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Digital Test and Demonstration Infrastructures

- an opportunity for Smart Specialisation in the Baltic Sea Region

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1. **Background and introduction**

This report was commissioned by the Baltic Development Forum within the framework of the BSR STARS S3 project\(^1\), co-financed by European Union Interreg Baltic Sea Region Programme. BSR STARS S3 aims to promote innovation in the Baltic Sea Region, including by identifying new opportunities for smart specialisation. The partner regions in the project are: Greater Copenhagen (Denmark), Sør Trøndelag (Norway), Skåne (Sweden), Tampere (Finland) and Lithuania (participating at the country level) – and thus this report has a particular emphasis on these regions.

The report maps a number of digital test- and demonstration infrastructures and facilities in the Baltic Sea Region. It also sheds light on available funding schemes to support SMEs’ costs of test and demonstration.

It will appear that there is quite an abundance of digital economy related test and demonstration infrastructures in the Baltic Sea Region. With that the report will provide a basis for dialogue among policy makers, testbed practitioners and SMEs on current testbed services and approaches – and on what the opportunities are for taking advantage of complementary and overlapping areas of expertise among digital testbeds in the Baltic Sea Region.

As documented by Baltic Development Forum and the Danish Business Authority in the preparations for the seminar “Digital Growth in the Baltic Sea Region” on 9 December 2014, access to testbeds are critically important for innovation in the digital economy: Both in order for companies to make initial tests of innovative ideas together with end-users, as well as for companies to test and make final adjustments to prototypes together with relevant user groups before actually (investing more massively in) introducing new digital products or services on the market\(^2\).

This report was commissioned by the Baltic Development Forum within the framework of the BSR STARS S3 project, co-financed by European Union Baltic Sea Region Programme. BSR STARS S3 aims to promote innovation in the Baltic Sea Region, including by identifying new opportunities for smart specialisation.

Also, the report connects closely to efforts of another major macro-regional initiative, namely “The Top of Digital Europe”. Top of Digital Europe is an independent, non-profit think tank that promotes the Baltic Sea Region as a leader in the ICT sector. Top of Digital Europe facilitates cross-border dialogue and public-private initiatives with the ambition to strengthen the digital economy in the Baltic Sea Region. One of the key objectives of Top of Digital Europe is “to strengthen competitiveness through innovative cross-border actions” – something this report will add to.

A macro-regional seminar will be held in Tampere on 6 April 2017 to present the report – and to provide a starting point for a dialogue on opportunities for, actually and practically, realising economic and technological synergies by sharing digital test and demonstration facilities in the Baltic Sea Region.

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2. Baltic Development Forum, Danish Business Authority et al.
2. Digital test and demonstration infrastructures in regions and countries

Below follows an overview of digital test and demonstration infrastructures in project partner regions AND countries – stressing countries for the reason that the majority of digital test and demonstration infrastructures are not provided at regional level. In addition short overviews are also available for Estonia and Latvia, even if these countries are not partners the BSR STARS S3 project.

Digital test and demonstration infrastructures – Testbeds

There is no clear definition of what “digital test and demonstration infrastructures” – or “testbeds” – are. This report will re-apply a framework commonly used, namely that: testbeds may be defined as facilities (physical or virtual) that enable companies or researchers to develop and systematically test new and innovative solutions such as interfaces, apps and products and their associated business models.

Testbeds can be managed by private companies, associations as well as by public organisations. Test- and demonstration services offered by fully owned and fully commercial private companies/laboratories are not included in the report. The reason for this is that investigating opportunities for integration of such private test- and demonstration companies/laboratories goes beyond the scope and the target group of the BSR STARS S3 project.

Furthermore, on the extend of this mapping: A number of pilot, test and demonstration projects are ongoing in the Baltic Sea Region, aiming to document the more generic potentials of digital technologies e.g. research efforts on IoT (Internet of things) and Big Data. This report includes only those test and demonstration infrastructures that are open to companies beyond those engaged in a particular project or test pilot partnership, i.e. those infrastructures that as part of their basic activities provide testing and demonstration services.

A large number of universities provide through joint research activities with the private sector also access to laboratory facilities for testing and demonstration of product ideas or concepts within the digital economy. However, where such infrastructures are exclusively available for companies engaging as research partners with a university – and not as partly or fully commissioned test and demonstration services – these university infrastructures are by and large not included in this mapping. Commissioned based test and demonstration services provided by universities are however included.

The Digital economy

The digital economy can be defined as the part of our economies that is based on use of digital computing – be it e-business infrastructures (i.e. hardware, software, communication networks, ICT education and research infrastructures); e-business (i.e. use of IT in producing products or services); and e-commerce (i.e. use of IT in marketing and delivering products and services).
Nicholas Negroponte, founder of MIT Media Lab\(^3\) frames that the digital economy quite simply “as the part of the economy that uses bits instead of atoms.”

Thus it is clear that the digital economy is extremely diverse – basically the combined subset of all those economic activities that apply IT as enabler for what they produce and consume. As a result, as we will see below, digital test beds often taps into what could also be considered testbed infrastructures in more traditional economic sectors such as marine, agriculture, energy, transportation etc.

### 2.1 Denmark / Greater Copenhagen

In Denmark testing and demonstration services to SMEs in the digital economy are anchored with the GTS institutes (technological service centres).

The GTS institutes do not have funding available to co-finance companies costs of hiring lab facilities. Therefore, either the companies must pay for these services on commission basis or then may apply for public support.

The key financial incentive scheme in Denmark for companies seeking support to benefit from test and demonstration infrastructures is the InnoBooster (innovation voucher) programme. Under this scheme entrepreneurs and SMEs can apply for project support to develop a new product or service that currently is not on the market, or to significantly improve production processes that increase company competitiveness. More specifically companies can get support to engage expertise – including advisory services and use of test and demonstration infrastructures. Successful applications may receive between DKK 50.000 and 5 Mio in support from InnoBooster\(^4\).

**GTS – Advanced Technology Group**

GTS – Advanced Technology Group is a network of 7 independent Danish research and technology organisations with 29 offices located throughout Denmark.

The GTS institutes offer a range of services to companies throughout the country, including: knowledge, technology and consultancy, co-operation on technological and market-related innovation, and testing and demonstration.

There are 7 GTS institutes: Alexandra Institute; Bioneer; DBI Danish Institute of Fire and Security Technology; DELTA Danish Electronics, Light & Acoustics; DFM Danish Institute of Fundamental Metrology; DHI Water and Environment; and DTI Danish Technological Institute and FORCE Technology.

The following GTS institutes provides testing- and demonstration services to digital economy SMEs:

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\(^3\) [www.media.mit.edu](http://www.media.mit.edu)

\(^4\) [http://innovationsfonden.dk/da/investeringstype/innobooster](http://innovationsfonden.dk/da/investeringstype/innobooster)
DELTA – a part of FORCE Technology

In 2016 FORCE Technology and DELTA merged, hence now the name “DELTA – a part of FORCE Technology”. DELTA provides a number of testing, accreditation and certification services for companies in the IT/digital economy, including: EMC and safety; Approval and quality advice; Reliability and robustness; RF/Wireless; and Self-testing (where companies may make use of DELTA’s test facilities with support from DELTA technician). DELTA provides a number of testing, accreditation and certification services for companies in the IT/digital economy, including: EMC and safety; Approval and quality advice; Reliability and robustness; RF/Wireless; and Self-testing (where companies may make use of DELTA’s test facilities with support from DELTA technician). DELTA’s core competence areas are: Electronics, Microelectronics, Software technology, Light, Optics, Acoustics, Vibration, and Sensor systems. Four test and demonstration platforms at DELTA are targeting particularly SMEs in the digital economy:

TestLab

At the TestLab DELTA support companies with testing to improve reliability and adherence to regulations for various IT and digital products.

During 2013-15 Delta implemented 3,000 preliminary product tests aimed at supporting companies in the early development stages to identify needed specifications and to develop test strategies. The preliminary product test helps to accelerate innovation processes and improve cost-effectiveness.

Delta is accredited to provide EMC tests. EMC test are Electro Magnetic Compatibility test – or put more simply tests of electronic or electrical products to ensure that they work as intended in its environment. These tests help to improve durability, reduce product complaints and assist companies in producing required product documentation. Areas of EMC test excellence include: consumer electronics, industrial electronics, acoustics, IT and telecom, automotive and transport, and wind and energy.

At the TestLab companies can also have performed Electric Safety test. Similarly these tests help to improve durability, reduce product complaints and assist in producing required product document.

IdemoLab

IdemoLab aims to bridge the gap between technology and design. The focus is on early stages of the design process (prototyping) and to create meaningful experiences for users and customers. IdemoLab has four key areas of expertise:

- Within the area “Internet of Things (IoT)”, IdemoLab can support companies with development of concepts and feasibility; sketching and prototyping; wireless standards; antenna designs; wireless power charging, energy harvesting and more.

http://testlab.madebydelta.com
- In the area of “Design Smart Things”, IdemoLab can support companies with Design (design thinking via user centred design, context validation, technology validation, and solving real problems with useable, meaningful solutions), Smart (sensors which allow us to interpret the world around us in a new way, sensing both what humans can, and can’t sense; and making some sense of it), and Things (To-market, buyable products which people truly want to invest in to better their lives).

- In the area of “Battery-less and self-powered electronics”, IdemoLab can support companies with assessing the feasibility of energy harvesting and build battery-less prototypes with energy optimized power management design. Furthermore, support is available for power management in low power devices, especially in IoT and wearable wireless sensor applications. And finally, within this area IdemoLab offers a broad range of test facilities and climate chambers to characterise new energy harvesting technologies, including within solar, thermal, kinetic and radio frequency energy harvesting technologies.

- In the area of “Retail technology”, IdemoLab supports companies with development of new stronger business models based on customer and company-data and innovative services that can contribute to making the physical part of retail-services more competitive. The effort includes development of new technologies and tests of these in a number of shops and municipalities in Denmark.

SenseLab

SenseLab provides listening and viewing tests to companies for whom the end-user perception of the product, and its quality, are important. The aim is to make perceptual evaluation a natural part of the product development process and benchmarking. By customizing to end-users’ senses SenseLab helps companies to develop products that are more pleasant. In more details SenseLab provides: custom and standard compliant listening tests; benchmarking; quantification of the key perceptual product characteristics; linking perceptual characteristics to consumer preferences; and access to user groups and identification of their perceptual needs.

Nordic IoT Center

The Nordic IoT Center is a joint effort between DELTA and a number of companies and business organisations. The partnership collaborates around six phases to guide the development process from IoT ideas to IoT products6.

Ideation, where the Nordic IoT Centre guides companies through a process in which the concept for an IoT application is matured, tested, and validated so that it can be implemented.

Feasibility, where specific applications and first prototypes are scrutinized to re-move any technical barriers for the solution.

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6 [http://iot.madebydelta.com](http://iot.madebydelta.com)
Design and development, where support is available for hardware, firmware and software engineering, by specialists in wireless communication, big data analysis, visualization, and IoT back-end platforms.

Test and validation, where the Nordic IoT Center help perform regulatory surveys across markets and multiple sectors such as medical, automotive, marine and infrastructure, and then testing the product for either temperature, humidity, mechanical stress, salt spray, electromagnetic compatibility, electrical safety, etc – and on this basis document the performance of a product, including its performance with competing products.

Integration and manufacturing, where the Nordic IoT Center helps in finding the right partner to integrate the product – be it into existing systems of a company’s product range or to create a new systems. This includes Big Data analysis, security management, analytics, IT platforms, and business models. Also the centre can assist with market yield analysis, production, and supply chain optimization – all of it to improve return on companies’ IoT investments.

DTI, Danish Technological Institute

DTI works to develop, utilize and communicate research and technology-based knowledge for the benefit of Danish companies. These efforts happen often in cooperation with education and research institutions in Denmark and internationally. It is a key objective for DTI’s to ensure that new knowledge quickly is transformed into value for its customers in the form new of improved products, materials, processes, methods and/or ways of organizing.

DTI offers consultancy and services to more than 15.000 company clients annually, within a large range of business areas, including: agri-business, chemical and biotechnology, climate and energy, food & packaging and material technologies.

More specifically DTI\(^7\) test and demonstration facilities focusing on the digital economy include:

Testing laboratory for Ecodesign and Energy Labeling

This infrastructure includes opportunities for companies to test e.g. electronics for household and professional use such as computers, power supplies, printers, scanners, televisions and more. Test can be performed on commission basis to ensure e.g. compliance EU regulations and energy and power consumption. Also consultancy is offered to companies on ecodesign and energy labelling requirements as well as CE marking.

Agrotech Software Development

In 2016 Agrotech became a part of DTI. Within the agri-digital line of services DTI is supporting companies to exploit digital competitive advantages.

DTI’s core competencies in the agri-digital space include application of data acquisition, data

\(^7\) [http://www.dti.dk/services/software-development/38014](http://www.dti.dk/services/software-development/38014)
integration, statistics and modelling in unique IT solutions. The platform for system development can be composed and developed from proof of concept demo versions to operational market proven software systems.

More specifically services include: Software development from demo systems to market proven IT systems; Data collection; Data management; Big Data; Implementation of models of calculation; Visualization of data; and Statistics and modeling services including implementation of advanced calculations and models.\(^8\)

Danish Meat Research Institute

The Danish Meat Research Institute (DMRI) support SME’s with equipment and IT solutions for measuring quality of slaughter animals for classification or sorting purposes. This includes solutions for foreign object detection, automation, bone fragment removal, predictive model for meat and food safety and more.\(^9\)

Robot technology

DTI also support SMEs in developing, applying and transferring robotic technologies. For example, the Center for Robotics performs research in cooperation with Danish and foreign research institutions and enterprises. Also, DTI support SMEs to identify the types of data generated by production processes and describe how this data can be used as a basis for analysis and decision making. Another example is in the area of virtual production where DTI support SMEs with computer-calculated simulation of small and large adjustments in production, thereby allowing companies to assess information on the consequences of a (simulated) change in production before making actual making the changes in the process line.\(^10\)

Energy-related test and demonstration infrastructures

In Denmark a number of digital economy test and demonstration infrastructures relate to renewable energy production and energy conservation. Some of these link much into the digital economy space:

*PowerLabDK* er established by the Danish Energy Authority in partnership with DTU (Denmarks Technical University) and Bornholm Utility Company (Bornholm Energi & Forsyning).

PowerLabDK offers testing, technology development, educational training and demonstration of energy technologies. Key industries targeted include: wind energy, solar energy, plants and installations, offshore, utility and infrastructures, eMobility, energy analytics and business models, and smart homes.

Services to SMEs are based on self-service or full-service testing in PowerLabDK’s facilities. SMEs

\(^8\) [http://www.dti.dk/services/software-development/38014](http://www.dti.dk/services/software-development/38014)

\(^9\) [http://www.dti.dk/services/equipment-and-it-solutions-dmri/36913](http://www.dti.dk/services/equipment-and-it-solutions-dmri/36913)

\(^10\) [http://www.dti.dk/services/robot-technology/products/23617](http://www.dti.dk/services/robot-technology/products/23617)
can do—or have done—experiments within electric equipment, renewable energy sources, smart grid technologies, smart home and electric appliances, control and ICT-solutions in energy systems, wind power, e-mobility, real-time grid analysis, control center tools and many other areas

As regards testing more specifically tests are offered for electric components and equipment within all application areas and all power ranges up to MW-scale. They can be conducted according to both national and international standards (IEC, IEEE, VDE, DS, etc.), e.g. development tests or pre-tests before a type approval. Also, PowerLabDk can provide customized tests according to company specifications and identified specific needs. Examples of tests include: performance tests, compatibility tests, environmental exposure tests (thermal, mechanical, air pollution, EMC, etc.), shock tests (short-circuit lightning), and life-time tests.

PowerLab has a number of specialised labs, including Control Center Lab (a Full-scale real time power system control room), Electric Vehicle Lab, a High Power Lab (for short-circuit test), and an Intelligent Energy Laboratory. Also the full scale test and demonstration of smart grid technologies on the island of Bornholm is an integrated part of PowerLab:

**Bornholm Test Island:** Over the past 5-8 years the island Bornholm – within the Greater Copenhagen Region – has made many efforts to position itself as a test island/testbed, “Bornholm Bright Green Island”. A number of efforts in this strive relate to the digital economy. For example: “Villa Smart” has been running now for a number of years as a demonstration house where companies can access – and to some extend try out their own products – for intelligent (digital based) management of buildings. Also, “Eco-Grid EU” that is a research and demonstration project that connects 2.000 private energy consumers to test new electricity management opportunities. Eco-Grid also includes testing of Smart PV Grid management. Energy production and management systems are also tested on Bornholm. To this end PowerLabDK has made Bornholm a full scale laboratory, where future societal electricity systems are tested. These efforts are to a large extend based on digital innovations.

### 2.2 Norge / Sør-Trøndelag

In Norway like in Denmark few test and demonstration infrastructures are provide at the regional level, rather a network of institutions specialized in different areas of the digital economy offer their services nation-wide.

**The Research Council of Norway**

The Research Council promotes an integrated R&D system that supplies high-quality research, develops knowledge for dealing with key challenges to society and the business sector, fosters dynamic interaction within the R&D system nationally and internationally, and creates a framework for learning, application and innovation.

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11 [http://www.powerlab.dk](http://www.powerlab.dk)
12 [http://www.powerlab.dk/we-offer](http://www.powerlab.dk/we-offer)
13 [www.forskningsradet.no](http://www.forskningsradet.no)
The Norwegian state provides basic funding to 48 research institutes each year under the public funding scheme administered by the Research Council. The institutes fall in four areas (Technical-industrial institutes; Primary industry institutes; Social science institutes, and Environmental institutes).

SIVA

The Industrial Development Corporation of Norway (SIVA) is a government owned entity responsible for government investment in incubators, science parks, industrial parks and real estate through partial ownership of other companies. SIVA aims to stimulate economic growth, through strengthening Norway's capacity related to innovation and creativity.

SIVA is headquartered in Trondheim. Key activities of SIVA is to support business start-ups through incubation – and to provide businesses with access to expertise, networks and an academic and social community to facilitate growth, cooperation and development.

Development of industrial test arenas for future industries is a strategic priority for SIVA, so is the strengthening of regional arenas for commercialization of research and ideas from the business sector14.

Katapult – innovation voucher

On initiative of SIVA, the Norwegian Research Council and Innovation Norway is developing a new funding programme – Katapult – which will come into effect from 2017 with a budget of NOK 50 Mio per year. The programme will support test and demonstration activities in companies with a view to develop further conceptual ideas and make them market ready.

The test and demonstration centres will be managed by Siva. No decisions have been made as to what specific industries the centres will target – as the government wish for this to be demand-driven based on company interest.

Before Katapult there were no innovation voucher-type support programmes in Norway co-financing test and demonstration activities of SMEs. There was – and is – however a number of research and innovation programmes supporting testing and piloting at larger societal level, and implemented many be universities and research15.

SINTEF

SINTEF, The Foundation for Scientific and Industrial Research, is headquartered in Trondheim but supports through a number of subsidery organisations research and development throughout Norway and this to thousands of companies annually.

14 www.siva.no
The applied research, technology and innovation areas targeted by SINTEF includes:

- Renewable energy – where SINTEF partners with industry and government agencies to create more efficient, less polluting and more flexible energy solutions.
- Climate and environment – where SINTEF provides expertise and laboratories for development of environmentally friendly buildings, renewable energy, energy efficiency, and more.
- Industry – where SINTEF in cooperation with industry seeks to advance fabrication methods, automation, systems and logistics, and to develop sustainable manufacturing processes.
- Materials – where efforts target the full value chain from raw materials, to environmentally-friendly production processes, to casting and moulding, assembly etc. State-of-the-art characterisation methods and laboratory facilities are available to model and determine the structure of materials and the properties of products.
- Biotechnology – where SINTEF provides research partnerships and laboratory facilities to develop biotechnological processes used for production of a wide range of products such as pharmaceuticals, vaccines, biomaterials, enzymes, food, feed, chemicals and energy.

SINTEF Digital

Within SINTEF, SINTEF Digital, offers access to skills and state-of-the-art digital technologies within SINTEF's focus areas. SINTEF Digital carries out research and development projects and research-based consultancy, and provides laboratory and small-scale production services.

A number of SINTEF laboratories provides test and demonstration services for SMEs in the digital economy, including:

**Acoustics Laboratories**: SINTEF's labs cover a large variety of fields in acoustics, including noise, hearing, building acoustics, underwater acoustics, and auralisation\(^{16}\): The Noise and Hearing Lab in Trondheim enables companies to have tested hearing protection devices and communication equipment in a realistic environment. The Building Acoustic Lab in Oslo enables research partners and companies to carry out full scale measurements of acoustic properties of building components such as walls, ceilings, floors and floor covers, and smaller components such as doors, windows, and slit valves. The Underwater Acoustic Lab in Trondheim is equipped to carry out ultrasonic experiments, smaller-scale underwater experiments, and for testing and calibrating transducers to be used in larger-scale tests in the fjord or the ocean. Finally, the 3D Sound and Auralisation Lab is a calibrated 5.1 surround system that can be used to auralise everyday sounds at the correct levels. Calibrated recordings for this are also available.

**Electrotechnical laboratories**: SINTEF Energy Research operates laboratories for high voltage, high power and climatic testing. Customers are manufacturers, suppliers and users of electric power equipment. Services include research, development work, routine-, type- and field tests for manufacturers, suppliers and users of electrical equipment.

\(^{16}\) [www.sintef.no](http://www.sintef.no)
**Smart Grid Laboratory:** NTNU and SINTEF are currently building a new National Smart Grid Laboratory in Trondheim (with funding by the Research Council). The laboratory is a system-oriented laboratory providing state-of-the-art infrastructure for R&D, demonstration, verification and testing over a wide range of Smart Grid use cases – including smart transmission grids, HVDC grids, smart active distribution grids, micro grids, integration of Smart Grids, smart houses and smart industries, integration of renewables, smart Grid and home automation, smart electricity use, electrification of transport, energy storage in Smart Grids, energy conversion in Smart Grids, power system stability in Smart Grids, monitoring, control and automation in Smart Grids, communication technologies for Smart Grids, information security and privacy in Smart Grids, reliability challenges in Smart Grids-dependencies of Power Grid and ICT, smart grid software Big data management and analytics in SmartGrids.

**ROBOTNOR**

ROBOTNOR – Centre for Advanced Robotics – is located in Trondheim and funded by NTNU and SINTEF. ROBOTNOR specializes in development of next generation robotics technologies and concepts, promoting education and industrial innovation.

At ROBOTNOR a number of lab facilities are available, including:

The *industrial robotics lab*, which is a lab where the challenges of robot manipulation can be tackled. With multiple industrial manipulators, conveyor belts, and imaging equipment, this lab is capable of analyzing and emulating a variety of scenarios.

The *robot learning laboratory* acts as a cooperation arena with the other laboratories of ROBOTNOR. Examples of laboratory activities include the development of a robot controlled camera system that learns how an operator would like to view his or her environment, and a robot arm that learns to grip and lift different objects.

The *nanorobotics lab* which is a lab facility for research on nanopositioning. The laboratory is equipped with state-of-the-art instrumentation required for high resolution, high bandwidth motion control.

The *UAV lab*, the unmanned aerial vehicles laboratory is a test facility for NTNU’s Research on unmanned aerial systems (UAS).

The labs are available for companies to use against a fee. In addition, master students at NTNU can support companies with expertise at no cost. Co-financing for companies costs of renting lab facilities are available through various schemes, in particular those of the Norwegian Research Council.
2.3 Finland / Tampere

In Finland it is the VTT Technical Research Centre of Finland, Tekes (Finnish Funding Agency for Innovation), the Ministry of Transportation and Communication and a number of universities that provide the majority of test and demonstration infrastructures benefitting SMEs in the digital economy.

The test and demonstration infrastructures collaborate with SMEs – either based on commissioned work or through joint research and development activities.

Tekes offers a programme – Innovation Vouchers – supporting innovation activities in SMEs. “Innovation activities” refers in this programme to all measures employed by the company to develop its products, services or processes, or to acquire new knowledge and competencies required in innovation activities.

An innovation voucher can be used to purchase new knowledge and skills, for purchasing expert services related to innovation activities, e.g. from companies providing innovation services, universities, universities of applied sciences and research organisations. An innovation voucher can amount to a maximum of EUR 5,000 + VAT. Test and demonstration costs beyond this amount must be fully paid by the companies.

The Tampere Region Economy Development Agency (Tredea) also offer an Innovation Voucher scheme. This pilot programme is implemented with support from the European Union Regional Development Fund. It targets innovation in SMEs under five priorities: Renewing Industries, Smart City, Smart Mobility, IoT and Healthcare. The funds are disbursed by Tredea to pay for test and demonstration services provided by Tampere Technical University (TUT) and Tampere University of Applied Sciences (TAMK). Innovation vouchers can amount up to EUR 5,000 per SME. Practically it works in a way where the two participating universities provide information in the form of “Product Cards”. In these cards the universities offer details on their test and demonstration service. SMEs can then apply for these services – using a web-based platform. If a SME is granted a Tredea innovation voucher, the regional financial support flows directly to the universities once the test and demonstration service has been provided to an SME.

The programme started in November 2016 and runs until June 2018. The scheme has received much interest with 100 vouchers being disbursed in the first 3 months. The next call under the scheme will be in September 2017. Here Tredea aims to open up the programme for also non-Finnish services providers i.e. test and demonstration infrastructures in other EU countries.

For further information reference is made to the sections below on Tampere Technical University (TUT).

Finnish universities also provide services that involve components of testing and demonstration through the Demola programme. Demola is a common innovation platform of the higher education

17 https://www.tekes.fi/en/funding/SME/innovation-voucher/
institutions in Tampere. It offers companies an opportunity to develop and test their ideas together with students. The company provides a topic for a project (idea/challenge) and a student will then work for three-four months with support from a facilitator and the partner company. The result may be a demo or something else that validates the feasibility of the original idea. If the partner SME finds the outcome commercially useful, the company can acquire the right to use the results. There is also a small administration fee for the service 18.

**VTT Technical Research Centre of Finland**

VTT Technical Research Centre of Finland Ltd operates (non-for-profit) under the mandate of the Ministry of Economic Affairs and Employment. VTT provides research and innovation services and information for domestic and international customers and partners – within Finland and beyond. One of the four subsidiary companies is VTT Expert Services Ltd (the others being VTT Ventures Ltd, VTT International Ltd and VTT Memsfab Ltd):

**VTT Expert Services Ltd**

VTT Expert Services offers expertise, certification and product approval services, testing and inspection services and calibration services. Testing and inspection support of electronic products, include:

**Electronic expert services**, where VTT help to ensure the reliability and safety of electrical and electronic products in accordance with the requirements of the market, users and authorities. VTT help companies to solve technical problems relating to products or production – from the product development stage to speeding up the product's entry into markets.

**Environmental testing**, where VTT help with determination of environmental condition stresses, consequent testing requirements and design of testing programmes and test set-up and fixtures. Thereafter VTT can assist with the actual climatic testing of products, vibration and shock testing and tightness testing of enclosures (e.g. against dust, water and protection against other objects).

VTT also offers test and demonstration services on **Vehicles, machines and systems**, including system and software testing, where companies can benefit from third party independent services for the reliability inspection and estimation of safety critical functions of software, hardware and automated systems 19.

**5G Test Network Finland (5GTNF)**

18 [http://www.demola.net/](http://www.demola.net/)
19 [http://www.vttexpertservices.com/services/testing-and-inspection](http://www.vttexpertservices.com/services/testing-and-inspection)
5G Test Network Finland (5GTNF 20) is a versatile 5G technology and service trialling infrastructure comprising of multiple interconnected sites hosted by the Finnish 5thGear21 testbeds. These national 5G test networks, which are mainly funded by Tekes, are placed in several cities around Finland. They provide an integrated platform for development and testing of new applications, services, algorithms, technologies, and systems. The collaborating sites form a joint innovation platform and ecosystem which can flexibly serve the needs of industry, SMEs, start-ups and academia by providing an opportunity to try out 5G mobile technology functionalities well before 5G becomes commercially available.

Generally, 5GTNF services include: support and consultancy for all 5G-related R&D; research platform for studying and exploring 5G; possibility to test partners’ applications and tools over live 5G network, including demanding IoT solutions; development of new business models; and more generally opportunity for long term co-operation in the wireless communications ecosystem.

The testbeds participating in the 5GTNF ecosystems are as follows:

5G Test Network+ (5GTN+ 22) project, hosted by University of Oulu and VTT Oulu in cooperation with over 20 industry partners, provides a scalable environment for developing future business models and services as well as for testing and developing key 5G technology components and related support functions. 5GTN+ provides options for open or restricted access for the test network users. In restricted network, partners can test their innovations in a controlled environment. Open network offers an open platform where interactive value creation with users and customers can happen. The project focuses, instead of pure technology, more to service/application driven research targeting to support bringing spearhead technology and applications from different vertical application areas to real use.

Critical Operations over Regular Networks (CORNET 23) project discovers and tests novel solutions for realizing critical communications in a highly cost-effective manner by reutilizing commercial radio networks and everyday communication equipment. The main goal of CORNET project is to develop a powerful test platform where the Quality of Service of critical communications in commercial radio networks as well as the operability of movable temporary radio networks can be tested in a real-life environment. The studies focus mainly to priority communication and temporary network deployment use cases.

A project, Wireless for Verticals (WIVE), focuses on vertical sectors that will benefit from the vision and its realization via 5G. The vertical sectors present in the project are media & entertainment and machine-type connectivity for industry. The project will develop future radio technology and study its application for verticals by setting up use cases, scenarios and requirements for the technology as well as via testing. Testing and trialing of the technology will happen in test facilities provided by 5GTNF as well as in the testbeds from the consortium.

20 http://5gtnf.fi  
22 http://5gtn.fi  
23 http://www.oulu.fi/cornet/
A project, The 5th Evolution Take of Wireless Communication Networks (TAKE-524), provides a multidisciplinary and open research platform for the investigation and experimental evaluation of innovative ideas in networking, services and new business models for 5G. In TAKE-5, existing research networks are enhanced and integrated into a common shared testbed for the new test and validations. The project gathers the major industry players, SMEs and research institutions to work together towards 5G.

HILLA

Established by University of Oulu, Oulu University of Applied Science, Business Oulu, Tekes and VTT, HILLA is a 5 year acceleration and investment program focusing on ICT smart specialization within selected business areas: wireless ICT, automotive and traffic, health and heavy industries.

HILLA aims to: a) accelerate research to business, b) efficiently utilize ICT and industry knowledge and resourcing in business development, and c) build market driven operation model between participants.

HILLA activities facilitates: co-creative ideation of new business opportunities; research and technology resourcing; business sparring and partnering, project development and managed services; customer matchmaking and showcase events; and shared of R&D environments and tools.

One of the first results of HILLA was the establishment of the Nordic Test Cluster (NTC) aiming to provide a one-stop-shop for digital test and demonstration services in Finland.

Also, a Testing Special Interest Group (SIG) is currently being planned. This will aim to bring researchers and companies together to exchange information on newest trends and requirements in digital testing.

Nordic Test Cluster – a part of the HILLA programme

The Nordic Test Centre (NTC) is a business initiative established to promote collectively the wide range of testing, simulation and certification services available in Finland. NTC services are offered globally through a single communication channel thus allowing a rapid response for the needs of our customers.

NTC provides a wide range of R&D test services, the majority of these in the digital economy space (OTA, EMC, SAR, RF, antenna, audio, structural, mechanical/environmental, etc.). Also digital prototyping services are offered. The rationale/business model is that NTC combined pool of knowledge, skills and high standard equipment and laboratories enable NTC to make the development process cost effective and rapid for its customers.

24 http://take-5g.org/
Finnish Transport Safety Agency – Traffic Lab

Finland aims to be the best place in the world to develop and test digital transport services. The Traffic Lab is a testbed for digital and innovative traffic and logistics services.

The Traffic Lab’s focus on development of new service concepts for mobility, traffic automatisation, the Internet of Things, as well as pilots that are strategically significant to trade and industry, companies and regions.

Testing and making conclusions about people’s everyday mobility are essential in the Traffic Lab. The test environments are used in attempts to find innovative solutions, to improve services, and to promote independent initiative and entrepreneurship.

The Traffic Lab provide for five test environments:

• Growth Corridor Finland which is offers private companies and consortia a possibility to scale the first stage of mobility services and to more extensive modelling of the products. The network comprises of 18 cities and municipalities, all three Regional Councils of the area, as well as all four Chambers of Commerce.

• ITS in Tampere which is a innovation and experimentation environment for intelligent traffic. It aims to position Tampere region as a key development environments for intelligent traffic.

• NordicWay which aims at developing new kinds of traffic services and road traffic automation e.g. for cars to utilise the mobile network to share specific and low latency traffic safety information regarding e.g. obstacles on the road, weather conditions, slippery surfaces and accidents.

• Aurora Fell Lapland Test Arena which is a test area for automated driving with a goal to create an internationally unique, information-based test area and centre of excellence for intelligent traffic automation in Arctic conditions.

• Aurora Living Lab Bus which is a testbed that enables development, testing and demonstration of various services and technologies in a transportation. A fleet of innovative electric buses in normal operation in the Helsinki Region are used as a concrete test environment.

Practically The Traffic Lab provides test and demonstration services in the following areas: transport legislation; data protection, consumer protection, taxation and insurance; product commercialization; and standardisation and certification.

Tampere University of Technology (TUT)

At Tampere University of Technology, TUTLab provides testing and demonstration services for SMEs. TUTLab consists of two parts, ProLab and FabLab. ProLab is a lightweight engineering workshop that supports both research and teaching by manufacturing research equipment for their use but also for companies. The services that ProLab provide include component manufacture,

25 http://trafficlab.fi/test-environments/
assembly, mechanical and electromechanical consultation and machining services.

*FabLab* on the other hand is a new learning environment on TUT campus. It is an open workshop for digital manufacturing focusing on the integration of various techniques and it is the center of manufacturing and hands-on learning for the students of TUT. The focus area is learning and joint research, e.g. not commissioned testing. In FabLab there are on offer different equipment for digital manufacturing, e.g. 3D printers, laser cutters, CNC milling machine and software for designing projects. Companies can book the machines for an hourly rate of 100 euros. Also, FabLab is available for companies for product development for a fee of EUR 2000-2500 per day. Companies can also work together with the students, for example give some problems for the students to solve in TUTLab as course work.

*Smart Machines and Manufacturing Competence Centre (SMACC)* is a collaboration between TUT and VTT Technical Research Centre of Finland Ltd. SMACC offers high-end services in the field of smart machines and manufacturing. SMACC boosts the ecosystem development of the manufacturing industry and serves as a one-stop shop for flexible execution of research-based development projects. The competence centre provides companies with services for technological and business development and access to latest research findings. SMACC’s key areas of expertise are: Advanced digital and additive manufacturing; Digital design and modelling; Digital services and quality management; Maintenance and life cycle management; and Automation and robotics. Services target companies aspiring to identify their own trumps and development targets in the digital operating environment; speed up their product and production development; test the functionality of their solutions with top experts in the field; and improve their overall productivity. Companies can join the SMACC community free of charge and gain access to specialised industry information, events, networks and the joint-use SMACC facilities at TUT.

### 2.4 Sweden / Skåne

In Sweden it is RISE Research Institutes of Sweden (including since 2016 Swedish ICT and Swerea, Swedish Research) that provide the majority of test and demonstration infrastructures benefitting SMEs in the digital economy.

The test and demonstration infrastructures collaborate with SMEs – either based on commissioned work or through joint research and development activities.

Vinnova (Sweden’s innovation agency) supports testing and demonstration of products, processes or services in SMEs through an [innovation voucher scheme](#) (innovation checks). Support can amount up to SEK 100,000. The innovation voucher may be used to buy external expertise from research institutions, universities or private consultants – and more specifically to investigate innovative and new business models, products, services or processes. The voucher may also be used to develop a strategy for mastering novel immaterial approaches. The vouchers are provided through innovation coaches at Almi (regional business development centres, IUC (Industrial Development Centres) and Companion (regional business advisory and cooperation network).
RISE Research Institutes of Sweden

RISE Research Institutes of Sweden is a newly formed network integrating a large number of research and technology organisations (RTOs), wholly or partly owned by the Swedish state. The RTOs within RISE perform industrial research and innovation. RTOs under RISE provide in Sweden the vast majority of testing, demonstration and certification services available to companies in the digital economy:

RISE SICS

SICS is a research institute in the field of digitalization of products, services and businesses. SICS contribute with technology services within including big data analytics, automation, security, and internet-of-things. Advanced research is carried out in close collaboration with Swedish and international industry and academia – in particular within the areas of: Internet of Things; Industrial Automation and Maintenance; Automotive and Rail; Telecom; Digital Health; Digitalization of Education; Decision support and business intelligence; and Data Centers.

Key competence areas include: Big data analytics, machine learning and optimization; Data intensive computing and cloud platforms; Network technology and architectures; Security, trust, privacy and integrity; Interaction and user experience; Software and systems engineering; and Computer systems.

SICS has six laboratories:
- Computer Systems Laboratory.
- Decisions, Networks and Analytics Lab.
- Digital Health Lab.
- People Technologies Lab.
- Software and Systems Engineering Lab.
- Security Lab.

The main office of SICS is situated in Kista outside Stockholm with smaller office in Uppsala, Lund, and Norrköping and regional subsidiaries SICS East (Linköping), SICS North (Luleå), and SICS Västerås.

RISE ICT

RISE ICT provides testbeds and demonstrator facilities that are both physical sites, mobile and virtual resources. RISE ICT can support companies with pre-studies, research, industrial applications and project management as well as hands-on support.

8 testbeds and demonstrator facilities are available through Rise ICT26.

RISE Acreo

26 [https://www.swedishict.se/our-offer/testbeds-demonstrators-and-labs](https://www.swedishict.se/our-offer/testbeds-demonstrators-and-labs)
RISE Acreo has offices in Stockholm/Kista (HQ), Gothenburg, Norrköping, Lund and Hudiksvall provided services to companies throughout Sweden.

RISE Acreo is a research institute within electronics, optics and communication technologies. Acreo provide resources and knowledge within electronics, optics and communication technologies. Facilities and lab resources are available for advanced R&D as well as for small scale production and prototyping. Acreo’s mission is to find new ICT-solutions for existing and future demands, creating sustainable growth in industry and society.

Acreo National Testbed, ANT

Acreo National Testbed, ANT is an umbrella of testbed activities for a wide spectrum of regional, national and international institutions and companies working with research and development of today’s and tomorrow’s ICT products and services within the areas of smart living, eHealth, service distribution and broadband networks. Common for all testbed activities is that they are performed in real networks using real end users. The testbed is open to companies (and universities) that wish to test their equipment or service in a sophisticated environment with end users.

Acreo Fiberlab

Acreo Fiberlab is laboratory for research, development, manufacture, and characterization of advanced optical fibers and preforms. Testing and development can be done in advanced coating technologies, microstructured fibers and silica capillaries, doped core preforms and more.

Electrumlab

Electrum Laboratory is a test bed for nanoelectronics. It makes available a semiconductor process laboratory, with complete process lines for device research and fabrication of components in a wide variety of materials such as silicon, glass and polymers. The 1300 m2 clean-room area for electronic, optoelectronic and MEMS processing is operated jointly by Acreo and the Royal Institute of Technology (KTH).

Printed Electronics Arena Manufacturing Lab

The printed Electronics Arena Manufacturing Lab which is a greenhouse located in Norrköping Science Park (NOSP) for the development of prototypes and small scale production of printed electronics. As an incubator PEA Manufacturing is open to anyone that would like to test printed electronics in their products and processes – including start-up companies, SMEs and well established companies.

RISE Interactive C-studio

RISE Interactive C-Studio is based in Norrköping, Sweden. The studio works with project based applied research, development and experimental production within the field of visualization and
interaction design. With a practical and prototype driven approach C-studio works with projects within many areas such as immersive display environments, stereoscopic 3D technology, interaction design, information and geo visualization, ambient visualization, exhibition design etc. The center collaborates with industrial partners and constitutes a hub for knowledge dissemination and commercial collaborations.

Integration Catalyst for Residential ICT

The testbed, usually known as "The Catalyst" or "The Wall" has its origins in a research project called Smart ICT for Sustainable Living in Stockholm Royal Seaport – a project which was funded by Vinnova and implemented by the Swedish ICT institutes SICS and Acreo. The main aim of the testbed is to create better conditions for SMEs: For SMEs to be better able to create, combine, integrate, test and demonstrate their products and services on a more open and tolerant platform. Some of the testbed activities has taken place in the companies' own premises using a remote connection to The Catalyst. The Catalyst can therefore be considered to be both a physical and a virtual IoT testbed. The Catalyst belong to RISE ICT, while the researchers around it comes from SICS. The Catalyst is open for SMEs - it is actually the very purpose of the test bed. It is difficult for small companies to pay 100% of the costs for using The Catalyst and the SICS expertise. Therefore research activities has so far been conducted as projects with external funding with the SMEs only paying their own hours of work.

SICS ICE – data center in Luleå

A new industry sector, the datacenter sector, is emerging in Sweden. Large companies – including Facebook, ABB and Ericsson have already installed large data centers in Sweden. To further take advantage of this opportunity SICS Swedish ICT, in partnership with Luleå University of Technology, is planning for a large-scale testing and experimentation facility under the working name SICS ICE (Infrastructure and Cloud datacenter test Environment). The test facility will enable research and support large scale testing of new data center technologies.

Urban ICT Arena

Urban ICT Arena (UICTA) is an open co-creation arena and testbed in Kista where the possibilities of digitalization are developed, tested and showcased. The overall purpose UICTA is to futureproof Sweden by using the projects pursued within UICTA to help develop tomorrow’s sustainable cities, boost innovation and secure jobs for the future. UICTA has extensive IT infrastructure comprising several different types of wired and wireless components (including 5G networks, dark fiber, etc.) – combined with a unique presence of community stakeholders from industry, academia and the public sector.

Swerea

Swerea is the Swedish Research Institute for Industrial Renewal and Sustainable Growth – and a part of the RISE network. Swerea supports industrial renewal and sustainable development. Its objectives are to create, add value and disseminate research results in material development,
process and product development – and do this is close cooperation with academia, business and society. Swerea is made up from five subsidiaries each focused on different research areas such as composites, polymers, metals, ceramics and textiles.

Swerea support companies with testing and demonstration through smaller facilities as well as large test and demonstration infrastructures. Associated researchers supports the companies with preparation, implementation and evaluation as well as in making proposals for solutions and improvements.

Test- and demonstration services for SME’s are provided both as commissioned work (often in the case of design, calculation and material testing) and through collaborative development efforts together with industrial partners. About 15% of Swerea’s total budget is supplied from RISE and designated for strategic development. A large part the Swerea’s funding is applied from national and European research programs in cooperation with industrial and research partners.

*Product development and prototype production*

The Swerea's engineering hall in Mölndal – close to Gothenburg – houses extensive production resources for companies to use when they want to produce prototypes of new products. The facility has pieces of production equipment to suit a number of different materials and technologies. In the digital space Swerea can assist with building electronics using circuit boards, soldering, contacts etc, and also with support in production of enclosures for electronics, enabling them to cope with high temperatures and rugged environments.

*Virtual Lab*

The Virtual Lab is a service to companies that use simulation to support certification and safety approval. Companies can access expertise in the use of modelling and computational tools that can be applied within a many materials (e.g., ceramics, composites, textiles and metals) and manufacturing processes. Advanced modelling and simulation can be performed in many different areas of the development process, including conceptual design, materials development and manufacturing engineering as well as prediction of the performance and characteristics of components and systems.

**2.5 Lithuania**

The Lithuanian Agency for Science, Innovation and Technology provides SMEs support to research and innovation activities through *Innovation Vouchers*.

The Innovation Voucher support companies buying R&D expertise or knowledge from research institutions. The aim is to speed up knowledge transfer and commercialization of research results. Companies may receive support amounting to 70% of eligible costs, up to EUR 5.682.

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27 This chapter on was drafed with kind support of the Baltic Development Forum.
Testing and demonstration is not specifically mentioned in the programme – the reason being that Lithuania currently lack such technological service institutions. Rather, collaboration between SMEs and companies takes place in the form of joint research and entrepreneurship incubation activities at a number of universities and national research institutions/centers. The universities and research institutes have recently established what is called “open access R&D centres/laboratories”, where business and public partners can access the R&D resources, advanced technologies and get other kids of advanced services. The “Open R&D Lithuania network” is a cooperation between 14 Lithuanian universities, 13 public research institutes as well as 8 science and technology parks.

**Kaunas University of Technology**

Kaunas University of Technology (KTU)\(^{28}\) has two centres of science, studies and entrepreneurship: The "Santaka" and "Nemunas" valleys. Santaka and Nemunas is part of the National Innovation and Entrepreneurship Centre located at KTU. It was established in 2014 and provides hub in Lithuania for applied scientific research and innovation.

**The IT Open Access Business Lab**

KTU host the IT Open Access Business Lab specialized in providing technology services on eye tracking equipment to companies in communication, advertising, webservices and media agencies. The equipment establish heat maps of human gaze which allows establishing what locations the gaze is pointed at. Such research helps establish whether the advertising layout, website or product packaging efficiently attracts consumer attention and where exactly they cast this focus on. More specifically the eye tracking equipment is designed for: Assessing advertising product design in focus groups of potential customers created; Assessing attention of website visitors in focus groups; and Assessing attention of consumers of print lay-out design in focus groups\(^{29}\).

**Vilnius University**

Research areas at Vilnius University includes Diagnostics and Treatment of Diseases, Genomics, Biomolecules and Biotechnologies, Changes in Ecosystems, Protection, Natural Resources, and New Functional Materials and Derivatives.

Companies and other organizations can collaborate with Vilnius University through joint research activities, commissioned research services, use of research infrastructure and services at Open Access Centres – including assistance with licensing inventions and patent applications\(^{30}\).

Research areas related to the digital economy at Vilnius University includes: Laser Physics and Light Technologies; Fundamental and Applied Mathematics and Informatics and Information Technologies.


\(^{29}\) [http://kaunomtp.lt/it-laboratorija](http://kaunomtp.lt/it-laboratorija)

Vilnius Gediminas Technical University

Vilnius Gediminas Technical University (VGTU) is active in technological science and experimental development – benefitting from its’ 14 institutes, two research centers and 34 research laboratories.

The main VGTU initiative targeting product development and prototyping is the Creativity and Innovation Centre, “LinkMenų Fabrikas”, that aim very practically to nurture research and innovative ideas into commercial products, services or processes. However, currently at LinkMenų Fabrikas the emphasis is on audio, electronics, metal engineering, picture, color and paint.

LinkMenų Fabrikas includes a Workshop on Elektronic and Elektromechanical Work. Here, companies can rent facilities for design of electric schemes; design and manufacturing of printed circuit boards; composition of electronic systems; optimization of electronic systems; and electromechanical works.

Also at LinkMenų Fabrikas there are workshop facilities for e.g. 3D printing and layouts, 3D scanning, and printing and layout31.

Center for Physical Sciences and Technology

The Center for Physical Sciences and Technology (FTMC) is the largest scientific research institution in Lithuania with the areas of fundamental research and technological development in laser technologies, optoelectronics, nuclear physics, organic chemistry, bio and nanotechnologies, electrochemical material science, functional materials and electronics32.

The main activity of FTMC is to carry out fundamental and applied research as well as experimental investigations in the fields of physics, chemistry and technologies – to the benefit of the Lithuanian society and economy.

FTMC has both a large pool of laboratory facilities and experts, including 38 habilitated doctors of science, 246 doctors of science, more than 500 researchers and 60 PhD students. In January 2017 more than 300 scientific investigations were ongoing commissioned by companies.

Key areas of scientific expertise in the digital economy space include development of new optoelectronic devices as well as electronics and sensors.

2.6 Latvia

In Latvia efforts are ongoing to soon announce an Innovation Voucher scheme providing up to 60% government co-financing for R&D projects and product testing33.

33 http://www.labsoflatvia.com
Currently in Latvia – like in Lithuania – it is the universities that provide the vast majority of test and demonstration infrastructures in the digital economy.

**Institute of Electronics and Computer Science**

Institute of Electronics and Computer Science was created in 1960 as a part of Latvian Academy of Science and is a state research institute dedicated to fundamental and applied research in computer science, information, communication and electronic technologies. It has 6 different laboratories: signal processing, time measurement, sampling conversion, network research and development, embedded system and cyber-physical systems that can be used by university students. Moreover, the institute provides different products and services such as dimension 1200es 3D Printer and Digital Serial Analyzer used for consumer electronics gigabit transmitter and signal path characterization.

One of the services they provide is EDI Testbed that is a 100+node heterogeneous sensor network and wireless sensor networks testbed for validation and research in sensor network protocols. It can be used as a test facility for large-scale experimentation with sensor network software and hardware and WiFi network software34.

**Riga Technical University**

Riga Technical University (RTU) prioritizes highly collaboration with industry, including innovation and technology transfer, and application of scientific discoveries. For business and other organizations, RTU offers: Laboratory research; Design and prototyping services; Start-up support; as well as Premise and equipment lease. RTU Lab assist with prototype design, experimental production, product upgrade, as well as contracted work; consultative services on product design and development; prototyping and testing; and design of custom-made research35.

**Use Science platform**

Equipment can be leased through Use Science platform which is an online scientific service, equipment, and program register. The Use Science system was developed to catalogue, record and locate laboratory equipment, ICT and specialist tools more effectively utilizing the assets already in existence and lessening the need for duplication of material assets, thus ensuring that RTU employees, students, representatives of enterprises and other institutions, as well as public users have the information regarding research equipment, software, and services, which are available at RTU and Use Science partner institutions. More than 20 different partners offer they services and equipment through this system in many different research fields including biotechnology, computer science and technology. Even though most of the partners are universities, SMEs and startups can also enquire the access to the equipment for testing and prototype development and finding available testing and demonstration facilities in Latvia36.

36 [https://scientificservices.eu/facility](https://scientificservices.eu/facility)
**Design Factory**

RTU Design Factory brings together research, education and the industry to create a new hands-on learning culture and opportunities for radical innovation. RTU Design Factory provide access for researchers and students to facilities, tools and services for prototyping enabling them to create new and complex solutions. Technologies offered range from laser cutting and engraving, 3D printing and scanning to high-speed CNC machining and post-processing. They also work with interdisciplinary student and researcher teams to solve real-life challenges from various industries by developing scientific equipment, demonstration models or fully functional prototypes to support scientists and staff of RTU. Nevertheless, startups and SMEs can rent the equipment and the space as well in order to develop their solutions and prototypes.

**Idea Lab**

RTU also support business development through Idea Lab which helps students and alumni members to develop their business ideas into the reality. Idea Lab provides the space for the meetings and work, consultations by experts, mentoring and in some cases also the financial support for the business idea development. Even though Idea Lab’s main focus is on the students, in some cases Idea Lab also work with Startups and SMEs to help them to develop the solutions by providing access to the Design Factory to test and develop prototypes and apps\(^\text{37}\).

### 2.7 Estonia

In Estonia **innovation vouchers** are available to SMEs though Enterprise Estonia. The innovation voucher enables a small and medium-sized entrepreneur (SME) who is cooperating with a higher education institute, test laboratory, or intellectual property experts, to develop innovative solutions, carry out tests with new materials, gather knowledge on technologies, conduct studies in intellectual property databases etc.

The maximum grant to SMEs is 80% of costs up to EUR 4.000. Eligible activities supported under the scheme include: consulting on product or service development; consulting on production or technology; conducting product tests and industrial experiments; carrying out feasibility and cost-benefit research; legal protection consultation, tests and registration regarding patents, utility models or industrial design; consulting regarding metrology, standardisation and certification; and development and implementation of technological solutions\(^\text{38}\).

Currently in Estonia – like in Lithuania and Latvia – it is the universities that provide the vast majority of test and demonstration infrastructures in the digital economy.

\(^{37}\) [http://idealab.rtu.lv/](http://idealab.rtu.lv/)

\(^{38}\) [http://www.eas.ee/service/innovation-voucher/?lang=en](http://www.eas.ee/service/innovation-voucher/?lang=en)
**Tallinn University of Technology**

Tallinn University of Technology (TTÜ) is the only technological university in Estonia and the flagship of Estonian engineering and technology education. One of its institutions is Mektory center for innovation and business. It has a special focus on startups and development of new solutions for different problems. It arranges start up competitions and workshops on how to start a startup as well as mentoring students in their ideas development, that are promoted on the Mektory website and can be pitched to the industry delegation that visits the center. Moreover, it offers different testing facilities and office space for students free of charge.

The center has 11 different labs including Electronic lab, Telia TestLab and VR Lab “Re:creation”. The electronic lab is a workshop created in collaboration with Erikson for quick prototyping and provides different equipment for testing. VR Lab “Re:creation” focus on virtual reality and aims to develop virtual reality skills, encourage students to engage in scientific research and develop ideas into practical applications. University students, scientist and visitors can improve products and services with unique virtual reality applications, train staff or clients through different simulations in virtual reality, test telepresence and establish a cooperation with different research- and development platforms.

**Smart Lab**

Telia TestLab, also known as Smart Lab, is a testing environment for mobile applications. It has a variety of mobile devices (hardware and software) on which manual and automatic tests can be run in order to provide the best user experience. University students can learn to develop and test apps on different devices (mobiles, pads, wearable) with different platforms (Android, Windows Phone, iOS). Testers and developers have a physical place to run automated tests with applicable software and emulators. Also, researchers and advanced students can develop further automated testing and companies outsourcing application development can benefit from an environment to test that outsourced application development function as ordered. The cost for using the lab for business customers is 40 euro per hour +VAT, which include the rent of all lab devices, infrastructure and help with installations.39

**University of Tartu**

University of Tartu (UT) is Estonia's leading centre of research and training and includes four faculties: Faculty of Arts and Humanities, Faculty of Social Sciences, Faculty of Medicine and Faculty of Science and Technology. The Institute of Computer Science within Faculty of Science and Technology is one of the fastest growing and most international institutes at the UT.

An important UT initiative is the Mobile & Cloud Lab at the Institute of Computer Science. It conducts research and teaching in the mobile computing and cloud computing domains and research topics include: cloud computing, mobile application development, mobile cloud, mobile web services, Internet of Things (IoT) and migrating scientific computing and enterprise applications to the cloud. In 2016 Institute of Computer Science opened an IoT lab in collaboration with Telia.

39 [https://www.ttu.ee/projects/mektory-eng/mektory-center/labs-and-studios/]
The equipment in the lab will be used mainly by researchers in the mobile and cloud computing laboratory to create new groundbreaking smart solutions\(^40\).

3. Summing up and what’s next...?

This report provides an overview – snapshot if you will – of a number of digital test- and demonstration infrastructures in digital economy in the Baltic Sea Region.

It appears from the analysis that there is quite many – and a growing number of – test, demonstration and verification infrastructures that SMEs can benefit from when attempting to commercialise new digital products, services or processes. It also appears that there are both overlapping and complementary areas of testbed expertise in the digital economy among regions and countries in the Baltic Sea Region – with e.g. Denmark having particular digital testbed excellence related to the energy sector; with Norway having such excellence in particular related to the maritime sector; and with Sweden and Finland having similar such excellence but related to in particularly the communication sector. The offers a number of opportunities for cooperation.

It also appears that test and demonstration infrastructures in Lithuania, Latvia and Estonia are increasingly becoming more sophisticated – including due to support from new innovation voucher schemes in all three countries. Still, the Baltic countries have some way to go to reach the level of testbed service and expertise that is available to SMEs in Denmark, Finland, Norway and Sweden. This situation offers great opportunity for sharing experiences on the “nuts and bolts” for successfully delivering test and demonstration services to SMEs in the digital economy. It also offers further arguments for encouraging SMEs to acquire test and demonstration services at the macro-regional level.

This report was prepared to provide a basis for dialogue – among policy makers, practitioners of testbeds and SMEs (as the users) on testbed policy approaches – on opportunities for benefitting from joint and complementary areas of digital economy testbed excellence in the Baltic Sea Region.

This dialogue will be commenced in connection to the presentation of this report at the macro-regional seminar in Tampere on 6 April 2017. To further set the stage for dialogue, as a first next step a Discussion Paper will be made available to participants at the seminar. The discussion paper will include a set of practical recommendations to enhance cooperation among digital economy testbeds in the Baltic Sea Region.