives can and should be promoted in the BSR transnational collaboration enabled by InnoCAPE ³³ and the upcoming BSR S3 initiative ³⁴ . Such joint initiatives will create awareness for advanced digital technologies and their usefulness within the clusters. They will also enable SMEs to join such platforms once they realise the value of advanced digital technologies.

A 6.3.3 Cross-border collaboration between industry and educational institutions

Problem 3		
Macro-regional challenges	Related national challenges	Possible solution
Inadequate collaboration between industry and educational institutions	Need for upgrade of networking with and between knowledge institutions	Introducing more cross-border collaboration between industry and educational institutions.

The suggestion here is for active collaboration between industry and knowledge institutions across borders. Universities and other knowledge institutions across the BSR should develop digitalisation laboratories that are not exclusive to national actors. They should be open to SMEs and accessed also remotely. SMEs are typically open to more collaboration with

³³ <https://innocape.eu/>

³⁴ <https://projects.interreg-baltic.eu/projects/bsr-s3-ecosystem-214.html>

knowledge institutions but do not necessarily know how to initiate, for example due to lack of information about the university's internal structure and proper contacts.

Proposals

Specific problem	Need for upgrade of networking with knowledge institutions
Suggestion	Digital Innovation Hubs, industry associations and universities in the BSR could develop a BSR-wide database of active SMEs and their needs and interests. Universities and researchers can use the database to inform SMEs about research portfolio, accessible and available resources (facilities, machinery etc.) and accomplishments. The database can be developed nationally or locally and then linked to other (countries') database systems. It must be clear who will collect data, where to store it and how it is accessed. The infrastructure will enable SMEs to identify the knowledge institution with whom they can partner to develop projects, products or engage in knowledge sharing. It will also facilitate connections between SMEs and researchers.
Specific problem	Need for upgrade of networking with knowledge institutions
Suggestion	Promotion of joint SME-government-university projects, initiated and boosted by industry associations and government agencies ³⁵ .
Specific problem	Need for upgrade of networking with knowledge institutions
Suggestion	Promotion of national policies that encourage or mandate SME representatives to have a say in the creation and development of curricula at educational institutions ³⁶ . It could include the cross-border aspect enabling SME's in neighbouring countries to benefit from knowledge and student activities across the border.
Specific problem	Need for upgrade of networking with knowledge institutions
Suggestion	BSR inter-ministerial coordination for aligning regional SMEs' need to access knowledge incl. academic and applied research at universities.

A 6.3.4 Access to qualified workforce

Problem 4		
Macro-regional challenges	Related national challenges	Possible solution
Insufficient access to qualified labour power.	<ul style="list-style-type: none"> • Lack of relevant skills and competences • Lack of widely accepted learning certificates • Long lead times of formal education 	Introduction of collaborative regulation and technical measures for promoting and accessing relevant skills and competences.

³⁵ E.g. in Denmark, MADE.DK promotes similar projects and provides support as an applicant to apply for EU funding for the project. The application for EU funding enables a cross-border approach as universities and SMEs from different countries collaborate.

³⁶ This is a practice in Denmark where an education cannot be offered unless there is a feedback from industry that there is the need for it. This activity keeps the industry informed about the competences within the university.

Although there is free movement of citizens in the EU, there are still mobility-related challenges. These challenges are heightened by the requirements imposed on the labour workers when they migrate from one country to another. There are requirements related to getting a resident permit, registering with the tax office, etc. Some of these requirements are tied to getting an accommodation, which can be difficult in some countries. Due to these challenges of mobility, it is sometimes difficult for SMEs to attract, access, and secure talented and qualified labour force.

There are also challenges related to wage disparity between BSR countries as well as specific language requirements, especially in positions related to customer interfaces and services. Hence, there is the need for regulatory incentive and wage incentive to hire. Furthermore, the problem is heightened by the inability of SMEs to know, where they can hire qualified labour force and/or how to develop the competences of their existing personnel.

Proposals

Specific problem	Lack of skills and competence (mobility of labour force)
Suggestion	Inter-ministerial collaboration to ensure the removal or lowering of barriers to labour mobility, acknowledging BSR as a “pool of talents”
Specific problem	Lack of skills and competences (competence of labour force)
Suggestion	BSR-wide, inter-ministerial, cross-border collaboration to create and modify relevant teaching schemes that address the identified competence gaps, and to develop the right university courses for creation of the required knowledge.
Specific problem	Lack of skills and competences (competence of labour force)
Suggestion	Promotion of national policies that either encourage or mandate SME representatives to have a say in the development of curricula of universities and other educational institutions.
Specific problem	Lack of skills and competences (access to labour force)
Suggestion	Industry associations in the BSR should collaborate to create a digital platform that can perform the following tasks: <ul style="list-style-type: none"> • Enable SMEs to track the offering of universities and other institutes for higher education in the whole BSR in order to identify potential sources of trained new work force and tools for competence development of their existing personnel. • Enable SMEs to identify and track non-university-based candidates with competences that they need.
Specific problem	Lack of skills and competences (competence of labour force)
Suggestion	BSR collaboration on best practice in practice-based learning and on-the-job training
Specific problem	Lack of skills and competences (access to labour force)

Suggestion	BSR-wide competence centres located in different countries and specialised in different advanced technologies where resources are pooled and capacities offered for SME's in the whole of BSR
Specific problem	Lack of skills and competences (competence of labour force)
Suggestion	A BSR-wide testbed for reinventing education: A growing number of EdTech startups around the world are working to improve education with technology (i.e. to adapt to rather than just adopt technologies in the classroom on different levels of education). BSR countries could work together to leverage these developments by providing a joint harmonised testbed for reinventing education, from elementary school to on-the-job training ³⁷ .

³⁷ As suggested in [State of the Digital Region 2017](#), from think tank Top of Digital Europe, www.topofdigital.eu

Section B: Cross-border digital solutions for business

B1. Introduction

Part B is based on DIGINNO WP3 and has a focus on cross-border e-mobility for businesses. It gives examples of challenges and obstacles for businesses and puts forward policy proposals for G2B (Government-to-Business) cross-border services that will enhance the e-mobility of businesses in the BSR.

Ideas and proposals in part B are mainly based on the document: ***“Recommendations to policy makers for developing G2B cross border e-services in Baltic Sea region”*** elaborated by Latvia’s Ministry of Regional Development and Environmental Protection (VARAM). The paper is a deliverable in Feb 2020 from DIGINNO WP3, Activity 3.3, as an input to WP4. It suggests policy and technical recommendations for policy makers and public institutions for the development of digitalised G2B services.

WP3 includes activities that bring out the shortages and set prerequisites of development for different G2B cross-border services. The policy recommendations consider the input from industry organisations, businesses, as well as public sector organisations in countries during the different activities of WP3. As stated in the VARAM paper, the policy recommendations are inspired by reports elaborated in DIGINNO WP3 - 1st study report³⁸ and 2nd study report³⁹ - as well as numerous discussions among project partners and with external stakeholders from policy and industry side, in particular during the development of show case models.

Due to the lack of existing definition of the term **“cross-border”**, the project partners agreed upon a definition that builds on characteristics that best describe the term **“G2B cross-border e-service”**:

- it can be used by the business based in a foreign country,
- it is related to a company’s business operations or formalities,
- it is independent of the location of the business that uses it and of country of establishment,
- it is provided by a governmental body (central or local institution),
- it operates in an interoperable environment,
- it is based on shared electronic authentication, identification, and signature support services,
- it is available in at least one language other than the official, original national language, and
- G2G transactions are excluded, as well as G2C (Government-to-Consumer), unless Customer is a business representative acting on behalf of a business.

³⁸ [“The research report of G2B cross-border services and e-services at the national level”, CIVITTA 2018](#)

³⁹ [“Business study \(needs side\) report Business needs assessment of G2B cross-border services usage”, CIVITTA 2018](#)

B 1.1 Cross-border e-solutions in the BSR: State of the art

Based on the European Commission’s DESI index 2020 (fig 1), the BSR countries lead the way in Europe when it comes to the implementation of digital public services. More than 60% of digital public services in the BSR are online. Estonia is ahead of both the BSR and Europe with almost 90% of its public services online. Germany is the BSR country with the least number of public services online, i.e. 60-70%.

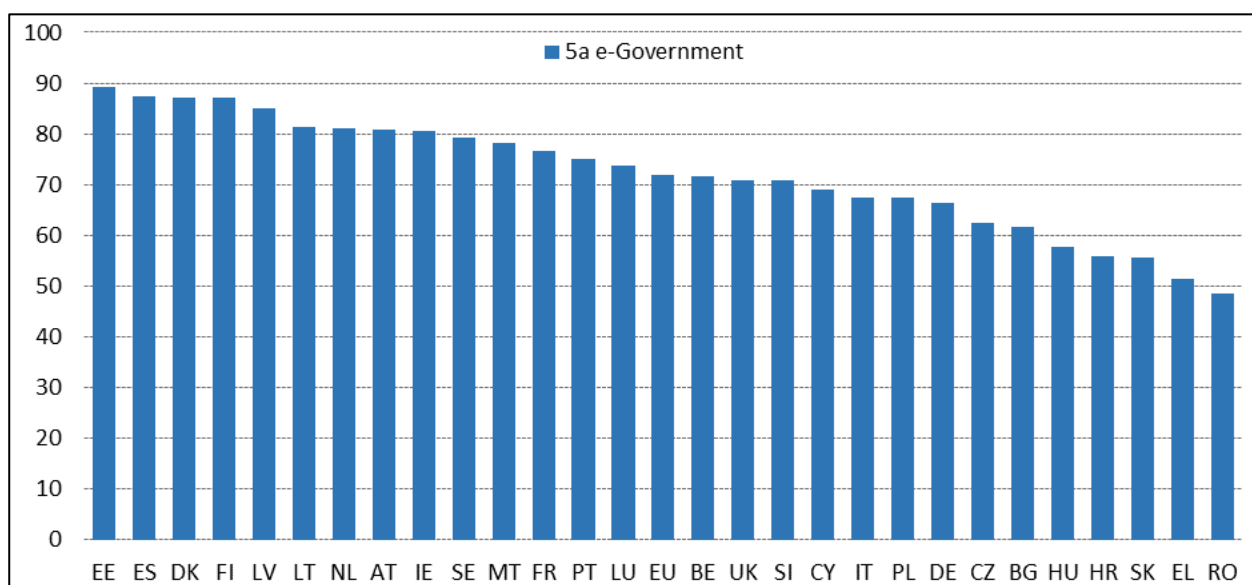


Figure 1. Digital Public Services⁴⁰

Source: [DESI 2020](#)

Based on the annual evaluation made by DESI, in 2018 digital public G2B services were already highly adopted in the EU⁴¹. In the BSR, Sweden, Denmark, Estonia, Lithuania and Latvia were at the forefront. Norway is also doing very well in this regard as seen in chapter 2. Hence, individually the different countries in the BSR are gradually developing their e-government infrastructure and specifically the G2B infrastructure needed both for horizontal and vertical services. Different EU and national initiatives have been helpful in the development of e-government infrastructure in Europe from 1996 when the continental policy measures were introduced to date.

However, the overall objective of achieving cross-border G2B digital public services in the EU is far from being achieved. The same is the case in the BSR. There have been studies in the facilitation of

⁴⁰ <https://ec.europa.eu/digital-single-market/en/digital-economy-and-society-index-desi>

⁴¹ DG Connect, Digital Economy and Society Index Report 2018 – Digital Public Services, 12 09 2018. [Online].

cross-border G2C initiatives in the Baltics, an example is the e-prescription initiative initiated between Finland and Estonia. These two countries also exchange information between business and population registers using X-Road platform. In G2B, examples such as the exchange of data between the Estonian and Finnish Business registries have been mainly case studies.

B 1.2 Investigating the challenges: WP3 show-cases

The lack of adequate cross-border G2B digital public services has inspired the DIGINNO WP3 activities. In WP3, the problems related to these services were identified and investigated, solutions proposed, and policies recommended. During their investigation of the G2B challenges, the project partners realised the need to conduct a business needs analysis in the bid to provide a scope for the investigation. This is because there are hundreds of G2B e-government services in the BSR and it is difficult to provide overarching solutions for problems associated with each service. Each of these services are unique and the demands from businesses on the public agencies for these services is unique in themselves.

Hence, to investigate the aforementioned problem, DIGINNO partners - based on business interviews - identified four G2B e-services in which partners from different countries had a common interest and in which show cases could be developed:

- eCMR⁴²
- e-receipt
- “Know your customer” (KYC)
- Cross-border business registration

These four e-services were identified through the following process:

As the first step, the state of horizontal,⁴³ cross-border, digital public services in the BSR was investigated. The aims were (i) to identify the market entry, market activity, and market exit horizontal, cross-border G2B services that were available either online, offline or partially online in the BSR countries, and (ii) to identify the challenges associated with the delivery of horizontal G2B cross-border services. The results of this investigation were documented in the first study report⁴⁴. As the second step, the state of selected vertical⁴⁵ cross-border digital public services in the BSR was investigated. The aim was similar to that of the first step, but the focus was on the selected vertical cross border services.

They were:

⁴² CMR document deriving from CMR Convention (UN Convention for the carriage of goods) is mandatory for international shipments and holds key information about the goods, the transporting and receiving parties

⁴³ Horizontal cross border services are services that cuts across different sectors

⁴⁴ [“The research report of G2B cross-border services and e-services at the national level”, CIVITTA 2018](#)

⁴⁵ Vertical cross border services are sector specific services

- Land and water transport;
- Manufacture of wood and products of wood and cork, except furniture;
- Manufacture of machinery and equipment;
- Telecommunications;
- Financial service activities, except insurance and pension funding.

The major finding in the second phase was the disparity in the maturity level of the investigated services and the challenges posed by cross-border interoperability. These challenges are elaborated in more detail in chapter B2. Based on the findings, DIGINNO partners identified four common areas where countries in the BSR could collaborate to facilitate horizontal and vertical G2B digital public services. The areas were defined as cross-border G2B showcases and as areas for further investigation into the challenges posed by interoperability and prospective solutions to the problems.

The four showcases were:

- Cross-border eCMR in the Nordic-Baltic region,
- Cross-border business registration using eIDAS,
- Borderless Real-Time Economy (RTE), spearheading eReceipt, and
- Cross-border Know Your Customer (KYC) utility.

Investigating the problems and solutions related to these showcases was done in collaboration with working groups made up of SMEs, public agencies, and industry associations from the countries the four representative services were decided upon. Three of the services were horizontal and one vertical. The horizontal services were:

- Cross-border business registration: the service is designed to enable any BSR business owner to register his/her business in another BSR member state without traveling there.
- Cross-border Know Your Customer (KYC) utility: the service is designed to enable both local and foreign businesses in the EU to conduct cross-border verification while onboarding a customer.
- Cross-border eReceipt: the service is designed to harmonise common standards and cross-border networks that facilitate the delivery of eInvoice and eReceipt services in the BSR.

The vertical service is designed for the transport sector.

- Cross-border eCMR service: the service is designed to enable the cross-border transmission of electronic consignment notes between different stakeholders in the BSR, such as the border police, the transport companies, the national transport agencies, eCMR service providers, etc. The service interlinks the different e-CMR systems in the BSR and enables free flow of data as well as the electronic management of the consignment notes.

Though distinct, these services are also interlinked. The cross-border business registration system serves the businesses during the market entry, the cross-border KYC utility is for onboarding of customers – enabling the SMEs to expand their reach across borders, the cross-border eReceipt is for enabling cross-border Real Time Economy (RTE)⁴⁶, and the cross-border eCMR is an example of an actual vertical service that will use various horizontal services.

For each of the four showcases, DIGINNO partners and working groups investigated the challenges, designed solutions, suggested and evaluated policy recommendations. Their activity forms the basis of Chapter B4 with recommendations aimed at providing inspiration to policymakers and industry to collaborate at the transnational level in the BSR.

⁴⁶ e-invoices, e-receipts, automated reporting, e-CMR, real-time e-procurement, instant payments real-time supply chains, real-time product information are all examples of the RTE concept

B2. Cross-border e-services for e-mobility: Challenges and potential solutions for businesses

This chapter outlines challenges and potential solutions to cross-border e-services meant to facilitate e-mobility.

The chapter has two sections. In the first section, the challenges outlined are generic but inspired from the work on the showcases. In the second section, the challenges and solutions are showcase-specific. Although the chapter is split into two sections, the overall challenge of cross-border interoperability will be discussed in this chapter. The various dimensions of the challenges will be discussed in both sections.

The challenges and solutions to cross-border e-mobility presented here are those investigated in DIGINNO. These investigations were conducted via policy seminars, working group sessions, bilateral interaction with public and private e-mobility stakeholders, and in the cross-border mobility showcase development.

B 2.1 Generic Challenges

As mentioned above, the main challenge identified as a hindrance to cross-border e-mobility is lack of cross-border interoperability. However, there are also additional challenges associated with cross-border interoperability. The associated challenges have an indirect impact on cross-border interoperability. This is because their existence serves as a barrier towards achieving cross-border interoperability. Hence, in the following section the main challenge, its associated challenges and their implications are presented.

B 2.1.1 The main challenge

The major challenge identified was the ***lack of cross-border interoperability between the relevant national e-government infrastructures***. The infrastructure are information systems operated by national agencies offering e-government services. The infrastructure supports different aspects of the vertical and horizontal sectors of the economy. The dimensions of the cross-border interoperability identified in the DIGINNO processes were legal, technical, semantic, and operational. The four dimensions must work together. Each BSR country has national laws that govern the e-government service delivery processes. Hence, the technical infrastructure and its underlying semantics (i.e. data exchange logic) are deployed in such a way that they support the

national, existing operational processes. As a result, the technical infrastructure differs in different countries and it becomes challenging, for example, to connect the procurement infrastructure in one BSR country with the procurement infrastructure of another BSR country.

Though the four dimensions of interoperability work together, the one considered most urgent in this policy paper is **legal interoperability**. This is because the alignment of laws governing national e-government service delivery processes will enable the other forms of interoperability to materialise. Aside that, the EU has introduced laws, initiatives and standards that will enable technical and, to a lesser extent also, semantic interoperability. These initiatives include the Single Digital Gateway Regulation (SDG), the eIDAS regulation, e-Invoicing regulation, interoperability frameworks (such as Interoperability solutions for public administrations, businesses and citizens (ISA2)), the European Interoperability Framework (EIF), and harmonised standards, such as those in the Connecting Europe Facility (CEF) building block, Pan-European Public Procurement OnLine (PEPPOL) and Electronic Freight Transport Information Regulation (adopted Aug 2020).

However, the fruits of these initiatives are rare as national laws still serve as an effective blockage towards the full implementation of these initiatives. An example can be seen in the implementation of the eIDAS. The eIDAS infrastructure was designed to facilitate secure and trusted access to public service portals of EU member states for EU citizens and businesses. Granting access to these service portals works all right, but transactions are not possible. This is because the accessing party needs to fulfil certain requirements set by the EU or the BSR member state. In some cases, fulfilling such a requirement requires travel to the member state. An example of such requirement is proof of residence in the EU or BSR member state. Hence, the onus is now on BSR member states to align their national laws and policies so that these EU initiatives are enabled, and therefore the reason for focusing the policy paper on legal interoperability.

B 2.1.2 Associated challenges

The associated challenges to cross-border e-mobility are national challenges that have an indirect impact on cross-border interoperability. These are challenges related to inadequate (technical) infrastructure and other operational challenges.

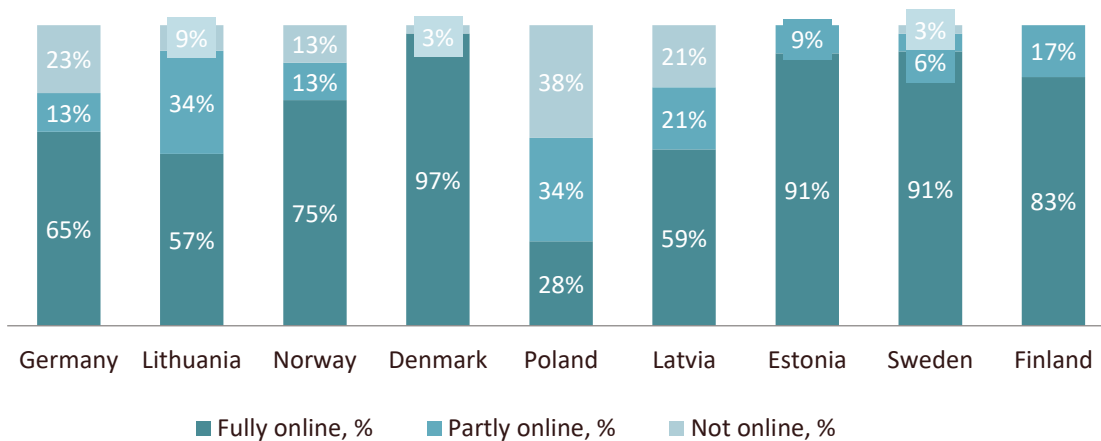
Inadequate infrastructure at the national level

As seen in fig. 1, in general the adoption rate of digital public services in the BSR countries is at a very high level. Aside Spain, five of the first six countries in the EU are BSR countries, and Poland and Germany are not far behind. So, overall there is already a great deal of effort in the development of national e-government infrastructure.

However, the indices indicated in fig. 1 point more toward Government-to-Citizen (G2C) e-government services. Further investigations conducted reveal that the infrastructure needed to deliver digital public services in individual BSR countries is still lacking key functionalities. The

situation is more pronounced when it comes to the delivery of G2B digital public services. This further investigation was conducted in DIGINNO. The focus of the investigation was on the state of adoption of horizontal and vertical G2B digital services in the BSR. The horizontal services investigated were market entry, market activity and market exit services. The vertical services investigated bordered on services related to market activity. The analysis shows that G2B public services were either delivered online, partially online or offline as presented in the figures 2 and 3. The services delivery processes described as partially online are hybrid (a combination online and offline) services. This implies that the infrastructure available is not sufficient to facilitate a fully digital public service. The offline service are services not delivered digitally.

Figure 2 - Horizontal G2B services by e-maturity, %



Source: “The research report of G2B cross-border services and e-services at the national level”, CIVITTA 2018

As seen in fig. 2 the majority of the BSR countries, except Poland (28%), in 2018 delivered more than 50% of their horizontal G2B services online. The country with the highest number of online G2B horizontal Services is Denmark, delivering 97% of their horizontal G2B digital public services online. Estonia has made giant strides over the years in the development of their e-government services. This has yielded results as 91% of their online horizontal G2B services are delivered online. Also Sweden delivers more than 90% of their horizontal G2B services fully online. From the 1990s onwards the country has invested heavily in the development of the national IT infrastructure and e-government services.

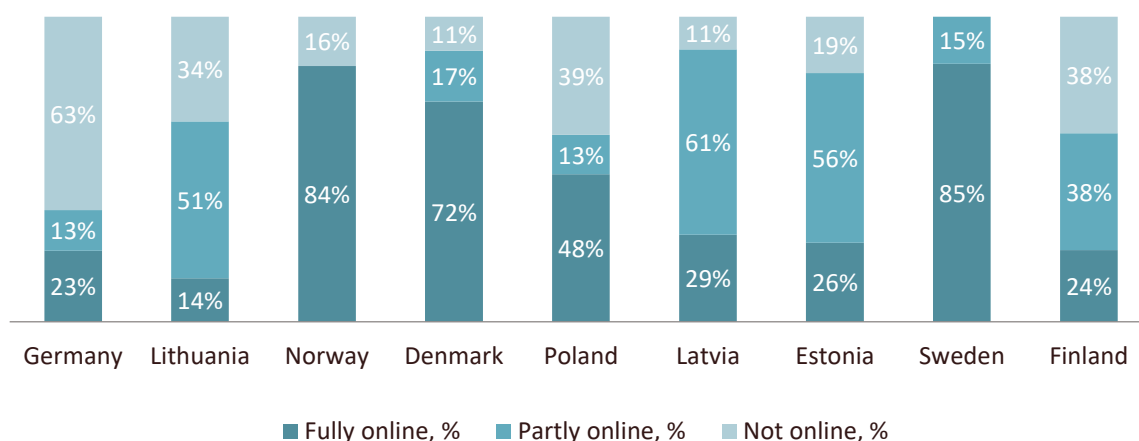
However, based on the results of the survey more work needs to be done at the national level in order to ensure that all horizontal services are fully online. As seen in figure 2, services are still being developed that are only partially online. Estonia and Finland were the only countries delivering those services using the hybrid approach (partially online). However, the other countries sampled

(Lithuania, Poland, Norway, Germany, Latvia, Sweden and Denmark) still delivered some of their horizontal G2B digital public services offline. Denmark and Sweden had the least (3%) of their G2B horizontal digital public services delivered offline.

Poland and Germany had more of their G2B horizontal digital public services online. In Germany one of the reasons for such a high number of offline horizontal services is the disparity in digitalisation of public services in the different German federal states. For example, horizontal services such as business registration is handled by different agencies from the federal state and district level. Along this value-chain certain aspects are digitalised and others are not. Hence the number of German G2B horizontal e-government services delivered offline could be high despite the high level of digitisation of public services at the federal level.

The fact that offline and partially online systems still exist in the BSR imply that there is still work to be done to ensure that the remaining systems are fully digitised.

Figure 3 - Vertical G2B services by e-maturity level, %



Source: “The research report of G2B cross-border services and e-services at the national level”, CIVITTA 2018

Fig. 3 highlights the results on the level of digitisation of vertical or sectoral G2B services in the BSR. Here most of the vertical digital public services in 2018 were not fully online if compared to the state of digitisation of the horizontal G2B digital public services. The countries with the most online vertical G2B services were Norway (84%), Denmark (72%) and Sweden (85%). Partly online vertical services prevail in Germany and in the Baltic countries, namely Lithuania (51%), Latvia (61%) and Estonia (56%). In Germany most vertical services are offline (63%), whereas in Finland 38% of their vertical G2B digital public services are offline and 38% are delivered using the hybrid approach.

Just as in the case of the horizontal G2B digital public services some countries had a great deal of partially digital vertical G2B digital public services. These countries were Lithuania (51%), Latvia

(61%), Estonia (56%) and Finland (38%). Poland (13%), and Germany (13%) have a smaller portion of partially digital Vertical G2B digital public services but most of their vertical G2B digital services are delivered offline. Sweden was the only country with no fully offline vertical G2B digital public services. This is because the services that were not online were partially online. Denmark and Latvia were the countries with the smallest number of offline services.

Although there are differences in the state of development of vertical G2B digital public services, it is difficult to compare the countries because they have different governance structures, different institutions and different culture towards e-government digitisation. Hence these factors do affect why, how long and in what way they develop their e-services to enhance e-mobility.

Nevertheless, as seen in fig. 2 and 3, despite the high implementation of digital public services in the BSR reported in fig. 1, there are cases where there is insufficient infrastructure to enable the delivery of G2B digital public services at the national level. The problem is not significant with horizontal services as it is with vertical services. Furthermore, there are substantial differences in the maturity levels of digital public services across the BSR, the Nordic countries and Estonia being the leaders.

In a further investigation conducted within DIGINNO, it was revealed that only 72%⁴⁷ of the existing digital public services in the BSR are available cross-border. Cross-border here implies that the public service provider has provided some form of access for foreign businesses to access such services. However, due to lack of technical interoperability between the peer national agencies in the region, the findings from the project indicate that the number of BSR digital public service providers that can exchange data with each other to facilitate cross-border e mobility is very low. This means that national operations, though consolidated nationally, still exist in silos on a cross-border level. Obviously offline and partially online services are not cross-border ready so they are not considered.

Operational challenges

These are challenges related to fully and partially online services:

- Language barrier is the most common challenge when addressing limitations to uptake of G2B services. This is because most of the countries in the BSR offer their G2B services in the local Lingua franca and only in a handful of other languages. Sweden is an exception. Language barrier is most typical in Germany and Lithuania, where 49 out of 77 and 48 out of 77 analysed services, respectively, face this barrier. Three other countries in which language is the main barrier using G2B services are Denmark (30 services), Poland (28), and Latvia (26). In total, 262 services analysed among all countries face this particular barrier.

⁴⁷[“The research report of G2B cross-border services and e-services at the national level”, CIVITTA 2018](#)

- Lack of online identification takes a strong position in Sweden (36 services). It is also significant in Germany, Lithuania, Norway, and Finland (24 to 28 services). In Estonia, only one service was recognised with online identification as one of the barriers. The absence of online identification has been identified as the second biggest barrier only in the not online group. It should be noted that eIDAS will hopefully solve this in future.
- Absence of e-documents is another challenge. Some digital services are either hybrid or informational. Hence, paper documents have to be sourced and received from the relevant local bureau in order to be processed for the intended service. In the DIGINNO survey, companies faced this challenge most often in Sweden (23 services) and Germany (17 services). In other countries quantity of analysed services with this barrier did not exceed more than six services. In Estonia, all G2B services already have e-documents function implemented. Furthermore, Estonia is moving towards data exchange instead of exchange of e-documents.
- Lack of online recognition and authentication of documents implies that relevant documents have to be certified separately before they are accepted. Online recognition is available for all services analysed in Poland. It is least available in Germany (22 services) and Sweden (23 services). In other countries the barrier occurs in 9 or less services.

These national operational challenges are hurdles that businesses encounter when they access G2B cross-border services they need to deliver their products and services. The national centric challenges also make it difficult to facilitate cross-border operational interoperability and semantic interoperability of the different national technical systems delivering the services. The challenges highlight that some of the systems facilitating national processes in some countries are still in silos. More needs to be done at the national level to facilitate a centralised service delivery system as without one achieving cross-border technical interoperability will be difficult. The challenges also highlight some form of protectionism, which can make cross border interoperability impossible in practice where adequate facilitating measures are lacking.

B 2.1.3 Implications of the challenges

The lack of cross-border interoperability has implications for cross border e-mobility of businesses and public agencies. The implications for businesses include:

- The inability to easily enter new markets: Although there is free movement of goods and services in the EU, each member state has different requirements such as licensing, access to public data, rules for company operation, and company financial requirements. National laws govern these requirements. As long as the legal and policy barriers exist, the technical system and the operationalisation will hinder cross-border e-mobility. Hence, mobility of

businesses will become a luxury, as only SMEs which have the resources to meet the demands of the requirements will achieve mobility.

- Cost of cross-border operations: The existence of the legal, technical and, operational interoperability barriers comes with a cost to businesses. This includes the cost of travelling, the cost of transactions with the public agencies, and the cost of setting up operations in the destined member state. The cost of travel and some of the costs of transactions could be reduced if the barriers to e-mobility were reduced or removed. An example could be the settling of travel expenses using an e-Receipt network and service. Rather than collecting paper receipts and filing them via a bureaucratic, physical process, travelling employees of an SME can make business-related procurements in a foreign member state and transfer the receipts and other documentation digitally to the company accountant, to the tax office, and to other relevant stakeholders. So, the SME does not have to invest in country-specific filing systems.

The implications of lack of cross-border interoperability for public agencies include:

- The impossibility to share data electronically across borders;
- The inability to implement the File Once Only Principle;
- The potential high cost of transactions if verification services are needed from another public service operator in the BSR.

In the next section, potential solutions that will inspire the policy recommendations will be discussed. As mentioned in the introduction, cross-border G2B services are broad and it is challenging to offer overarching solutions to the hundreds of services that exist in various countries. Hence, the four showcases worked upon in the DIGINNO project will be presented. In each case, the practical problem and its solution for e-mobility will be described. To read more about the showcases, please consult the individual showcase reports⁴⁸.

⁴⁸ <https://www.diginnoobsr.eu/wp-3-2-outcomes>

B 2.2 Showcase specific challenges and solutions

B 2.2.1 eCMR challenges

What is the problem?

The overall problem is the slow uptake of digital means in the international road transport logistics operations. Most freight transport operations in the EU still require the use of paper version of eCMR/Consignment note as the main document, leading to the situation that international truck drivers still need to carry with a huge amount of paper hardcopies. According to the Commission staff working documents (i.e. Impact Assessment studies) in the recent years, *almost 99% of all cross-border transport operations in the EU still involve paper-based Consignment note at one or several stages of the operation*⁴⁹.

A number of corporate/private e-CMR systems have already been implemented by major transport operators and taken into use in the Business to Business segment, also in cross-border operations. However, they are, in general, *not recognised by public authorities in all countries*, and the *information provided is not compatible* with the public data systems, which can be accessed by, for Tax and Customs Board, Police, Road Administration, etc.

What is the solution?

Cross-border eCMR working group proposed a model for a secure and trustful way to exchange the eCMR data between the Government and the Business from different countries. It will include:

1. The partners will develop the indexing scheme for the eCMR interchange;
2. The Distributed Ledger Technology (DLT) service will be used secure and document the data interchange;
3. Specialised API for eCMR information access will be developed (between eCMR service provider and Governmental institution, G2B).
4. Specialised API eCMR index exchange will be developed (between foreign Governmental institutions, G2G).

This solution has been prototyped as described in chapter B5.

B 2.2.2 eReceipt

What is the problem?

Many BSR countries do not have any previous experience with eReceipt services, only few of them have developed national standards, and even less have launched related live services. Lack of

⁴⁹ Impact Assessment. Proposal for a Regulation of the European Parliament and the Council on electronic freight transport information, 17.05.2018.

common standards, cross-border networks, and unified regulation has hampered and slowed down the uptake of cross-border eInvoices and eReceipts. eInvoices and eReceipts are very similar, as they both record business transactions. Some facts:

- There is no nationally or internationally agreed standard for eReceipts.
- Instead, some member states have created their own national standard(s).
- There is no standardised addressing logic or commonly used identification tools nationally or internationally for exchanging eReceipts.
- There is no commonly used infrastructure for exchanging eReceipts nationally or across borders.
- Due to lack of service providers, eReceipts are typically exchanged using the 3-corner model.
- eReceipts are also exchanged through point-to-point roaming channels.
- Most of the existing service providers do not have the capability to process eReceipts.

What is the solution?

To prevent the lagging situation with eReceipts, there is a real need to regulate the cross-border eReceipt service from the very beginning and to develop and agree on commonly used standards and infrastructure for cross-border eReceipt services. Technical recommendations:

- There is the need to agree on international eReceipt standard and a semantic model;
- There is the need to map existing eReceipt standards;
- There is the need to create relevant language translations;
- There is the need to agree on common addressing logic and identification tools;
- There is the need to use already existing infrastructure for exchanging eReceipts nationally and internationally (e.g. PEPPOL);
- There is the need to make sure that service providers compete using the 4-corner model;
- There is the need to promote the update of existing service providers' systems and software to process eReceipts.
- There is the need to use eReceipts as communication channel for accompanying communication and documentation, e.g. warranties, manuals, service calls, and recalls.

B 2.2.3 Know Your Customer (KYC)

What is the problem?

Currently collecting the data for conducting KYC consumes time and money (i.e. resources). The same data is collected repeatedly by the obliged entities. Access to national registers serving the purpose of obtaining information for conducting KYC is limited and often costly. Frequently, data/information received is not machine readable. Data exchange in-between obliged entities is

often very limited because of Anti-Money Laundering (AML) and Contra-Fighting of Terrorism (CFT) laws. Therefore, currently the cross-border exchange of KYC data which exists in national registries is not possible.

What is the solution?

A cross-border KYC utility allowing easier and cheaper identification of AML/CFT risks is needed. This utility will make it possible for the obliged entities to perform the assessment and identification of AML/CFT risks for a certain customer and its transactions. In practice, the obliged entity would feed the identification data into the KYC utility and, supported by the query based data collection from relevant national registers, have a chance to get the AML/CFT data and use it for its operations based on the defined data access needs. Obligated entities will see only data that is assigned to them in accordance with the standard. For example, banks will see much wider range of data than notaries, etc. The data collected is machine-readable and usable for risk-assessment modules/analyses. As the obliged entities will not have to start their risk assessment from zero, the use of proceeds from crime can be halted considerably faster.

B 2.2.4 Cross-Border Business registration

What is the problem?

There are different facets of the problem. They are:

- Institutional/Legal challenges
 - Business registration laws in the member states are still national.
 - There is no provision for electronic cross-border business registration.
 - Existing business registration laws are not citizen-centric.
- Operational/process challenges
 - Cross-border business registration is not possible in most EU member states, if the company representative or company owner does not possess the required national eID.
 - Business registrars currently cannot verify the identity of (foreign) Applicants. In most cases they regard their national eID as more trustworthy than others.
 - Existing business registration portals have limited language options for EU citizens.
 - Although there are some similarities in the business registration processes across member states, there are also differences with respect to, for example:
 - The type of certifications needed for documents. In some cases, the documents have to be certified at the destined member state.
 - When the Applicant needs to open an account to pay for the share capital. In some countries, this must be done before the company is registered. In other countries, this process occurs only after the registration.

- Another example is when the Applicant needs to register with the tax authorities: it is either before, during, or after the business registration process.
- Technical challenges
 - E-Identity and Access
 - Most member states are still implementing eIDAS as a form of e-Identity. In the showcase, only Estonia had a notified scheme.
 - Based on the investigation, those eIDAS eidentity frameworks that are being developed will not necessarily enable companies to be registered across borders. Companies still have to fulfil national legal requirements, which in most cases requires proof of residence or physical presence before they can register their companies. Hence, eIDAS in its current form and design is not sufficient.
 - Low business registration infrastructure readiness
 - Some member states possess either a semi-functional, incomplete, or non-existing cross-border enabled business registration infrastructure.
 - Lithuania possesses an electronic business registration system, but it is not enabled for cross-border registrations.
 - Denmark has enabled cross-border business registration, but their infrastructure does not recognise foreign eIDS. After the eIDAS is implemented, the situation will not be different, because the eIDs will only be used for identification of the Applicant, but its attributes will not permit transaction by law.
 - Norway has an electronic business registration system, but its cross-border transactions are only possible once the Applicant has been able to provide a proof-of-residence and has acquired a D-number.
 - Estonia possesses an electronic business registration system but proof-of-residence and an Estonian contact person are required. In Estonia, this is often solved via service providers.
 - Interoperability
 - Different member states possess different technical infrastructure and they are not technically interoperable.

What is the solution?

Technical

- In the showcase, a technical solution that would enable cross-border business registration and harmonise the process is proposed.
 - This solution is a middleware that interconnects prospective companies to the business registration infrastructure in each member state.
 - The middleware enables:

- The search for relevant business registration services available on the national infrastructure in each member state.
- The ability to directly register a company without being physically present in the member state.
- Access to the middleware is via eIDAS. Additional functionality is proposed to enable information accompanying eIDs via eIDAS to be sufficient for legal business registration.

Institutional

- The proposed owner of the infrastructure would be the European Business Registrar Association. The reason is to grant the national business registrars control over the infrastructure.
- A Public Private Partnership arrangement is proposed as a means of funding and maintaining the infrastructure.

Legal/ Policy recommendations

- The showcase further proposes policy recommendations that would enable the legal delivery and operation of the infrastructure in each member state. They are as follows:
 - EU policy approach
 - Business registrars in each member states ought to facilitate greater technical and organisational cooperation aimed at enabling technical interoperability among themselves and with relevant agencies at the national level.
 - National policy approach
 - Change management policies to enable the adoption of the infrastructure once implemented.
 - Member states should have a policy that facilitates the alignment of member states with their Chamber of Commerce to promote the ease in cross-border business registration process alongside the incentives for investing in the member state.
 - The provision of incentives that will make the member state an attractive place for a young entrepreneur to invest.
 - National laws
 - National business registration requirements can be restructured to enable companies fulfil selected aspects of the business-registration process across border, while the rest could be performed when they take up residence.
 - Adopting more citizen centric regulation and laws that will facilitate cross-border business registration online service delivery. Such laws should be premised on the expected increase in Foreign Direct Investment and employment creation potentials than just protecting national interests.

- Simplifying cross-border business registration rules without doing away with aspects of the business registration procedure that are beneficial to the member states. In this case, the registration process needs to be reorganised.

In chapter B4 examples of overall policy solutions are discussed that can address challenges related to interoperability. Policies aimed at enabling legal interoperability, which will serve as a driver for the technical, operational and semantic interoperability solutions, are described in this chapter.

B3. Policy framework and national initiatives

B 3.1 EU policies & strategies

Europe has made great strides in the development of digital public services and e-government. The commitments between Member States have been expressed in EU's e-government Action Plans, the first of which was launched in 2006 to promote an information society within the EU⁵⁰. The Malmö Declaration on e-government was approved in 2009, a.o. to achieve seamless cross-border mobility by 2015⁵¹. The 2017 Tallinn declaration was a political commitment to facilitate, among other objectives, cross-border e-government services for business. The current AP 2016-2020 includes actions aiming at "Enabling cross-border mobility with digital public services".

Numerous directives and regulations have been launched in the area of digital public services and e-government. Among main initiatives are:

Single Digital Gateway (SDG)

Launched in 2018 to facilitate online access to the information, administrative procedures and assistance services that citizens and businesses need to get active in another EU country. The goal is that by the end of 2020, citizens and companies moving across EU borders will easily be able to find out what rules and assistance services apply in their new residency. By the end of 2023 at the latest, they will be able to perform a number of procedures in all EU member states without any physical paperwork and a list of 21 important administrative procedures will be available fully online in all EU countries. More administrative procedures can be performed online than currently, by users in their own country and cross-border users. All national online procedures will have to be made fully accessible to cross-border users.

SDG includes establishing a single point of access to information, procedures and assistance services online. In addition, from December 2020, users will be able to provide feedback on the obstacles they may encounter in the single market to improve policymaking. The 'once-only principle' (i.e. users should not have to submit to authorities documents or data already held by other authorities) will be applied to cross-border exchanges of evidence for a range of procedures. The SDG infrastructure is still being developed, expected to be ready by 2023. There are still regulatory issues that have to be dealt with.

Electronic Identification and Trust Services (eIDAS)

⁵⁰ European Commission, EU e-Government Action Plan 2016–2020, 2015. [Online]. http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=15268

⁵¹ European Commission, The European e-Government action plan 2011–2015, 15 12 2010. [Online]. <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0743:FIN:EN:PDF>

The Regulation adopted in 2014 on electronic identification and trust services for electronic transactions in the internal market, to ensure cross-border mutual recognition of eID by creating a new system for secure electronic interactions across the EU between businesses, citizens and public authorities. eIDAS aims to improve trust in EU-wide electronic transactions and to increase the effectiveness of public and private online services and e-commerce. ensures that people and businesses can use their national electronic identification schemes (eIDs) to access public services available online in other EU countries.

Interoperability programmes

Since 1995, the EU has supported a series of programmes promoting interoperability for European eGovernment Services⁵². To remove barriers of the digital single market, the European Interoperability Framework (EIF)⁵³ has been introduced as a generic framework to organise cross-border cooperation in the EU. It allows administrative entities to organise an electronic exchange of information, amongst themselves and with citizens and businesses, in ways that are understood by all parties.

As part of the EIF, the ISA² Programme (Interoperability Solutions for European Public Administrations) supports the development of digital solutions that enable public administrations, businesses and citizens in Europe to benefit from interoperable cross-border and cross-sector public services. A follow up of ISA that supported cross-border large scale projects. ISA² is running 1 Jan 2016 to 31 Dec 2020.

ISA² funding can be used to promote interoperability. The programme is currently developing the European Interoperability Reference Architecture (EIRA©) for classifying and organising building blocks relevant to interoperability, which are used in the delivery of digital public services. The goal is to facilitate interoperability and reuse when developing public services. EIRA is a way to implement the EU interoperability framework.

Large Scale Pilots

As part of the EU e-govt Action Plan 2016-2020, so-called "Large Scale Pilot" projects (LSPs) have been launched to develop practical solutions tested in real government service cases across Europe. To respond as cross-border solutions, Large scale pilot projects (LSPs) have been developed and run in five main areas: eID, eProcurement, eBusiness, eHealth and eJustice to engage public authorities, service providers and research centres across the EU. Seven LSPs are piloting a number of solutions, or building blocks, that enable cross-border digital services in the above-mentioned policy areas. They are intended to be taken up as part of online services which make these online services 'cross-border enabled'.

⁵² [E-Govt in depth analysis, European Parliament 2015](#)

⁵³ [The New European Interoperability Framework](#)

Connecting Europe Facility (CEF) Building Blocks

CEF is an EU instrument to facilitate cross-border interaction between public administrations, businesses and citizens, by deploying digital service infrastructures and broadband networks. CEF Building Blocks are open and reusable digital solutions in the shape of a framework, a standard, a software, or software as a service, or any combination thereof. The CEF Building Blocks offer basic capabilities that can be reused in any European project to facilitate the delivery of digital public services across borders and sectors. The Building Blocks aim to ensure interoperability between national IT systems so that citizens, businesses and administrations can benefit from seamless digital public services wherever they may be in Europe.

Shaping Europe's digital future

With the initiative "Shaping Europe's digital future" the European Commission intends to develop a stronger EU-government interoperability policy by the end of 2021, to foster coordination and the adoption of common standards for public services and data flows. These include for example creation of European interoperable platforms such as a common framework for citizens' electronic identity management (eID).

eFTI Regulation

Co-legislators adopted the regulation on electronic freight transport information – the eFTI Regulation 2020/1056 (EU) (2020)⁵⁴ – in Aug 2020. Aug 2024 is the deadline for launching the digital transport information exchange between business and authorities in the EU. Although composing the practical guidelines for implementation will last till 2023, there is readiness and willingness of both private and public sector parties to move forward already today and take steps towards harmonised and digitised cross-border exchange of road transport information.

In the past years, there have been a considerable number of private, public and mixed initiatives aiming at developing technical solutions for the digitalisation of transport and logistics processes (DIGINNO, DIGINNO-Proto, Benelux, FEDeRATED⁵⁵ etc), which has demonstrated the benefits of real-time transport data exchange for all stakeholders.

Moving forward with these initiatives requires trust and investment security from the side of business and administrations, which can be achieved through political support and cross-border high-level agreements. Therefore, there is an important role in the quick development of eFTI implementing acts for achieving a swift progress in the sector.

⁵⁴ <https://eur-lex.europa.eu/eli/reg/2020/1056/oj>

⁵⁵ <http://www.federatedplatforms.eu/>

B 3.2 The need for a cross-border perspective

Numerous policy initiatives exist at the EU level and are being implemented in the EU member states. However, the expert inputs and discussions in the DIGINNO project indicate that the existing policies are inadequately able to solve cross-border challenges. EU regulations are intended to promote cross-border interoperability, but they are interpreted and implemented differently in the member states. It appears from the project discussions that e-solutions for business are national-centric. Many digital public services exist and BSR is doing very well (fig.1) but there is not necessarily a cross-border dimension and promoting cross-border interoperability is not necessarily a priority for the national authorities. Also, national laws are in general not aligned to help the facilitating of publicly provided cross-border services for business.

Furthermore, most EU cross-border digital public service initiatives seem to be directed towards G2G/G2C⁵⁶ whereas G2B solutions are not being prioritised to the same extent.

During the project discussions, a few examples of nationally initiated cross-border initiatives were highlighted. For example, Estonia has started legal and infrastructural collaborations with the neighbouring countries using the X-road. E-prescription is now available cross-border between Estonia and Finland, established by using CEF building blocks. In addition, Estonian and Finnish government institutions started exchanging the data from the business and the population registers.

In the project discussions, it was expressed that:

- All countries can come up with technical solutions but what type of policies should they agree on that will fit “the national environment”?
- It must be clarified how to make technical solutions compatible and identify which data to share
- How can data transfer cross-border be handled due to the issue of trust?
- How can the countries create transfer opportunities despite different “rail sizes”?
- It seems to be a dilemma at the national level to prioritise the cross-border dimension: *“Why waste taxpayer’s money to change our national system unless there are obvious advantages?”*

There is a relatively high adoption of CEF building blocks in the EU member states. However, important challenges must be addressed to improve the uptake of the building blocks and improve interoperability, challenges mainly related to low prioritising of transnational dimension. These can be exemplified by statements from the project discussions of CEF building blocks:

⁵⁶ G2G = government to government; G2C = government to citizens

- The uptake varies from one country to another. Each country tends to “pick and choose” depending on national approach, interest and thematic priorities, leading to a heterogeneous implementation
- Building blocks are mostly adopted for domestic use, only very few for cross-border use. This seems to be due to lack of incentives in some parts of the public sector where the need is not acknowledged
- Building blocks are the only tools/infrastructure. What is mostly needed is a cross-border service as a good business case. Once countries agree and prioritise a number of cross-border services, only then technology/infrastructure comes into play. This is what DIGINNO is doing: Selecting four services, agreeing on process architecture and then considering which technical infrastructure to use.
- CEF Building Blocks are cross-border tools by default. When they are not implemented nationally, they generate no added value. However, in many cases, governments are not aware of the benefits of cross-border interoperability
- We need commonly used standards that can be adapted in every member state
- National policies should aim at awareness raising and capacity building in the public & private sector on how CEF building blocks should be implemented and promoted
- National legislation to implement EU directives on CEF building blocks should include initiatives to facilitate cross-border uptake of the services
- Business cases should be integrated into policy recommendations with emphasis on economically and socially added value for business and citizens
- *“Governments need stronger incentives to provide tools for cross-border transactions. One way forward could be market needs analysis of financial benefits for the public and private sector”* (Idongesit Williams).
- *“What is mostly needed is a cross-border service as a good business case. Once countries agree and prioritise a number of cross-border services, only then technology/infrastructure comes into play”* (Rūta Šatrovaitė)

DIGINNO project has provided a lab for informal and pragmatic discussions between partners from different countries, some of them responsible for policy development in their native country: *“We don’t have any formal political duties telling how it should be. We take our outset in the practical solutions and what can be achieved from a pragmatic point of view... ”*. The project is suggesting policies that can help to harmonise initiatives at the national level and enable cross-border connectivity of public services.

B 4. Policy recommendations for G2B cross border e-services in BSR⁵⁷

B 4.1 Interoperability is the key challenge

Interoperability is a key factor in making a digital transformation possible. To remove barriers of the digital single market, the European Interoperability Framework (EIF)⁵⁸ has been introduced as a generic framework to organise cross-border cooperation in the EU. It allows administrative entities to organise the electronic exchange of information, amongst themselves and with citizens and businesses, in ways that are understood by all parties.

EIF identifies different layers of cooperation that has to be addressed to ensure the successful cross-border provision of public services:

- **Legal issues**, e.g. by ensuring that legislation does not impose unjustified barriers to the reuse of data in different policy areas;
Each public administration contributing to the provision of a European public service works within its national legal framework. Legal interoperability is about ensuring that organisations operating under different legal frameworks, policies and strategies are able to work together. This might require that legislation does not block the establishment of European public services within and between the Member States and that there are clear agreements about how to deal with differences in legislation across borders, including the option of putting in place new legislation.
- **Organisational aspects**, e.g. by requesting formal agreements on the conditions applicable to cross-organisational interactions;
This refers to the how public administrations align their business processes, responsibilities and expectations to achieve commonly agreed and mutually beneficial goals. In practice, organisational interoperability means documenting and integrating or aligning business processes and relevant information exchanged. Organisational interoperability also aims to meet the requirements of the user community by making services available, easily identifiable, accessible and user-focused.
- **Data/semantic concerns**, e.g. by ensuring use of common descriptions of exchanged data;
Semantic interoperability ensures that the precise format and meaning of exchanged data and information is preserved and understood throughout exchanges between parties, in other words ‘what is sent is what is understood’. In the EIF, semantic interoperability covers both semantic and syntactic aspects

⁵⁷ This chapter is based on the paper “Recommendations to policy makers for developing G2B cross border e-services in the Baltic Sea region”, VARAM, Latvia, Feb 2020

⁵⁸ [The New European Interoperability Framework](#)

- **Technical solutions**, e.g. by setting up the necessary information systems environment to allow an uninterrupted flow of bits and bytes.
This covers the applications and infrastructures linking systems and services. Aspects of technical interoperability include interface specifications, interconnection services, data integration services, data presentation and exchange, and secure communication protocols.

The background layer of four levels of interoperability is **interoperability governance**.

Interoperability governance refers to decisions on interoperability frameworks, institutional arrangements, organisational structures, roles and responsibilities, policies, agreements and other aspects of ensuring and monitoring interoperability at national and EU levels.

B 4.2 Strategies for cross border e-service establishment

Policy recommendations for developing cross-border e-services in BSR are organised along dimensions of the European Interoperability Framework (EIF).

To establish an EU level framework for cross border processes there can be several strategies, for instance (fig.1):

- Establish EU level legislation and harmonised standards framework that has to be implemented nationally and regionally, by conducting activities nationally and cross border cooperation bilaterally, trilaterally or regionally;
- Driven by national and regional level needs to implement cross border projects bilateral, trilateral or regional formats and create and advance the initiative as well as by national and regional political support initiate the development of EU level legislation and standards

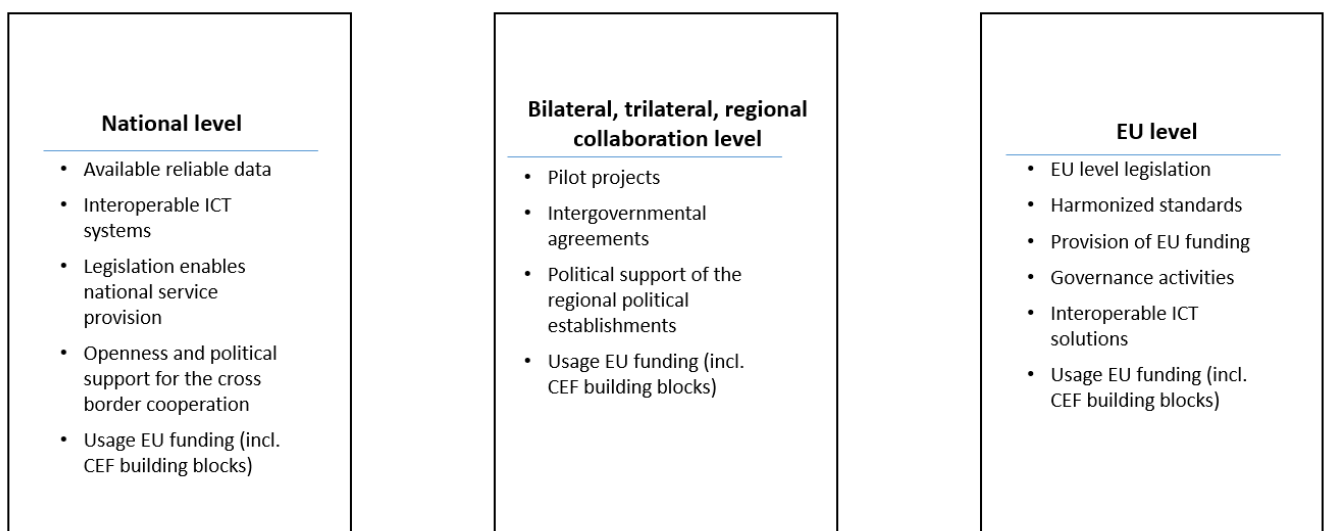


Fig.1 (VARAM 2020)

The EIF provides value in both bottom-up and top-down directions of the strategies for cross border service system establishment:

- In case of a bottom-up approach, national regulation aligned with the EIF is used for the implementation of public services at all levels of national administrations; it creates the interoperability conditions for extending the scope of these services across borders;
- In case of a top-down approach, the EIF provides a structural approach for the increasing of the interoperability potential of the national activities from the implementation of EU level legislation and its transposition approaches and uptake of EU standards.

The focus of this paper is the development of cross-border digital services in BSR region, so the European Interoperability Framework is used as a generic framework to address the content of cross border initiatives. But in given context layers of interoperability can be addressed not only on national and EU level but also on bilateral/trilateral and regional level.

In our context at least three policy/ activity levels should be addressed (national; regional; EU) that extends the generic framework of EIF.

B 4.3 List of policy recommendations

B 4.3.1 Interoperability Governance

Interoperability governance refers to decisions on interoperability frameworks, institutional arrangements, organisational structures, roles and responsibilities, policies, agreements and other aspects of ensuring and monitoring interoperability at national and EU levels.

Cross border public service provision often requires different public administrations to work together to discover and meet end-users' needs and provide public services in an integrated and proactive way, ensuring seamless execution, reuse of services and data, and development of new services. When multiple organisations are involved there is a need for coordination and governance by the authorities with a mandate for planning, implementing and operating public services.

To establish a sound background for any cross-border initiative and to ensure its sustainability over time, political support is essential. Interoperability between public administrations at different administrative levels will only be successful if governments give enough priority and assign resources to their respective interoperability efforts.

The effectiveness and efficiency of cross-border services and implemented ICT and consideration of user needs have to be properly addressed in all stages of cross-border service design. In the same time, the public administrations processes to provide cross-border service should be simplified and should reduce an administrative burden to end-user. It is important to include appropriate change management processes in the interoperability agreements to ensure the accuracy, reliability, continuity and evolution of the cross-border services.

The European network of national institutions for the cross-border collaboration should be developed for coordinating cross-border data exchange and evolution of this process based on concrete e-services.

Cross-border policy level agreements can be established at least on three levels:

- between two states (bilateral/ trilateral)
- within the region (Baltic Sea Region, Nordic-Baltic, etc)
- at EU level

If cooperation is initiated on a bilateral level, individual memorandums, agreements can be applied and trans-national agreements and working groups/ project boards can be established. On the level of the EU, all European coordination mechanisms apply. As the focus of this document is the Baltic Sea region, the main attention is paid to the (macro-)regional level, particularly BSR.

If cooperation is established on the (macro-)regional level, there are several political and coordination establishments where decision making, coordination can happen, e.g.:⁵⁹

- Nordic Council of Ministers (MR DIGITAL/ HNG DIGITAL)⁶⁰
- BCM Prime Ministers Council
- Baltic Council of Ministers
- Baltic Assembly

Provide long-term strategic, coordinated and sustainable funding for projects to implement the cross-border e-service provision financed on EU level, regional level, as well as at the national level.

- Nationally the usage of EU level instruments such as CEF building blocks and EU funds for building interoperable ICT solutions;
- On a regional level, there might be funding opportunities available in programs under such programs as Interreg Baltic Sea Region, MR DIGITAL initiatives, etc.

B 4.3.2 Legal aspects

To ensure legal interoperability for the cross-border services, the activity to begin with is screening existing legislation to identify interoperability barriers: sectoral or geographical restrictions in the use and storage of data, differences in data licence models, over-restrictive obligations to use specific digital technologies or delivery modes to provide public services, contradictory requirements for similar business processes, outdated security and data protection needs, etc.

The next activity is to analyse requirements regarding ICT in the process of the legislation of the cross-border service, identifying barriers and impact to the stakeholders and end-users and reducing them already in the process of legislation.

Ensuring that national (general and sector-specific) and cross-border specific legal and regulatory framework is serving the cross-border needs of business and citizens as end-users of private and public services.

- National regulation has to authorise cross-border service delivery and set general regulation for it, for instance, to extend eligible groups of persons for receiving the service or cross-border personal data exchange (once only principle), etc.

⁵⁹ <https://www.mfa.gov.lv/en/policy/baltic-sea-region/co-operation-among-the-baltic-states-13464-en>

⁶⁰ <https://www.norden.org/en/information/nordic-co-operation-digitalisation>

- Details can be addressed in cross-agency or transnational agreements.

B 4.3.3 Organisational aspects

Establish and strengthen international cooperation between governments to set up cross-border digital information exchange between national registries, e.g. the Nordic-Baltic co-operation on digital identities (NOBID) project⁶¹.

Encourage and establish the environment for the private and public partnership to engage and participate in policymaking and public service design and delivery⁶²

Focus on education and awareness building of citizens and business as public services users to enhance the quality of engagement of business in a public-private partnership, uptake of technologies in cross-border service usage.

Enhancing the knowledge, skills, attitudes and values needed for cross-border service user's mindset. Promote bottom-up activities in policymaking.

Promote projects that form collaborations between different types of partners that have different expertise and resources (governmental institutions, non-governmental organisations, business, and the scientific community). The partnerships between diverse partners can help create usable and efficient service provision and usage and also provide innovation incentives.

Digitisation of public services must be considered and analysed according to end-users needs. In the implementation of the approach digital-by-default, whenever appropriate, has to be at least one digital channel available for accessing and using this public service. By applying a digital-first approach, the priority is given to using public services via digital channels while applying the multi-channel delivery concept ensuring that physical and digital channels co-exist.

The pilot digital-only principle as the basic approach for business-related cross-border services.

To determine, design and implement the service the users' feedback should be systematically collected, assessed and used.

Users' needs should be considered when determining and designing which public services should be provided and how they should be delivered. Several core principles should be blended in the service provision process, such as a multi-channel service delivery approach, ensuring the availability of alternative channels, physical and digital, to access a service, a single point of contact to ensure invisible service administration to the end-user, especially focus on the services when multiple bodies or national administrations have to work together to provide a public service.

The multi-channel delivery includes the inclusion and accessibility usually, in a broader context the service design, information content and delivery mechanisms. Inclusion principle is enabling the delivery of public service to overcome any social and economic barriers the end user might face.

⁶¹ <https://www.norden.org/en/project/nordic-baltic-co-operation-digital-identities-nobid>

⁶² E.g. JSC "Credit Information Bureau" (KIB) is part of the world's largest credit information and risk management solutions providing group "Creditinfo Group" and aims to reduce financial risks of companies and individuals.

Accessibility ensures that people with disabilities, the elderly and other disadvantaged groups can use public services at service levels comparable to those provided to other citizens.

The multilingualism principle in the service provision is one of the basic success criteria and enabler of the cross-border service provision and its success. The modern technologies as machine learning, machine translation and artificial intelligence have to be exploited in the service design and provision.

B 4.3.4 Data/semantic concerns

Semantic interoperability covers both semantic and syntactic aspects. The semantic aspect refers to the meaning of data elements and the relationship between them. It includes developing vocabularies and schemata to describe data exchanges and ensures that data elements are understood in the same way by all communicating parties. The syntactic aspect refers to describing the exact format of the information to be exchanged in terms of grammar and format.

The activity to begin within improving semantic interoperability is to perceive data and information as a valuable public asset by coordinating the information and data management strategy at the highest possible level.

Adopt and promote existing EU standards or agree on other international or regional standards to ensure a common approach in cross-border service provision or initiate standardisation or harmonisation procedure of standards.

Adopt or create common standards for information exchange purposes both technical and organisational aspects to ensure technical interoperability and transparency and openness of processes.

In cases it is not possible to implement EU standards at the current stage, the data and semantic issues, reuse of data and other aspects can be included and covered by intergovernmental agreement.

Promote and support data-driven culture by the promotion of data democracy and data availability in open formats to enable inter-institutional and cross-border data transfer process. The data democracy engages social innovation in service design and delivery. Reduce barriers for data reuse by exploring payment reduction policy for data, nationally and cross-border. Open data should be published with as few restrictions as possible and clear licences for use to allow better scrutiny of administrations' decision-making processes and realise transparency and open government in practice.

B 4.3.5 Technical interoperability

The differences and lack of interoperability of ICT solutions both nationally and in EU scope has created a barrier and a fragmentation of ICT solutions also on a technical level. Use of formal technical specifications can improve the interoperability of ICT in service provision.

Establish and sustain a strong long-term strategy to facilitate coherent use and uptake of existing digital technologies and innovation across policy areas and levels of government to achieve digital transformation of the public services and development of e-services nationally and cross-border.

Develop and strengthen efficient use of technical interoperability of already existing information technologies to facilitate data exchange according to once only principle in the reuse of information, using of cross-border acceptable means of identification, signature and timestamping and ensuring personal data protection and management of personal data movement principles.

The use of open-source ICT products can save development cost, avoid fragmentation and helps with adaptation to specific business needs because of the developer communities constant efforts in the improvement of the open-source software. Open source is an enabler of the reusability principle.

Reuse and sharing can be effectively supported by collaborative platforms by ensuring data portability. Easily transferable data among different systems support the free movement of data and reuse of data.

Citizens and businesses must be confident that when they interact with public authorities they are doing so in a secure and trustworthy environment and in full compliance with relevant regulations, especially in cross-border service provision.

B 5. Upcoming initiatives in the BSR

During the project work, several ongoing and upcoming G2B initiatives have been identified that aim to improve cross-border interoperability. Initiatives being developed as transnational collaborations in a more or less formalised way.

These examples represent dedicated digital collaborations among countries in the BSR macro-region building on political commitments to develop efficient G2B solutions that are functioning across borders. They also represent joint cross-border actions among public and private stakeholders in the BSR, exemplifying how EU and national initiatives can be supported and complemented from a bottom-up perspective based on concrete business cases.

Scaling up DIGINNO showcases

Two of the thematic showcases developed in DIGINNO WP3 are being scaled up as part of testing their implementation potential:

- eCMR⁶³ showcase: Roadmap proposal for eCMR implementation in the BSR region and its extension to EU and non-EU partner countries. The main purpose of it is to define major steps/ milestones needed to implement eCMR solutions across borders. The roadmap should serve as a communication tool in a dialogue with policy makers on measures needed to implement eCMR.

On 5 Nov 2020 at the DIGINNO Transport Innovation Forum the countries of Poland, Lithuania, Latvia, Estonia and the Eastern Partnership countries⁶⁴ adopted the declaration on digital freight transport data exchange with the key objective to speed up the development of the eCMR project. As provided in the declaration a cross-border task force of experts will be established under the leadership of Lithuania with the focus on eCMR piloting between countries.

- KYC showcase: By the approving of the amendments to the Law on Prevention of Money Laundering and Terrorist and Proliferation Financing, Latvia has in 2020 established the new legal framework by regulating several Shared Client Research Tools and License and performance monitoring of those tools that enables development shared KYC in Latvia and across borders and removed data sharing barriers existing before, the lack of sufficient regulation.

⁶³ Paperless consignment notes in road transport, recognised by responsible institutions and used by businesses

⁶⁴ Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine; https://ec.europa.eu/neighbourhood-enlargement/neighbourhood/eastern-partnership_en

- In 2020, Ministry of Finance in Estonia has prepared amendments to the Anti-Money Laundering and Contra-Fighting with Terrorism Act, to establish legal framework for KYC data-exchange service, demands for the security level to such service and demands for the service provider and as well the KYC profiles. After those amendments are adopted by the Parliament, the KYC data-exchange service is planned to launch in the summer 2021.

DIGINNO-Proto project⁶⁵

DIGINNO-Proto is a spin-off project from DIGINNO supporting and extending the project outcome by prototyping and testing a proposed solution in one of the cross-border showcases to remove barriers that hinder cross-border eCMR usage. Based on the eCMR showcase the project has created an eCMR indexing prototype for paperless logistics in international road transport between Estonia, Latvia, Lithuania and Poland. DIGINNO-Proto is an example of a regional and well-functioning cross-border eCMR indexing scheme that could be scaled to other EU and neighbouring countries.

The project is financed by the Nordic Council of Ministers and implemented July 2019 to Dec 2020. It has been developed in three stages:

1. Architecture development: the concept was evolved with the project team between August 2019 and January 2020, with the mapping of the functioning of the proposed solution and drafting the requirements and tender documentation;
2. Technical development took place between April and September 2020 by contractual partner FITEK EDI, selected through public procurement.
3. International testing of the prototype involving public authorities, transport companies and eCMR service providers.

The prototype created the digital availability of a CMR document (preferred machine-readable) and a mechanism of indexing of such documents across the partner countries via an indexing scheme. Service providers were enabled to index their eCMRs and appointed government institutions of the involved country - to see where the eCMR is stored and receive agreed available data. E-government compatible distributed approach with application programming interface (API) accesses was deployed using distributed ledger technology (DLT) technology and platforms through API.

Cross-border prototype testing was carried out across all participating countries in Aug/Sep 2020 in cooperation with governmental institutions (Tax and Customs Board, Police, Road Administration, etc.) together with private sector eCMR service providers and road carriers. Testing involved remote eCMR control from offices, roadside checks, and testing while using the road and border cameras. The partners of the project and testing could successfully experience in practice how the eCMR issued in one country is visible to the controlling institutions of another country.

⁶⁵ <https://www.diginno.eu/diginno-protocol>

To facilitate the real-life deployment of the eCMR cross-border prototype and the expansion of the partnership network, the deliverables of the project are published, and the developed solution is distributed under MIT license^{66,67}.

Further steps with the eCMR showcase will be based on the following WP3 roadmaps proposals:

- Align eCMR data set with eFTI regulation and BSR countries regulation (based on index data from DIGINNO and DIGINNO-Proto projects).
- Define security and access rules to eCMR data set and prototype it based on eCMR DIGINNO architecture.
- Extend eCMR dataset with additional data subsets to support other documents needed for road transport.
- Extend eCMR solution to support other transport modes (e.g. WayBill)
- Legally recognise eCMR standard in BSR countries and other partnering countries
- Implement eCMR solution between BSR region countries based on DIGINNO project results
- Establish BSR as a leading region in EU and non-EU countries in development of innovative digital services and digitisation of public services in logistics sector

DINNOCAP project

DINNOCAP is an initiative based on selected outcomes of DIGINNO project that will be implemented Jan-Oct 2021, co-funded by EU's Interreg BSR programme as a so-called extension stage project building on DIGINNO. The project will support and strengthen implementation of tools, solutions and recommendations provided by DIGINNO project. DINNOCAP activities will directly target SME's and relevant industry sectors in the BSR countries with the goal to stimulate digital transformation via adoption of digital tools and solutions provided by DIGINNO. Nine partners will participate, including a partner from Kaliningrad, Russia. This will facilitate extension of DIGINNO experiences to Russia.

Among main outputs of the project will be:

1. A list of transnational actions for the BSR industry digitalisation community to adopt, i.e. transnational activities to improve ICT uptake among SME's.
2. A practical report with learning and recommendations helping the ICT uptake, to be used by Industry 4.0 platforms, SME's and public institutions involved in industry digitalisation.
3. An eCMR data exchange system that enables secured data exchange between government and business, to be used by government agencies and business associations as inspiration and guidance in providing and using cross-border data exchange instruments.
4. A methodology to inspire a transnational governance framework presented to government agencies and the BSR institutions regarding how to successfully implement cross-border e-services.

⁶⁶ As a permissive free software license, it puts only very limited restriction on reuse and has, therefore, high license compatibility. https://en.wikipedia.org/wiki/MIT_License

⁶⁷ <https://koodivaramu.eesti.ee/majandus-ja-kommunikatsiooniministeerium/ecmr-prototype-testing>

Real Time Economy Project

Real Time Economy (RTE) is a digital ecosystem where transactions between diverse economic actors take place in or near real time in order to improve productivity through direct cost savings especially in SMEs and the public sector. RTE means replacing paper-based business transactions and administrative procedures by automatic exchange of digital, structured and machine-readable data in standardised formats.

In an RTE environment transactions are in structured standardised digital form, increasingly generated automatically and completed increasingly in real time without store-and-forward processes. For RTE to work there has to be interoperability at the national as well as the EU level. Estonia and Finland are leading the way.

Nordic Smart Government Project⁶⁸. A pioneer programme for cross-border interoperability launched 2018 by the Nordic Ministers of Business as a collaboration between 16 Nordic national agencies. The aim is to make it easier for businesses to operate with other businesses and authorities alike by connecting private and government systems processing business data. An interoperable ecosystem of digital solutions will provide real-time business data for business-to-business and business-to-government to save time for SMEs and increase the quality of data.

MR Digital: Collaboration between Nordic-Baltic countries

In a political declaration from 2017 (with a follow up Sept 2020) under the umbrella of Nordic Council of Ministers⁶⁹ the five Nordic countries and the three Baltic countries have committed themselves to a dedicated collaboration to increase mobility and integration in the Nordic-Baltic region by building a common area for cross-border digital services⁷⁰, including:

- a continued close cooperation to improve cross-border digital service infrastructures or integrate the relevant national infrastructures, remove technical and legal barriers to digital integration and, where necessary, develop alternative approaches within the framework of relevant EU legislation and policies.
- Facilitate cooperation between national infrastructures for cross-border use of electronic authentication (eID) in accordance with the eIDAS Regulation.
- Promote the secure exchange, re-use, and free movement of data to support digital innovation in the provision of cross-border digital services, ensuring high levels of information security, personal data protection, and compliance with relevant European data regulation.

⁶⁸ <https://nordicsmartgovernment.org/>

⁶⁹ <https://www.norden.org/en/declaration/ministerial-declaration-digital-north-20>

⁷⁰ <https://www.norden.org/en/information/nordic-co-operation-digitalisation>

From 2021 the collaboration will have a focus on developing functional cross-border e-services between the Nordic-Baltic countries.

The ministerial collaboration in MR Digital is supported by a so-called high level group (HNG) of civil servants in the Nordic and Baltic ministries involved. The DIGINNO project has been in a close dialogue with Nordic Council of Ministers throughout the project period, in order to explore synergies and exchange of learnings between the initiatives.