WP5, Activity 5.3: Open data pilot

Programme document, evaluation & conclusions

28.2.2019

Table of contents

List of abbreviations

ARF	Analytical research facilities
ARI	Analytical research infrastructure
BT	Baltic TRAM
HEI	Higher educational institution
IA	Innovation agency
ILO	Industrial liaison officer
IReC	Industrial research centre
IReC Net	Industrial research centre network
RIS3	Regional smart specialisation strategy

List of Figures

List of Tables

Credits

Programme document: Kainuun Etu Oy (KE), Baltic TRAM PP4 has been responsible for the coordination of task T 5.3: the open data programme document. In this process all the partners have contributed, while more intense demands were made on the WP leaders (DESY PP1, UTU PP3, IIF PP11, BDF PP12 and CBSS PP14) as well as external experts (CSC especially for part 2.5 Technical specifications and Ernst & Young especially for trade secret and associated open data issues).

Contributions to the Review 1 (15.11.2018 version): University of Turku (Baltic TRAM PP3) technical aspects, 3rd HLG meeting on 14.11.2018 (LP, PP14, HLG-Estonia, HLG-Sweden).

Contributions to the Review 2 (14.3.2019 version): Foundation of Innovative Initiatives (Baltic TRAM PP11) WP5 coordinator.

Open data portal internal testing and finalisation: PP3 University of Turku and PP4 Kainuun Etu

Bilateral interviews with IReC members who contributed case studies on the usefulness and expectations from the open data portal: Kainuun Etu with the University of Tartu (16.1.2019), University of Turku (28.1.2019), Agency for Science, Innovation and Technology (4.2.2019), Foundation of Innovative Initiatives (5.2.2019), and Kainuun Etu (IReC contacts, 31.1.2019).

1. Reminder of Activity 5.3 of the Baltic TRAM project plan

Activity 5.3 Title: e-infrastructure and open data pilot

Description of activities: The aim in this group of activities will be to set up, operate, evaluate and mainstream, in collaboration with the Baltic TRAM ARFs (universities and research institutions) and all partners, an industry-driven concept for open data access, with the purpose of embedding, enhancing and consolidating demand for research infrastructure-based research results and services in the Baltic TRAM regions and beyond. Kainuun Etu Oy, Baltic TRAM project partner 4, is responsible for the coordination of this activity.

The Baltic TRAM concept for open data access and e-infrastructure testing will capitalise on the data generated by the pilot actions (group of activities 5.1 and 5.2). The test e-infrastructure will provide services, and map and analyse demand for data to and from the following target groups:

- Researchers at ARFs
- University faculties and researchers
- Businesses
- IReCs

Through this exercise, it will be possible to understand the profiles of the institutions that have requested data as well as the range, intensity and purpose of the demand for data and information.

The open data pilot responds to the question: does the data generated by the Baltic TRAM experiments have a reuse value? In addition, related to the above target groups, could the reuse value be such as to form a potential base for constituting an industry-led platform for knowledge, methodology and joint development exchanges and focusing on material measurements?

Output title: Open data access pilot completed.

Output description: The output will consist of a concept for open data access addressed to companies of selected branches. The aim is to provide company information about analytical research facilities (ARF) offers for possible research activities in relation to the companies' basic research needs. The test infrastructure will contain data from the 60 pilot projects, describe the problem/research activity, the used methods and instruments, and the received results.

2. Open data pilot, plan

Part 2 comprises six (6) subcomponents and aims at discussing the feasibility preconditions and planning provisions leading to the setting up of the pilot. Thus, the following issues are discussed: 2.1 Objectives, 2.2 Feasibility preconditions of the pilot, 2.3 Concept, components, functions and operations of the open data pilot, 2.4 Open data, open science and trade secret issues; reuse of research data, 2.5 Technical specifications (EUDAT) and 2.6 Evaluation criteria.

2.1 Objectives

The overall objective of the pilot is to formulate, test and validate a concept of open data access to material research measurements related to various industries.

Sub-objectives include setting up a data infrastructure in order to:

- collect data from at least the 60 experiments that will be implemented in the Baltic TRAM project: describe the problem/research activity, the used methods and instruments, and share the received results,
- define, agree and organise different levels of open data access,
- encourage networking through the open data pilot with other relevant projects and initiatives,
- disseminate the results of Baltic TRAM experiments to the research and business intermediary communities,
- provide businesses with information about what analytical research facilities (ARFs) offer for possible research activities in relation to businesses' basic research needs,
- provide businesses with information about industrial research centre activities and offers, liaising businesses and innovation agencies to ARFs,
- acknowledge the links and position the pilot in relation to the open data, open science and trade secret policies of the EU and Baltic TRAM partnership,
- liaise through the open data pilot with EU and national open access repositories and support its validity and sustainability in the long run,
- evaluate the results of the open data pilot, draw conclusions and formulate recommendations on the operational aspects and usefulness of the pilot in terms of longer-term sustainability.

2.2 Feasibility preconditions of the pilot

Section 2.2 outlines the open data pilot feasibility preconditions and indicates the sections in whichthese preconditions are discussed. We are referring to four types of preconditions: policy and legislative frameworks relevant to the open data pilot, operational aspects, and data supply, demand, monitoring and evaluation.

2.2.1 Policy and legislative frameworks

- Open government
- Open science (open access)
- Trade secrets
- Reuse of research data

Relevant sections: 2.4 Open data, open science and trade secret issues; reuse of research data

2.2.2 Operational aspects

- Objectives, concept, plan and support material
- Technical specifications of the e-infrastructure and the pilot
- E-infrastructure available
- Coherently and effectively organised levels of open data access, allowing monitoring and cumulative data analysis.

Relevant sections: 2.1 Objectives, 2.3 Concept, components, functions and operations of the open data pilot and 2.5 Technical specifications (EUDAT).

2.2.3 Data supply, demand, monitoring and evaluation

Supply side

- Sufficient number of experiments
- Data access and data release as part of the service contracts between businesses, ARFs and IReCs
- Upload of descriptions to the open data pilot
- Regular and relevant news and updates
- Dissemination to raise interest in the open data pilot
- Available and reliable contact persons in IReCs, ARFs and IReCs

Relevant sections: 2.3 Concept, components, functions and operations of the open data pilot and 2.5 Technical specifications (EUDAT)

Demand side

- The open data pilot is planned to test, in the restricted framework of Baltic TRAM project 60 experiments, an open data access "service", assess its demand and usefulness to various target groups, and come up with a concept that could be taken up later for more mainstream applications. The assumption of the open data pilot is that it would be useful to various groups of end users: HEIs (researchers and students) that can benefit from additional raw data and case studies; industry experts, IReCs and IReCs that can benefit (as part of a literature review when they are planning new initiatives) from the industrial application case studies, businesses that become aware of the benefits of material measurements to their products, and economic geographers that can study the evolution of the potential of macro-regional research-to-business service schemes. The anticipated demand is reflected in the open data pilot map and information flow (section 2.3.1 Concept, 2.3.2.2 Baltic TRAM experiments component/Component 2, 2.3.3 Information flow, and 2.6 Evaluation criteria).
- The demand side is measured through the monitoring and feedback functions and the evaluation report. See below in *Monitoring and evaluation*.

Monitoring and evaluation

- Monitoring and evaluation functions are included in the open data pilot operations.
- Data collection and monitoring function are parts of the technical specifications of the pilot.
- The evaluation report with recommendations is produced at the end of the open data pilot.

Relevant sections: 2.5 Technical specifications (EUDAT) and 2.6 Evaluation criteria.

2.3 Concept, components, functions and operations of the open data pilot

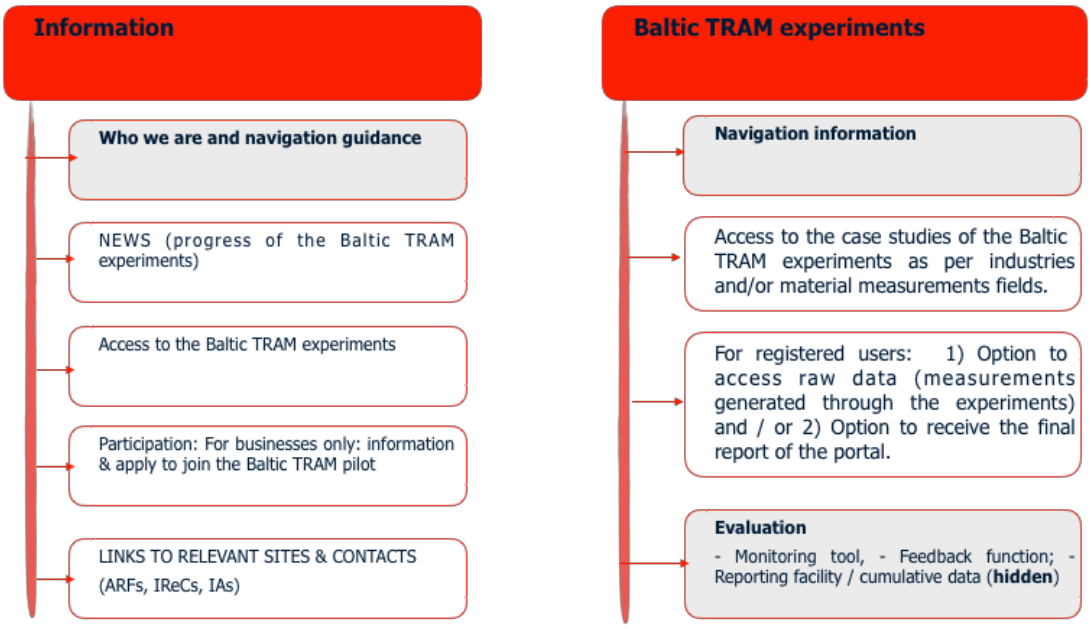
2.3.1 Concept

The open data pilot is conceived as an e-infrastructure that 1) provides information on the overall effort and links to relevant sites (*home component*), 2) provides information on the experiments (*experiments component*), and 3) promotes material measurements to businesses (and in the process the Baltic TRAM model) by allowing businesses beyond the partner region areas to join in with the Baltic TRAM experiments.

2.3.2 Components & functions of the open data pilot

In this section we discuss the functions under each of the components of the open data pilot. Material supporting the implementation of the functions is available in the Annex section of this document.

Figure 1 Map of the open data pilot and operations



2.3.2.1 Information component

The purpose of the Information component is to give information and guide visitors and potential users. The type of information the home component incudes could be, for example:

- Who we are and navigation guidance including access to Baltic TRAM ARFs and IReCs.
- News from the progress of the implementation of the experiments
- Links and relevant sites and contacts (marketing of the IReC Net as well).

- Participation**:** Initially, participation of external entities to the open data pilot welcomes businesses only**.** Businesses located beyond the Baltic TRAM regions to participate in the experiments. For the duration of the Baltic TRAM project, businesses beyond the project partnership can benefit from the Baltic TRAM provisions in the same way as the Baltic TRAM can benefit from the regions' businesses, i.e. it is possible to offer consultative tools (introductory explanations, guidance to fill in the application form, NDA and service agreement; service diagnosis, measurements, interpretation of measurements, and

recommendations) from the Baltic TRAM-registered ARFs and IReCs, and subsidised services. Businesses that wish to receive material research services need to register and mention their basic activity classification (NACE). The registration for participation is reaching the open data portal content coordinator (KE). KE forward the request to the most relevant IReC(-s), i.e. IReCs with the same or close industrial specialisation, prioritising same country of origin as that of the business location. If this option is not available (e.g. there is no IReC in the country where the business requesting measurement services is located), then the request for measurements is addressed to the most relevant IReC regardless of location. Measurement services are provided without fee for the duration of the Baltic TRAM project. After that, there will be updated guidance (estimated time is Dec 2018[1]). In any case, it is possible for the Structural Funds to be applied to pay for interregional innovation services outside programme areas, provided that the cost is incurred within the relevant programme area[2]. For expenditures generated outside programme areas, Article 70 of the Common Provisions Regulation[3] can be applied. Article 70 is explicitly applied by the Baltic Sea Region Strategy[4], provided that such actions have demonstrable added value for the paying region and they have an upper threshold of 15% of each programme area's ERDF. Measurement services, as overseen in the Baltic TRAM experiments, cost way below any 15% upper limit – at least during the pilot phase (project duration). There should be a quantification of projected needs, based on the demand for material measurements identified through the Baltic YRAM project, to allow cumulative calculations for such needs. Perhaps this could be part of the evaluation report.

[1] For example, on going work in WP3 for an interregional innovation voucher.

[2] According to the Guidance for Member States and Programme Authorities: Eligibility of operations depending on location (EGESIF_15_0009-00), version 10 February 2015, clarifies "Article 70 CPR and Article 13 ESF only refer to 'expenditure incurred' in the case of expenditure incurred outside the Union. The place where expenditure is incurred is the place where the expenditure is generated."

[3] Article 70(2) of the CPR (REGULATION (EU) No 1303/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 December 2013): ***Article 70 Eligibility of operations depending on location***: 1. Operations supported by the ESI Funds, subject to the derogations referred to in paragraphs 2 and 3, and the fund-specific rules, shall be located in the programme area. 2. The managing authority may accept that an operation is implemented outside the programme area but within the Union, provided that all the following conditions are satisfied: (a) the operation is for the benefit of the programme area;(b) the total amount allocated under the programme to operations located outside the programme area does not exceed 15% of the support from the ERDF, Cohesion Fund and EMFF at the level of the priority, or 5% of the support from the EAFRD at the level of the programme; (c) the monitoring committee has given its agreement to the operation or types of operations concerned; (d) the obligations of the authorities for the programme in relation to management, control and audit concerning the operation are fulfilled by the authorities responsible for the programme under which that operation is supported, or they enter into agreements with authorities in the area in which the operation is implemented. 3. For operations concerning technical assistance or promotional activities, expenditure may be incurred outside the European Union provided that the conditions set out in point (a) of paragraph 2 and the obligations in relation to management, control and audit concerning the operation are fulfilled. 4. Paragraphs 1 to 3 shall not apply to programmes under the European territorial cooperation goal and paragraphs 2 and 3 shall not apply to operations supported by the ESF.

[4] Provisions of the Baltic Sea Region Strategy (Embedding of the EU Strategy for the Baltic Sea Region (EUSBSR), page 1: "A study was commissioned by INTERACT with a view to analysing the contribution of European Structural and Investment Funds (ESIF) to implementation of the EUSBSR. On the basis of 18 pre- selected ESIF programmes, the study *'Cooperation methods and tools applied by ESIF programmes for 2014-2020 to support implementation of the EUSBSR' (June 2015),* showed that embedding of the EUSBSR varies among Member States and regions, and that different arrangements are foreseen to support the Strategy. These, for example, include: … Possibility to spend part of the funds outside the programme area (Art. 70 of Common Provisions Regulation (CPR) (e.g. Estonia, Finland, Lithuania, Poland)".

2.3.2.2 The Case studies component

The purpose of the Baltic TRAM experiments component is to provide open access to the data and metadata of the experiments, allow more businesses to join, allow contacts with IReCs/IReCs, and to monitor the demand and the feedback of the end users. The Case studies component has four functions: *1 Navigation, 2 Access to case studies, 3 Access to raw data & the final report for registered users, and 4 Monitoring and evaluation.*

- *The Navigation function* simply explains to end users how to benefit from this component.
- *The Access to case studies function* allows end users to screen and download case studies. Access to case studies is done either by selecting NACE & industry classifications and / or analytical research fields. The related drop down lists are included in he Annex of this document. End users have the option to select to screen one or all of accssible case studies. Care is taken that the case studies do not allow to trace experiments to individual businesses, as a way of protecting trade secrets.
- *The access to raw data & the final report option* is only for registered end users.This is where the open data pilot collects information on the commitment and interests of end users to access more in depth information. Here is also a channel for considering the open science significance of the portal.
- *The monitoring and evaluation function* records quantitative information reflecting the evaluation criteria (section 2.6 Monitoring & evaluation functions). A template describing the data to be collected has been formulated and can be found in section 2.6 of this document. The evaluation function summarises the quantitative inputs from the monitoring template, seeks insights, and draws conclusions. Evaluation is done once during the project life time. This is the final report, which is accessible only to registered users.

2.3.3 Information flow

The information flow in the open data pilot is discussed from the perspective of the actors involved, the sequence and flow of information, and it indicates open data access issues. We distinguish between three types of actors: data suppliers, data processors and end users. Data suppliers are the businesses (expressed need for the measurement services) that participate in the Baltic TRAM experiments, the innovation agencies and the IReCs as expert intermediaries and the formulation of descriptions to upload to the pilot, and the ARFs as raw data generators as per the experiment.

- External-internal data flows are 1) from businesses to IReCs, IReCs to ARFs; and 2) from end users to the open data pilot to access.
- Information, especially when they request access to raw data.
- Internal-data flows, are the exchanges between IReCs, IReCs and ARFs, and internal-external data flows are uploads to the pilot. In this context, the role of the IReCs and ARFs is also defined:

ARF

1. Helped by the IReC, business makes application to receive services
2. Experiment is made, raw data is generated
3. Researcher prepares "experiment feedback", i.e. interpretation of raw data + raw data attached, and sends to business, cc to IReC.

IReC

4. Supports business to make application for research services
5. Supports business to understand (if needed) the results of the measurements
6. Fills in the case study template and uploads to the open data pilot.

2.4 Open data, open science and trade secret issues; reuse of research data[5]

As emphasised in sections 2.1 and 2.2, the open data pilot is meant as a test tool for measuring the field supply and demand for research data. These issues were prioritised at the start, during the planning stages of the Baltic TRAM project in 2014. During this period, i.e. 2014 – 2017, these same issues have evolved considerably. The discussion below outlines key aspects of the on-going discussion, which have formed the framework for planning the open data pilot. In each case, we have tried to refer to state-of-the-art policies.

2.4.1 Open data issues in the open data pilot

Three relatively challenging areas for open data access are indicated by the red circles in Figure 2: 1) the raw data generated by each experiment in the sense of scientific secrets, 2) the raw data generated by each experiment in the sense of business secrets (trade secrets), and 3) the criteria by which such raw data is accessed by the end users.

Items 1 and 2 are analysed in some detail below, from two points of view: as EU policies and as national policies among the Baltic TRAM partners. This is necessary because many of the open data access policies (i.e. open government and open science) as well as trade secret issues are rather recent, while their transposition is not homogeneous across the EU; often, older national policies still apply. It is therefore necessary to have an understanding of the different regional contexts and how the differences might impact the implementation of the pilot.

Item 3 is addressed in section 2.4.4 Open data arrangements in the pilot.

2.4.2 Open government, open science and trade secret policies in the EU

The framework of the overall feasibility conditions of the open data pilot, are the EU and national policies relating to data access and reuse. In the preceding component (Figure 4) we outlined the types of data access relevant to the pilot. In this component we discuss the EU policy references of the open data pilot and how it relates to them. These policies can be grouped into data access relating to either public- or private-sector environments. In 2003, the EC introduced two milestone policies dealing with access to and reuse of information, i.e. the policies of open government and open science, which were updated in 2012 and 2013.

Baltic TRAM is a publicly funded project and therefore, the material measurements generated through the experiments and the services it provides to businesses are classified among the (extended) public sector data generation and reuse conditions. From this point of view, we discuss below the open government and open access/open science policies.

2.4.2.1 Open government

In 2003, the European Union (EU) adopted legislation to foster the reuse of open government data in Member States via the Public Sector Information (PSI) Directive 2003/98/EC (Capgemini Consulting 2015, page 7) "The main objective was to ensure equal treatment of all potential reusers where the

[5] This section contributes also to A 3.4 of the Baltic TRAM on open data issues, and ensures the coherence between A 3.4 and A 5.3.

public sector body had released information for reuse. The PSI Directive was subsequently amended in 2013 by Directive 2013/37/EU. With this amendment, the general principle was introduced that all information accessible under Member State legislation is in principle reusable. Also, administrative charges should in principle no longer exceed the marginal costs of making it available for reuse, excluding charging of the reuser for the production of the information. Reuse of information released for reuse by cultural institutions should also be subject to an obligation of equal treatment of all potential reusers, while such institutions could continue to charge reusers in a way that allows them to recover the costs of production of the information."

The expected impact, as expressed by the open government policy and the development of data portals, is to drive economic benefits from the reuse of data and further transparency: "Turning public data to business opportunities. *Public data is all the information that public bodies in the European Union produce, collect or pay for.* This information has a significant — currently untapped — potential for reuse in new products and services and for efficiency gains in administrations. … collect / produce / reproduce / disseminate…" (M.Girardini 2013, page 10).

Member States were obliged to transpose Directive 2013/37/EU by 18 July 2015. In the context of the Baltic TRAM project, the partner countries either transposed Directive 2013/37/EU directly (Germany and Sweden), used a combination of new measures specifically addressing reuse and legislation predating the Directive (Denmark), or adapted their legislative framework for access to documents to include reuse of PSI (Estonia, Finland, Latvia, Lithuania, Poland). A more concrete reference to the way individual Baltic TRAM partner countries have adopted this policy can be found in component 2.6.2.2.

The Baltic TRAM open data pilot is linked to the Open Government policy through the public funding of the experiments, and the subsequent reuse of publicly funded research, i.e. publicly funded projects and/or publicly funded research institutions. It also relates to improved transparency and the subsequent possibility for better policies ("Open access can also increase openness and transparency and thereby contribute to better policy making and ultimately benefit society and citizens.")[6]

2.4.2.2 Open science

This is further taken up by the Open Science (or Open Access) recommendation of 2012: in 2012, the EC introduced the Commission Recommendation 2012/417/EU[7] on access to and preservation of scientific information. "Open access policies aim at providing readers with access to peer-reviewed scientific publications and research data free of charge as early as possible in the dissemination process, and enable the use and reuse of scientific research results." The key argument for open access is that all research builds on previous work and depends on scientists' ability to access and share scientific information. The internet and electronic publishing have resulted in unprecedented possibilities for the dissemination and exchange of information. Open access *does not force researchers to publish*, however, in case a publicly funded researcher decides to publish, then open access is a requirement, which should be implemented taking the challenge of intellectual property rights into account. Thus, the European Commission follows the principle that data should be "as open as possible, as closed as necessary." Since 2014, a pilot on open access to research data in selected areas of Horizon 2020 (ORD pilot) has been running. This pilot takes into account the need to balance openness and protection of scientific information, commercialisation and intellectual property rights (IPR), privacy concerns, security as well as data management and preservation questions. The kind of data concerned is primarily the data required to

[6] Fact sheet: Open Access in Horizon 2020, https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/FactSheet_Open_Access.pdf

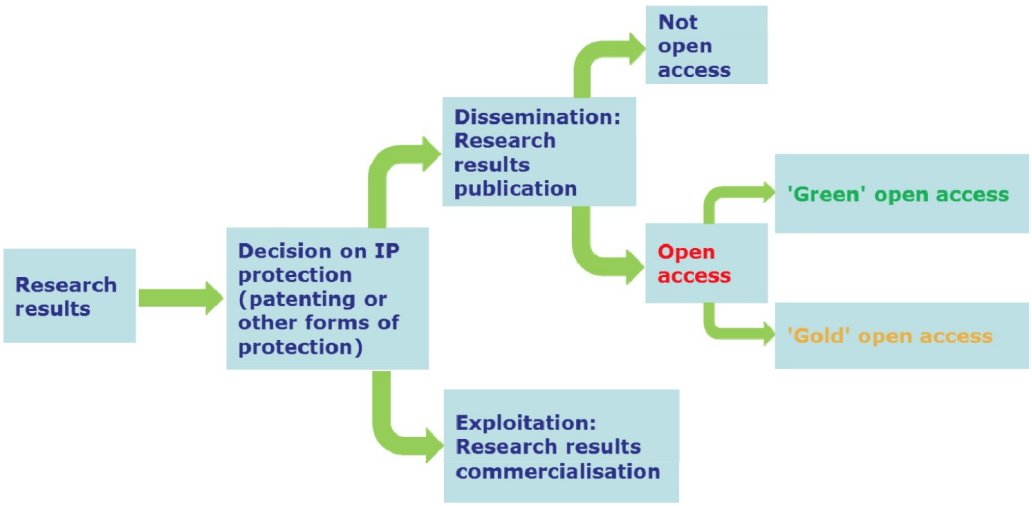
[7] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012H0417&rid=1

validate the results presented in scientific publications ("underlying data"), but projects may add any other data that they want to share in their Data Management Plan (DMP) [8].

The Open Access/Open Science policies are now founding elements of the EU policies. "Elements of 'Open science' will also gradually feed into the shaping of a policy for Responsible Research and Innovation and contribute to the realisation of the European Research Area and the Innovation Union, the two main flagship initiatives for research and innovation."[9]

The expected results of the open access policy is to enhance knowledge as a source of competitive advantage as early as possible, potentially realising a variety of benefits, including:[10] acceleration of the research and discovery process, leading to increased returns on R&D investment; avoidance of the duplication of research efforts, leading to savings in R&D expenditure; enhanced opportunities for multi-disciplinary research, as well as inter-institutional and inter-sectorial collaborations; broader and faster opportunities for the adoption and commercialisation of research findings, generating increased returns on public investment in R&D and the potential for the emergence of new industries based on scientific information.

Figure 2 Research result and the open access concept[11]



The ultimate aim is to speed up scientific progress and make it easier to cooperate across and beyond the EU. The concept of open access to data is summarised in Figure 5 below. The "gold open access" and the "green open access" are ways in which research results are paid for to be published, i.e. by the publishers or the researchers/research institutions; there is also the option of hybrid open access, whereby in a journal some articles are open access and some are not (Björk 2012, page 2): "In an attempt to build a gradual transition path between the traditional subscription journal and open access, several major publishers have started offering so-called 'hybrid' journals. These are traditional closed access subscription

[8] https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/FactSheet_Open_Access.pdf.

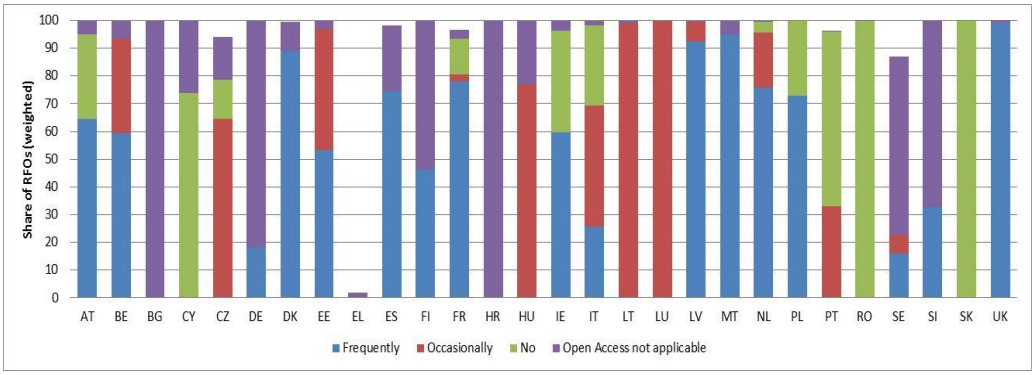
[9] Open Science (Open Access) https://ec.europa.eu/programmes/horizon2020/en/h2020-component/open-science-open-access.

[10] The list from https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/FactSheet_Open_Access.pdf

[11] https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/FactSheet_Open_Access.pdf

journals, which offer individual authors the possibility to open up their articles for free access from day one, against a payment."

Figure 3 Share of funders funding open access to publications 2013[12]



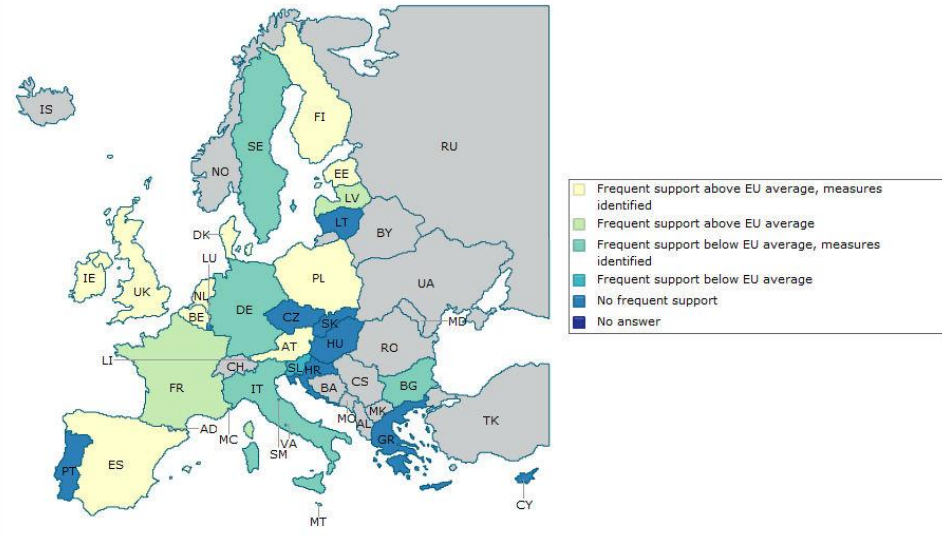
Source: ERA survey 2014

The Open Access Recommendation (2012/417/EU) was required to be transposed in the Member States by the end of 2015. The 2014 ERA (European Research Area) progress report maps the open access conditions and performance in the EU Member States. From that report we refer especially to two maps, relevant to Baltic TRAM in terms of funding and support for open access, figures 4 and 5.

Today the trend appears to be favouring fully open access journals. Björk (Björk 2012, page 14) notes "the trend for many established publishers now seems to be to start wholly new full open access journals, and in particular journals with very broad disciplinary coverage and reasonable article processing charges".

Figure 4 Member States' support for open access to publications[13]

A.



[12] European Commission 2014, page 64.

[13] ibid, page 65.

Table 1 summarises the Baltic TRAM regions' (as Member States) positioning in terms of the two criteria discussed above (Figures 4 and 5[14]) and indicates that open access conditions are fulfilled in all regions, while the practices differ quite significantly. *For the implementation of the open data pilot, it is essential to agree that the data generated by the experiments is not classified under the column "open access not applicable".*

Table 1 Open access level in the Baltic TRAM Member States

Member State (alphabetically)	Funders funding open access (Figure 6)				Open access support classification (Figure 7)
	Frequently	Occasionally	No	Open access not applicable	
DE	20%			80%	Frequent support below EU average, measures identified
DK	90%			10%	Frequent support above EU average, measures identified
EE	52%	46%		2%	Frequent support above EU average, measures identified
FI	45%			55%	Frequent support above EU average, measures identified
LT		99%		1%	No frequent support
LV	92%	8%			Frequent support above EU average
PL	75%		25%		Frequent support above EU average, measures identified
SE	15%	5%		60%	Frequent support above EU average, measures identified

2.4.2.3 Trade secrets at EU level

The open data pilot has linkages to the private sector and trade secrets through the data generated from the experiments and allowed for reuse (open data pilot and publications); this provision is stated in the contracts between businesses, ARFs and IReCs. For this to happen, the data must not break any trade secret in any of the Baltic TRAM partner countries. Thus the questions to answer are: 1) is there a general definition of what a trade secret is? 2) Are there shared provisions among the EU Member States regarding trade secrets? 3) Does the raw data and metadata generated from the experiments constitute a trade secret?

1) Is there a general definition of what a trade secret is? Are there shared provisions among the EU Member States regarding trade secrets? Maybe the most widely accepted definition comes from the TRIPS

[14] ibid above, page 65

agreement, article 39, which is specifically dedicated to "undisclosed information" and sets forth the minimum requirements that information shall meet in order to be protected under the agreement:[15]

> *"1. In the course of ensuring effective protection against unfair competition as provided in Article 10bis of the Paris Convention (1967), Members shall protect undisclosed information in accordance with paragraph 2 and data submitted to governments or governmental agencies in accordance with paragraph 3.*
>
> *2. Natural and legal persons shall have the possibility of preventing information lawfully within their control from being disclosed to, acquired by, or used by others without their consent in a manner contrary to honest commercial practices so long as such information:*
>
> *(a) is secret in the sense that it is not, as a body or in the precise configuration and assembly of its components, generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question;*
>
> *(b) has commercial value because it is secret; and*
>
> *(c) has been subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep it secret.*
>
> *3. Members, when requiring, as a condition of approving the marketing of pharmaceutical or of agricultural chemical products, which utilise new chemical entities, the submission of undisclosed test or other data, the origination of which involves a considerable effort, shall protect such data against unfair commercial use. In addition, Members shall protect such data against disclosure, except where necessary to protect the public, or unless steps are taken to ensure that the data are protected against unfair commercial use".*

However, still today, Member States have their own approaches (discussed in component 2.7.3.3) "The analysis has revealed the lack of a uniform definition and scope of protection of trade secrets throughout the European Union. In most of the countries protection is not specific and provisions dealing with trade secrets are scattered over completely different fields of law."[16] This hinders a more uniform approach whereby it would be possible to consider a trade secret as an IP right under national legislation and therefore falling under the IPR Enforcement Directive.[17]

On 27.5.2016 the EU Directive on trade secrets was approved,[18] providing a common reference as to what a trade secret is (and which is aligned with Article 39 of the TRIPS agreement): *"Article 2: For the purposes of this Directive, the following definitions apply: (1) 'trade secret' means information which meets all of the following requirements: (a) it is secret in the sense that it is not, as a body or in the precise configuration and assembly of its components, generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question; (b) it has commercial*

[15] Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), since 1994.

[16] Study on Trade Secrets and Confidential Business Information in the Internal Market, Final Study, April 2013, Prepared for the European Commission Contract number: MARKT/2011/128/D, page 26.

[17] **Directive 2004/48/EC,19.4.2004. According to the Trade Secrets Study 2013 (Study on Trade Secrets and Confidential Business Information in the Internal Market, Final Study, April 2013, prepared for the European Commission Contract number: MARKT/2011/128/D), page 27 "[it would be applicable] only in Italy, Portugal (to the extent the law implementing the Enforcement Directive is applicable to unfair competition conduct), the Slovak Republic and to a certain extent in Romania."**

[18] DIRECTIVE (EU) 2016/943 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2016; on the protection of undisclosed know-how and business information (trade secrets), against their unlawful acquisition, use and disclosure.

value because it is secret; (c) it has been subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep it secret."

3) Does raw data and metadata generated from the experiments constitute a trade secret? (If yes, why? If not, why not?)

The common definition of what constitutes a trade secret that is soon to be adopted across the EU defines not what a trade secret is but rather its qualities. Therefore, this definition still needs interpretation, i.e. the question still remains as to whether the data and potential metadata generated from the Baltic TRAM experiments constitute a trade secret or not, and if in that sense this data can be reused or not. The conclusion is whether we can have a jointly agreed, objective statement regarding the non-trade secret nature of the measurements resulting from the experiments. Such a statement is even more important when the variety of national approaches regarding trade secrets is taken into account (component 2.7.3.3). For the project's purposes, the issue has been addressed with provisions in the service agreement document, concluded between ARFs, businesses and IReCs. The provisions clarify access to data issues on a case-by-case basis.

2.4.3 Open government, open science and trade secret policies and initiatives in the Baltic TRAM partnership

2.4.3.1 Open government policies in the Baltic TRAM partnership

Denmark

- Forvaltningsloven (Public Administration Act), Lovtidende A n° 571, 19/12/1985)
- Lov om offentlighed i forvaltingen (Access to Public Administrative Documents Act), Lovtidende A n° 572, 19/12/1985
- Lov om videreanvendelse af den offentlige sektors informationer (Act on the reuse of public sector information) Lovtidende n° 596, 24/6/2005
- Lov om ændring af lov om videreanvendelse af den offentlige sektors informationer (Amended Act on the reuse of public sector information), Lovtidende A n° 551, 18/06/2008
- Lov om ændring af lov om videreanvendelse af den offentlige sektors informationer (Act amending the Act on the reuse of public sector information) of 2/6/2014

Estonia

- The Public Information Act (consolidated text March 2003)
- Act of 5 December 2012 amending the Public Information Act, RT I, 19/12/2012, 2

Finland:

- Act on Transparency in Government (1999, as amended)
- Act on Criteria for Charges Payable to the State (1992)
- Act on Sovereignty of the Island of Åland (1991)

Germany

- Federal law transposing the PSI Directive – Reuse of Information Act (2006)
- Federal law amending the Reuse of Information Act (2015)

Latvia

- Informācijas atklātības likums (Freedom of Information Act) of 29/10/1998, Latvijas Vēstnesis N° 334/335 of 06/11/1998
- Grozījumi Informācijas atklātības likumā (Amendments to Freedom of Information Act) of 22/12/2005, Latvijas Vēstnesis N° 1 of 03/01/2006
- Kārtība, kādā tiek piešķirtas ekskluzīvas tiesības informācijas atkalizmantošanai un publiskota informācija par šādu tiesību piešķiršanu (Ministerial Order setting the procedure for awarding exclusive rights for reuse of information and for publication of information on the award of such rights), 22/05/2007, Latvijas Vēstnesis N° 89 of 05/06/2007
- Law of 3 September 2015 amending the Law on the freedom of information (Grozījumi Informācijas atklātības likumā), Latvijas Vēstnesis N°185 (5503), 22/9/2015

Lithuania

- Law on access to information from central and local government institutions (2005)
- Law on State Registers (2004)

Poland

- Konstytucja Rzeczypospolitej Polskiej (Constitution of the Republic of Poland) of 02/04/1997, Dziennik Ustaw n° 78/483 of 16/07/1997
- Ustawa z dnia 14 czerwca 1960 r. Kodeks postępowania administracyjnego (Code of Administrative Procedure), of 14/06/1960, Dziennik Ustaw n° 2000/98/1071 of 17/11/2000
- Ustawa z dnia 6 września 2001r. o dostępie do informacji publicznej (Act on Access to Public Information) of 06/09/2001, Dziennik Ustaw of 08/10/2001
- Amendment to Act on Access to Public Information by Act of 16/09/2011

Sweden

- Lag om vidareutnyttjande av handlingar från den offentliga förvaltningen - Lag SFS 2010:566 Utkom från trycket den 15 juni 2010 (Law on the reuse of public administration documents)
- Lag om ändring i lagen (2010:566) om vidareutnyttjande av handlingar från den offentliga förvaltningen (Law of 21 May 2015 amending the Law (210:566) on the reuse of public sector documents
- Förordning om ändring i förordningen (2010:1770) om geografisk miljöinformation (Ordinance of 21 May 2015 amending the Ordinance (2010:1770) on Spatial Information)
- Förordning om ändring i arkivförordningen (1991:446) (Ordinance of 21 May 2015 amending the Archive Ordinance (1991:446))

2.4.3.2 Open access in the Baltic TRAM partnership

In a previous component (component 2.7.2.2) we have already made reference to the fact that all Baltic TRAM partners have open access policies and initiatives. Nevertheless, the approach is not uniform. In some cases there are national strategies (e.g. DK), whereas in other cases the focus is more on the proactiveness of universities and research institutions (e.g. FI). All partner countries have open access repositories, and one of the partners hosts the national open access repository (University of Tartu, EE). Only one of the partner countries does not have yet a very pronounced open access practice (PL[19]). It implies that for the most part, the open data pilot is relevant to most partner areas and should not face challenges for data contribution from the experiments from the analytical research facilities (ARFs), while a special effort might be needed in very few regions.

[19] "No research funding agencies in Poland have introduced Open Access mandates yet, and only two scientific institutions: the Silesian University of Technology and the Interdisciplinary Centre for Mathematical and Computational Modelling of the University of Warsaw, have introduced full open mandates (data from Otwarta Nauka w Polsce 2014. Diagnoza)". Source: https://www.openaire.eu/oa-poland

Table 2 Open access in the Baltic TRAM partnership

Open access in the Baltic TRAM partnership	
Baltic TRAM region	Open access policies and initiatives
DE	There are currently 347 higher education and over 250 public research institutions in Germany. Most of the higher education institutions are financed publicly (238), but there is also a large number of private universities which used to play only a subordinate role but are now gaining more and more importance. There are also several projects in the field of open access; a list of all projects can be found here. The most central ones are the following: -- Information platform open-access.net: The main aim of the platform open-access.net is to provide detailed information about open access for scholars and other stakeholders. For example, scholars from different disciplines can find information about the OA culture in their respective communities, about OA journals and repositories, etc. Moreover, information is presented from different user perspectives: authors, librarians, OA publishers, institutions running OA repositories, and so on. They may access more general information, dedicated to the respective group/interests, through short articles or via FAQs providing answers for more practical issues. -- Network of certified open access repositories and related projects: In order to increase the worldwide perception and effect of the German research contribution, the project "Network of Certified Open Access Repositories" OA network seeks to intensify the national networking of repositories. It aims to virtually integrate all document and publication services with a DINI certificate and to increase the number of DINI certified repositories. These certified repositories easily connect to networks such as the DRIVER pan-European repository infrastructure (Repositories Infrastructure Vision for European Research). Networking will not only be pushed forward organisationally, but also technically and in an infrastructural way. Source: https://www.openaire.eu/oa-germany
DK	On 24 June 2014 the Danish Minister of Research launched a National Open Access Strategy. The strategy has the following aims: in 2017: 80% of publicly funded research published in 2016 must be open access in 2022: 100% of publicly funded research published from 2021 and onwards must be open access In order to monitor the share of open access publications produced by Danish universities, the OA Indicator was launched in 2016. Source: https://www.openaire.eu/oa-denmark
EE	The digital repository of Tartu University Library is a repository for e-theses and e-publications, digitised theses and books, manuscripts and images, and so on. Source: https://www.openaire.eu/oa-estonia
FI	The Science and Technology Policy Council of Finland, reporting directly to the government and headed by the prime minister, prepares the overall science and

Open access in the Baltic TRAM partnership	
Baltic TRAM region	Open access policies and initiatives
	innovation policy. Finnish science and technology policy is mainly implemented through Ministry of Education and Ministry of Trade and Industry. The Ministry of Education and Culture of Finland launched the Open Science and Research Initiative (ATT) for the promotion of research information availability and open science platform for the years 2014-2017. The main goal of the Open Science and Research Initiative is for Finland to become one of the leading countries in openness of science and research by 2017. More about the ATT initiative: https://openscience.fi/ **Institution:** Academy of Finland; **Status:** "We require that Academy-funded projects commit to open access publishing. We urge projects to make their research data and methods freely available. The goal is to make research publications, data and material, metadata and methods widely available for further use. If researchers follow the principles of open science, they must do so with due consideration of research ethics and the judicial environment." (Updated 25.4.2016 from http://www.aka.fi/en/funding/responsible-research/open-science/) **Institution:** Universities Finland (Unifi) formerly the Finnish Council of University Rectors (founded in 1969), a co-operational organisation for Finnish universities; **Status**: signed the Berlin Open Access Declaration and several other definitions of OA policies. **Institution:** Aalto University; **Status:** has an OA policy – a self-archiving open access mandate. (http://libguides.aalto.fi/c.php?g=410663&p=2798228) **Institution:** Lappeenranta University of Technology; **Status:** has an OA policy which recommends that researchers self-archive. (http://www.lut.fi/web/en/library/for-researchers/open-access-publishing) **Institution:** University of Helsinki; **Status:** has an OA policy – a self-archiving open access mandate. (http://libraryguides.helsinki.fi/oa) **Institution:** University of Jyväskylä; **Status:** has an OA policy which strongly recommends that researchers self-archive. (http://openaccess.jyu.fi/en/oaju) **Institution:** University of Tampere; Status: has an OA policy – a self-archiving open access mandate. (http://www.uta.fi/english/research/OA/OA_at_UTA.html) **Institution:** University of Turku; **Status:** The objective of the University of Turku is to develop an operational culture where every level of the university operates according to the principles of open science. Openness is a central principle in research activities and one of the five basic values of the University of Turku. One of the policy programmes in the university's new strategy for 2016-2020 is promoting open science. The goal is that the principles of open science are adopted across the whole university. The university develops the openness of research data, scientific publication and research methods by developing new modes of operation and policies. This is supported by versatile training, instructions and communications. Institution: University of Oulu. Status: The national and international standards of open science and research are followed at the university, taking into account the legitimate constraints on openness in order to protect immaterial rights and personal privacy.

Open access in the Baltic TRAM partnership	
Baltic TRAM region	Open access policies and initiatives
	http://www.oulu.fi/university/node/38260 The policy programme of open science is carried out by the Open UTU project appointed by the rector. In addition, several universities of applied sciences have OA policies of their own. However, their research publication output is minimal compared to universities and scientific institutions. Source: https://www.openaire.eu/oa-finland
LT	The movement for open access to scientific information in Lithuania was started in 2003 when Lithuanian universities began a pilot project (financed by UNESCO) to create an information system for electronic theses and dissertations (ETD), which later developed into several larger projects at the Lithuanian Academic Libraries Network (LABT). In 2003, the libraries of Vilnius University Institute of Oncology and Kaunas University of Medicine became members of BioMedCentral and started to publish articles in BioMedCentral. In 2006, the Minister of Education and Science issued a decree to establish a Lithuanian information system for electronic documents (eLABa). Source: https://www.openaire.eu/oa-lithuania
LV	Even before participation in different OA projects, the University of Latvia (LU), the state agency "Culture Information Systems" (KIS) and eIFL.net understood the importance of OA resources and organised the seminar Open Access: Maximising Research Quality and Impact, which took place at the University of Latvia on 22 October 2009. In the last five years several important steps were taken in the development of the open access movement in Latvia. There are two institutional repositories, and researchers in Latvia are kept regularly informed about the benefits and possibilities of and activities related to open access in Latvia. From 2009 to 2014 the UL Library participated in the European Commission Seventh Framework Programme project "OpenAIRE" (Open Access Infrastructure for Research in Europe) and OpenAIREplus (2nd Generation of Open Access Infrastructure for Research in Europe: 2012-2014), and continued in 2015 at OpenAIRE2020 (Open Access Infrastructure for Research in Europe 2020) and PASTEUR4OA (Open Access Policy Alignment Strategies for European Union Research). The library of the University of Latvia celebrates international Open Access Week each year by organising discussions, meetings, presentations, workshops on various open access initiatives, and by disseminating promotional materials to other academic institutions. The library also participated in the eifl-OA project "Information about open access movement and resources in the University of Latvia" in 2011.

Open access in the Baltic TRAM partnership	
Baltic TRAM region	Open access policies and initiatives
	In 2012 the library of the University of Latvia organised a special week that promoted the repository of e-resources at the university to academic staff of the university and all higher education institutions in Latvia. In 2013 the Scientific Council of the UL held a session and a discussion titled "Copyright issues in open access: a burden or an opportunity?" which took place in the Scientific Café. A video devoted to the five-year anniversary of Open Access in Latvia and electronic booklets responding to the main questions about copyright issues in open access were produced. In 2015 the main event was a conference "Open Science - the 21th century benefits for researchers", which was held during the international Open Access Week. The aim of the conference was to raise awareness about open science, its challenges and benefits, and the recommendations of the European Commission in relation to research data management and digitalisation, and the sharing of experiences. The event was co-funded by the European Commission's research and innovation programme (FP7) project FOSTER (Facilitate Open Science Training for European Research). An important step in the contribution to the open access and open science movement in Latvian society was the creation of National Open Access Desk website and the open e-course "Open Science". Many researchers in Latvia publish their papers in open access journals and deposit their papers in subject repositories because they recognise that their studies will be accessible to a larger audience than by publishing in conventional journals. Scientists from Latvia are publishing individually in subject repositories such as PubMed Central, ArXiv, Cogprints, etc. and in open access journals. The publications can be accessed through DOAJ, Open J-Gate, PLoS, etc. Researchers from the University of Latvia and Riga Technical University can deposit their publications in institutional repositories and also the publications of the university, such as scientific papers and periodical editions, can be accessed in the repository of the University of Latvia. Source: https://www.openaire.eu/oa-latvia
PL	The Ministry of Science and Higher Education (MNiSW) is responsible for the development and implementation of research policy. It provides core funding for the statutory activities of various types of research and development units and for large infrastructure investments, and it also supervises the two major governmental granting agencies – the National Science Centre and the National Centre for Research and Development (see below). The National Science Centre (NCN) was launched in March 2011 as the main governmental agency for funding basic scientific research. This is achieved through the funding of research grants and fellowships as well as through special research programmes. The National Centre for Research and Development (NCBiR) was established in July 2007. It is a governmental agency responsible for the funding of applied scientific research programmes and activities. Its main task is the managing and implementation of strategic scientific research that should lead directly to the

Open access in the Baltic TRAM partnership	
Baltic TRAM region	Open access policies and initiatives
	development of innovations. NCBiR also supports the commercialisation of scientific research results. OpenDOAR provides a list of 85 registered open access repositories in Poland, but the majority of these are digital libraries, providing access to the digitised content of library collections, not functioning as repositories open to authors for the deposition of their own work. The content of these libraries can be searched and accessed through the Polish Digital Library Federation (FBC) website. However, there is a growing trend for scientific institutions to launch institutional repositories for the presentation of their scientific research output. The number of institutional repositories in Poland has increased significantly in the last few years. Currently, about 30 institutions have their own repositories (see Otwarta Nauka w Polsce 2014. Diagnoza – "Open Science in Poland 2014. A Diagnosis", in Polish only). Many of them can be accessed via the CeON Aggregator. No research funding agencies in Poland have introduced open access mandates yet, and only two scientific institutions, the Silesian University of Technology and the Interdisciplinary Centre for Mathematical and Computational Modelling of the University of Warsaw, have introduced full open mandates (data from Otwarta Nauka w Polsce 2014. Diagnoza). Source: https://www.openaire.eu/oa-poland
SE	There are currently 15 universities and 26 university colleges in Sweden. The majority are public institutions. They are organised on a voluntary basis under the Swedish Association of Higher Education (SUHF), which has no legal status but is acknowledged as the representative of universities and university colleges as a sector. The SUHF signed the Berlin Declaration in 2004 and has made recommendations supporting open access to its members. The business sector is the main source of Swedish R&D financing, accounting for about three-quarters of the total spending. Public funds for R&D are distributed either directly to higher education institutions (HEIs), or through research councils or sectoral authorities. Research institutes account for a small share of publicly funded research compared to other nations. During the last five years a number of influential bodies within the Swedish research community have taken a generally positive stance towards open access. Following the SUHF and the Swedish Research Council, the Swedish Royal Academy of the Sciences and the Royal Swedish Academy of Letters, History and Antiquities have also signed the Berlin Declaration. There are now six Swedish research funding agencies that have adopted OA mandates. In 2011 there were 12 HEIs that had open access policies with recommendations that researchers should make their works open access. This includes major universities like Lund University, Stockholm University, Karolinska Institutet and KTH Royal Institute of Technology. Four HEIs have mandatory open access policies also covering journal articles. These are Blekinge Institute of Technology (2007), Chalmers University of Technology (2010), Malmö University (2010) and Umeå University (2012). Another 12 have mandates for publishing e-theses and reports.

Open access in the Baltic TRAM partnership	
Baltic TRAM region	Open access policies and initiatives
	The National Library of Sweden (KB) combines the traditional mission of a national library with that of a coordinating national research library authority. It has supported the development of repositories and promoted open access for a number of years. In 2010 it adopted an in-house open access policy. Since 2006, KB has coordinated and funded the OpenAccess.se programme. The strategic goal of the programme is to promote open access to works produced by researchers, teachers and students. This is accomplished by supporting open access publishing – OA repositories and OA journals – at Swedish institutions of higher education. The programme is run by the National Library in partnership with the Association of Swedish Higher Education, the Swedish Research Council, the Royal Swedish Academy of the Sciences, the Swedish Knowledge Foundation and Riksbankens Jubileumsfond. The programme was implemented in the period 2006-2009 and then evaluated by international experts in 2009. It has now been transformed into a permanent programme addressing OA policy issues, development of infrastructure/user services and information to researchers. The programme has so far funded about 30 projects, details of which can be found on the programme website. Their focus has been to promote: i) the growth of the volume and diversity of material in OA repositories; ii) access to and use of content in OA repositories and OA journals; iii) publishing in OA journals, and the migration of Swedish scientific journals to an OA model. Source: https://www.openaire.eu/oa-sweden

2.4.3.3 Trade secret policies in the Baltic TRAM partnership

As already discussed in component 2.7.2.3, EU Member States do not have similar ways of addressing trade secrets. However, in the open data pilot, allowing access and publishing data generated through the experiments are at the core of the effort. Even if the experiment is publicly funded, any IPR or trade secret issues need to be taken into account. Table 3 summarises the state of play of trade secret approaches within the Baltic TRAM partnership, i.e. before the Member States have transposed the Trade Secrets Directive.[20]

Trade secrets in the Baltic TRAM partnership		
Baltic TRAM region	Trade secret definition	
	Statutory definition	Provisions
DE	No	The review of the different definitions has shown the presence of some common requirements. In general, a trade secret is defined as technical or commercial information (i) related to a business; (ii) which is not
DK	No	
EE	No	
FI	No	

[20] Source: Table 3 summarises information from the Trade Secrets Study 2013, pages 24-26 (Study on Trade Secrets and Confidential Business Information in the Internal Market, Final Study, April 2013, Prepared for the European Commission Contract number: MARKT/2011/128/D).

Trade secrets in the Baltic TRAM partnership		
Baltic TRAM region	Trade secret definition	
	Statutory definition	Provisions
LV	No	generally known or easily accessible; (iii) which has economic value (i.e. it confers a competitive advantage to the owner); and (iv) which could cause a prejudice to the owner's interest were it disclosed to a competitor. The review[21] has also shown that in almost all countries, the (statutory or jurisprudential) definition of trade secrets is very broad and suitable to encompass different types of information. *In principle, any type of information is potentially capable of being protected as a trade secret, as long as the above criteria are met*. We also noted that often, commentators and courts tend to categorise trade secrets into two main types: (i) Technical secrets, which include any type of technical information, such as manufacturing processes, technical drawings and designs, prototypes, inventions (not patentable or not patented), technical know-how, formula or recipes, genetic materials, fragrances, etc. (ii) Commercial secrets, which include customers and suppliers lists; information on business strategies and plans, business models, cost and price information, other marketing information, etc. Nevertheless, national legislation in Finland, for example protects trade secrets well, with three laws protecting trade secrets (criminal law, unfair trade practices, and work agreements).[22] Recently, the University of Lapland published a thesis[23] on the effects of the new EU directive (EU) 2016/943: on the protection of undisclosed know-how and business information (trade secrets), against their unlawful acquisition, use and disclosure. The directive is analysed from the Finnish perspective and the conclusion is that the transposition and generalised application of Directive (EU) 2016/943 would weaken the protection of businesses in Finland. The suggestion is to propose a less binding approach to the implementation of Directive 943/2016.
LT	Yes	**Article 1.116 "Commercial (industrial) and professional secret"** within the Lithuanian Civil Code states: "Information shall be considered to be a commercial (industrial) secret if a real or potential commercial value thereof manifests itself in what is not know to third persons and cannot be freely accessible because of the reasonable efforts of the owner of such information, or of any other person entrusted with that information by the owner, to preserve its confidentiality. The information that cannot be considered commercial (industrial) secret shall be determined by laws."
PL	Yes	**Article 11(4) of Polish Unfair Competition Law** states: "A company trade secret is understood to include any technical, technological, organizational information, or other information of commercial value,

[21] ibid.

[22] Rikoslaissa, laissa sopimattomasta menettelystä elinkeinotoiminnassa ja työsopimuslaissa

[23] https://lauda.ulapland.fi/bitstream/handle/10024/62358/Korva.%20Hanna-Mari.pdf?sequence=2

Trade secrets in the Baltic TRAM partnership		
Baltic TRAM region	Trade secret definition	
	Statutory definition	Provisions
		concerning an enterprise, undisclosed to the public, with regard to which an entrepreneur has taken necessary steps to maintain confidentiality."
SE	Yes	**Component 1 of the Trade Secret Act** reads: (The term "information" means "information documented in some form, including drawings, models and other similar technical prototypes, as well as the knowledge of a single individual about specific circumstances, even where it has not been documented in some form,") "For the purpose of this Act a trade secret means such information on business relations or operating conditions of a business in somebody's business which is kept secret and of which the disclosure is aimed at causing damage to the business proprietor from a competition point of view".

2.4.4 Reuse of research data

As emphasised in section 2.2, the open data pilot tests the supply side (supply of open data in the sense of access to open data by owners, both research institutions and businesses) and the demand side. The demand side is tested by the range and intensity for reuse of research data. The main benefit of research data sharing is well-recognised among researchers and society in general: to enhance and accelerate scientific progress for the benefit of science and society" (RECODE, 2013[24]; Tenopir[25] et al., 2011). However, still at this stage "reuse of research data is an important but emerging area in the EU."[26]

In addition to research-based demand, the Baltic TRAM pilot also takes into account potential demand from business and business intermediaries' communities for data reuse. The approach is very focused on a small sample space. The ultimate purpose is to gain insights into such demand and contribute to the relevant wider EU-level experience.

2.4.5 In conclusion

In conclusion, it follows from all four components 2.4.2.2, 2.4.2.3, 2.4.3.2 and 2.4.3.3 that the implementation of the open data pilot is essentially conditional on 1) the agreement among the research facility partners as to the non-confidential nature of the experiments, and 2) the consent of the SMEs benefitting from the experiments, documented and justified from the Expert Working Group (EWG)

[24] RECODE (2013), Policy Recommendations for Open Access to Research Data in Europe – Stakeholder values and ecosystems. http://recodeproject.eu/wp-content/uploads/2013/10/RECODE_D1-Stakeholder-values-and-ecosystems_Sept2013.pdf . RECODE (2014), Policy Recommendations for Open Access to Research Data in Europe - Institutional barriers and good practice solutions. http://recodeproject.eu/wp-content/uploads/2014/09/RECODE-D4.1-Institutional-barriers- FINAL.pdf.

[25] Tenopir, C., Allard, S., Douglass, K., Aydinoglu, A.U, Wu, L., Read, E., Mano, M., and Frame, M. (2011), Data Sharing by Scientists: Practices and Perceptions. PLoS ONE 6. doi:10.1371/journal.pone.0021101 plosone.org/article/info:doi/10.1371/journal.pone.0021101.

[26] EFRI Working Group on Innovation, (2016). Report to ESFRI; FI16-56-05, March 2016; page 37.

competent person, that the data generated from the experiments are neither patented nor trade secret information.

To address the former (research-based non-confidential nature of the experiments), all ARFs will agree on the non-confidential nature of the data generated from the experiments. A jointly agreed template formulated for this purpose and each ARF will need to sign it. Each new ARF that expresses an interest in joining the open data pilot will be asked to sign the same commitment. The template will be accessible through the EUDAT base (component 2.4 map).

To address the latter (SMEs' trade secrets), currently national (and often diverging) legislation is currently in force. As stated in the previous section, a common definition for trade secret will be adopted by all Member States when implementing the EU legislation at the national level. In principle, any data generated from the open data pilot can be treated as a trade secret, if such data meets the directive's definition. However, even in this case, the problem is not solved as the definition-to-be-adopted itself is broad, and therefore some guidelines are needed for the open data pilot.

Thus, for the purposes of the open data pilot, companies' trade secrets could be protected by limiting the definition of the trade secret contractually. By joining and contributing to the open data pilot, companies may provide information, which they would like to reserve as a trade secret. Since the open data pilot is a publicly funded project, basically all data should be subject to disclosure. To prevent this, what information is considered to be a trade secret and on what grounds needs to be determined objectively.

For example,

- a trade secret could be limited to refer to only that information which is stated in contracts and approved as such by the company on a case-by-case basis. Any other information and data which does not fall under this contractually defined trade secret definition is subject to disclosure and immediately available in the open data pilot.
- a trade secret could also be inclusive only of measurements that do not relate to any compliance regulation of a material (or product). For example, in the EU, all sellable foodstuffs need to be subjected to health and safety measurements. These measurements only prove that a certain product complies (or not) with some regulations, thus they are not linked to any innovations, for example, or to any market positions, since a food product that does not comply with EU measures does not have any market position in the first place – at least within the EU.

In conclusion, the objective definition in contracts could be stated as follows: "the term "trade secret" could in the context of the open data pilot mean i) any technical or business information furnished by one party to another in connection with the Baltic TRAM project; ii) which is not generally known or easily accessible; iii) which has economic value; iv) which is not a compliance measure; and v) whose disclosure to a competitor could cause prejudice to the owner's interest, regardless of whether such information is in written, oral, electronic, or other form. Such a trade secret may include, without limitation, know-how, inventions, technical data or specifications, testing methods, business or financial information, research and development activities, product and marketing plans, and customer and supplier information."

In addition, the release of the data, which includes companies' trade secrets, could be also contractually bound to certain timing. This is standard closure e.g. in non-disclosure agreements. For example, a restriction to disclose data that includes a company's trade secret remains in effect one (1) year or two (2) years after the data is provided to the open data pilot. Companies must allow the disclosure of all data (also data which has been classified as trade secret) after one/two years.

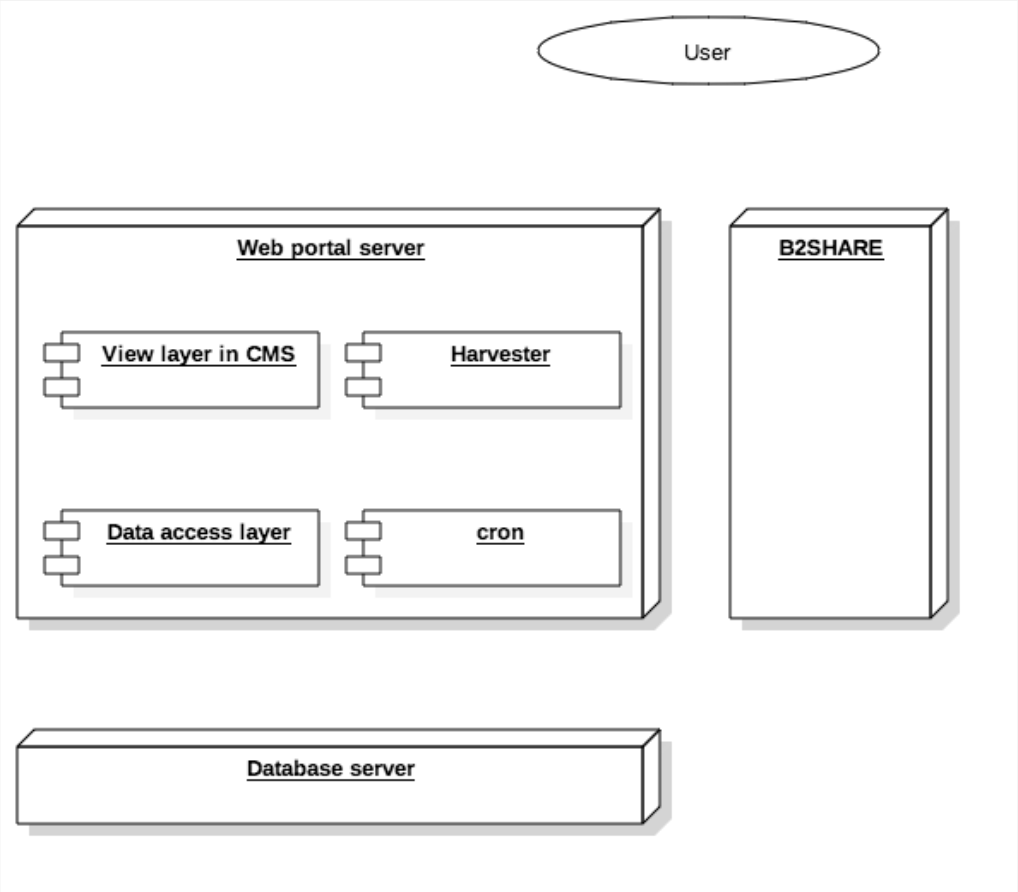
2.5 Technical specifications (EUDAT)

The aims of the Baltic TRAM open data pilot are to evaluate the possibilities of open data sharing, to gather data on access patterns for further analysis, and to advocate the use of open data in the respective communities. The pilot system should be implemented with a lean process that provides a usable system early and with limited effort, while still considering the larger objectives of open data. Ideally the system should have a life span that exceeds the project.

An open data pilot system is designed to provide a solution for storing, sharing and searching metadata about measurements conducted in the Baltic TRAM+ project. The pilot system is accessible via the web and stores content in a centralised repository. The European EUDAT collaborative data infrastructure is used as part of the pilot system (https://www.eudat.eu).

The system stores metadata about measurements, more precisely metadata descriptions following templates A, B and C as described in Annex 2[27]. The key entity in the system is an experiment to which the three metadata descriptions are attached. Actual measurement data is stored outside of the pilot system with the respective innovation agency (IA) and metadata descriptions are often created by industrial research centres (IReCs). Basic search, browse and management functionalities are provided for experiments. Fine-grained access control is needed at the level of metadata descriptions.

Figure 5 System architecture



[27] In separate document.

The pilot system will not be built from scratch. Instead, it will be based on the EUDAT B2SHARE service. The service provides a reliable way for researchers, scientific communities and citizen scientists to store and share small-scale research data. It guarantees long-term persistence and allows data to be shared. Each experiment conducted in the Baltic TRAM project would be stored as a *Record* in B2SHARE. The service is free of charge for European scientists and researchers.

Building on top of B2SHARE allows the pilot system to be built rapidly using existing services and also provides a life span that extends beyond the project duration. B2SHARE does not support all of the pilot system's requirements. To overcome the need for building a completely tailored solution, a separate front-end web portal is developed for showing data. The architecture of the proposed solution is shown in Figure 5.

The portal harvests data from B2SHARE through the use of OAI-PMH or REST API (https://b2share.eudat.eu/help/api) interfaces and provides the views and search functionalities that are required by the project.

B2SHARE integration

Experiment's basic metadata, together with metadata descriptions based on templates A, B and C, are stored in the B2SHARE service (https://b2share.eudat.eu), so that only basic metadata is public and template files are private. B2SHARE will add a new community for Baltic TRAM+ data, so that there is more control over the access patterns. The Baltic TRAM+ portal harvests B2SHARE using community administrator privileges to access both basic metadata and template files. A dedicated community is needed to allow the portal to access private data in B2SHARE. It is also possible to add custom metadata fields for the *Records* in Baltic TRAM++ community, but as the idea is to store the majority of metadata to the three template files and to only expose a minimal amount of it via B2SHARE, the default metadata model of B2SHARE will probably suffice.

When a user (typically representing IReC) stores data in B2SHARE, it is possible to choose between making the data open access or not. For the system both options are acceptable, as the portal is able to access the dataset and partially publish it regardless of the choice. Marking data as open access will make template files publicly visible via B2SHARE. If open access is denied, then template files are only accessible through the portal.

B2SHARE will generate a PID (https://www.eudat.eu/services/userdoc/b2handle) and a DOI (https://www.doi.org) for each *record*. These identifiers help with citing and uniquely identifying experiments of the Baltic TRAM+ project.

As a data storage backend, the role of B2SHARE is to provide reliability and long-term persistence. The service is professionally managed and data is safely preserved via a backup service, with planned and documented disaster recovery procedures. The B2SHARE service is implemented with open source software called Invenio and licensed under GNU General Public Licence (GPL).

Baltic TRAM portal

The Baltic TRAM portal has two roles. First, it stores static information about the project, as described in section 4.2. Second, it contains dynamic content that is fetched from the B2SHARE data storage and formatted according to the needs of the project. Thus, the portal both combines static and dynamic data, and enriches the limited view into experiment metadata that B2SHARE service is capable of providing. The high-level architecture of the system is shown in Figure 1.

Following the principles behind the pilot, the portal should be implemented using common and widely used technologies. It provides the best guarantees for the future and makes it easier to develop the

portal. The portal platform should allow project participants to easily edit static content. It is recommended that a widely used content management system is used for this purpose. Two widely used content management systems (CMS) are Wordpress and Drupal.

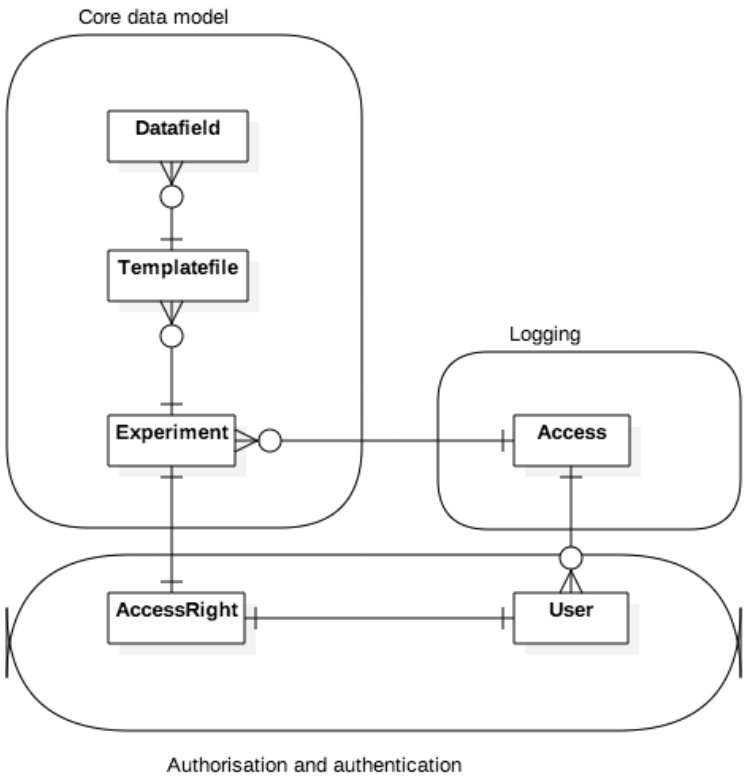
The three key components to be implemented to the portal are data harvester, database and data views. The data harvester is set to execute periodically (nightly) to access the B2SHARE data storage, fetch the latest copy of metadata and associated template files, and to store them in the database. The view components access the database and produce views in the experiment metadata.

The data harvester can be implemented as a standalone application that is triggered with the *cron* service or other system-level scheduling service, or alternatively by using scheduling mechanisms of the CMS system if such are available. The database should be implemented with industry standard open source SQL database engines, namely either Postgres or MySQL/MariaDB. Views are to be implemented as plugins of the CMS system.

Data model and formats

The primary data model of the system are the template files A, B and C. Their content is defined in Annex 2[28]. The described system needs to parse the files and extract information to display in the web portal.

Figure 6 Database schema



[28] In separate document.

Therefore, the file structure used for the template files should be one that facilitates machine readability and maintains good human readability. The implementation should not rely on users in innovation agencies to follow strict technical guidelines, as enforcing such a policy does not seem realistic.

The recommended solution is to create Excel template files with predefined locations for each value and comprehensive explanatory text around them. The idea is that Excel templates are self-descriptive. User-entered metadata would be stored as Excel files (XLSX, post 2004) based on the Excel templates. There are software tools for converting XLSX to commonly used comma separated value format (CSV), e.g. https://github.com/dilshod/xlsx2csv. Parsing CSV files with known row and column coordinates for each value is then trivial. This solution places some additional programming burden on data ingestion (parsing), but it makes the system more human friendly and saves time in the long run, compared to the alternative of having users always input CSV formatted data. It is also possible to create a web form for data input, but that will require more development effort. If such development is initiated, then Goodtables.js is a recommended library to be used.

The secondary data model of the system is the database schema behind the web portal. The portal needs to aggregate data and provide different views into it, so it is not feasible to scan through the template files every time a new view is rendered to the user. Therefore, parsed data is stored in the SQL database to allow browsing and searching through it. Also the access control limits as defined by the project are to be imposed at this point. A draft database schema is shown in Figure 2 as an entity relationship diagram.

The database schema should reflect template files A, B and C, also adding information about users and their access rights to experiment metadata. It should only contain the subset that is required for implementing search and navigation functionalities, or in other words, what is required for users to locate a particular experiment of interest. Additional data can be left in template files and shown in the web user interface when a single experiment is viewed.

Data flow within the system

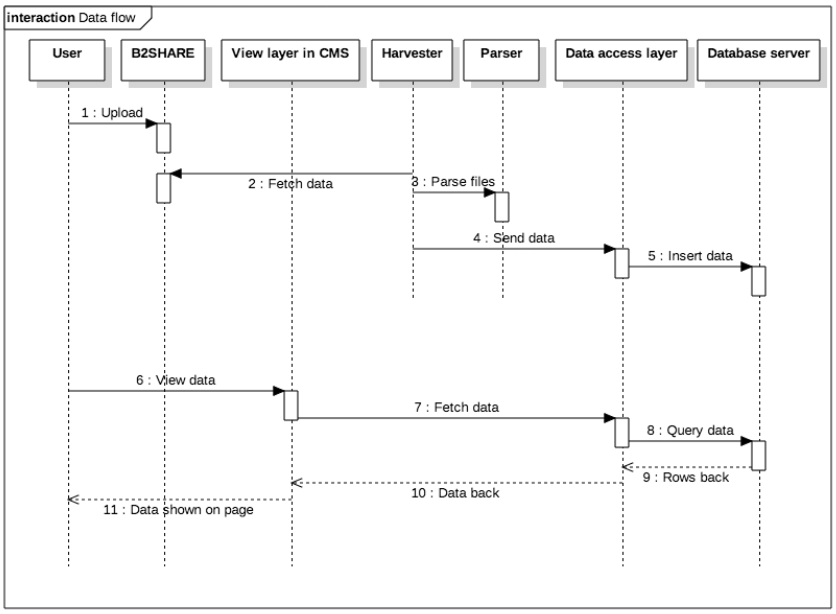
The data flow of the system is summarised in Figure y as a sequence diagram. The data input flow begins with the user uploading data to B2SHARE. When the harvester is triggered by *cron* or similar, it starts the data ingestion flow by fetching data from B2SHARE and then passing it through the portal layers to the database.

All data is versioned and only after a successful harvest is the latest version made visible. Versioning can be implemented so that each harvesting run is given a timestamp that is included in every inserted *experiment*. After a successful run the system-wide *latest timestamp* is updated and is always used when fetching data from the database. After a harvesting run, the system does a garbage collection run that removes all data versions that are older than a given time, such as one week.

Data viewing starts with the user making a request. It is processed inside the CMS engine, which uses a data access layer to fetch the required data from the database.

The data access layer implements the business logic layer of a three-tier architecture. It is a thin layer, only implementing the minimal shared functionality needed to tie together the view layer and the database, namely data access checks, data access logging and database connection management. Connection pooling is implemented if needed. The layer provides a simple procedural view in the database and does not implement more complex abstractions, such as object-relational mapping.

Figure 7 Data flow in the system



Data views

Data views implement the main user interface of the system. They are implemented inside the CMS system, using the plugin and customisation mechanisms that are provided by the chosen CMS implementation.

The CMS engine implements user authentication. During the implementation it should be investigated whether B2ACCESS (https://www.eudat.eu/services/b2access) federated authentication can be integrated into the CMS engine. That way, users could use the same account for data uploads in B2SHARE and in web portal. If the integration proves difficult, then user accounts should be created manually with the CMS engine. The B2ACCESS development team has initially indicated that such an integration might be feasible.

Data views provide the search and browse functionalities of the system. Users are able to search for individual experiments based on their metadata descriptions and browse through the experiments when shown in a categorised structure. The functionalities are described in section 2.3.2.2.

Data views also provide the user interface part of access control. Users are not given the opportunity to navigate to data that is not visible to them. However, this is only a usability consideration: the information security part of access control is implemented in the data access layer.

Usage statistics

The web portal collects extensive usage data to support further analysis and the study of open data access patterns. Each request to the data access layer is logged, together with information about the requester (IP address and username when logged in). To comply with data protection directives and regulations, the web portal must contain a public Privacy Policy Declaration, which reflects the latest requirements in EU General Data Protection Regulation (GDPR).

The data access layer implements the logging functionality. Each request is stored in a log database table. It is not possible to rely only on web server log files, such as access_log on Apache httpd. The Baltic

TRAM+ project needs detailed information on data that is viewed, particularly the identity of each experiment. This is not supported by default logging. It might be possible to extend existing logging, such as the Apache server's LogFormat declaration to support these requirements, but it goes beyond the intended use of those logging mechanisms and is not recommended. Requirements for usage statistics and analytics are described in section 2.3.2.2.

Implementing custom logging logic in the data access layer and storing results in the database allows for the satisfaction of all requirements and serves the future needs of the usage data display via the portal. The first implementation of logging can execute SQL INSERT for each query (web page load). If needed, SQL INSERTs can be cached and executed on batches. Batch operations should be run as a separate process so as not to delay web request processing.

For generating usage statistics from log data, it is recommended that existing popular open source tools, such as AWStats are used.

2.6 Monitoring, feedback and evaluation

The open data pilot is designed to propose, test (at an initial level), assess the usefulness and finally come up with a concept that could be taken up later for more mainstream applications, special attention is paid to the monitoring, feedback and evaluation functions.

As explained in the main programme document, the open data pilot includes monitoring and feedback functions (Figure above, emphasised by the red circle).

The monitoring function is activated each time someone uploads, screens, requests and downloads information.

- The monitoring and evaluation functions are linked in the sense that the evaluation report builds on the cumulative data produced from the monitoring function.
- The evaluation of the pilot takes place once, at the end of the open data pilot's operation, ideally between January – March 2019.

2.6.1 Monitoring function

The monitoring function collects information automatically in four (4) areas: supply of data to the pilot, demand for data, impact of data, and profile of end users. 60 cases have been planned in Baltic TRAM, but there may ultimately be more registered since there is an option for businesses to request material research services through the open data pilot.

Data is collected each time a case study is uploaded to the open data portal, each time someone visits the portal / downloads information / requests access to raw data / requests access to measurement services.

The monitoring function forms the documentation database of the pilot, with objective, quantitative information automatically registered.

The table below summarises the proposed criteria for and approach to the monitoring function. The information in the table is collected automatically by the portal (however anonymity of the end users is maintained).

Table 3 Monitoring and evaluation parameters of the open data pilot

Monitoring parameters	
Supply of data	1) Total number of experiments carried out (60 experiments were initially planned)
	2) Distribution of experiments by NACE and industry fields
	3) Distribution of experiments by material research area
	4) Distribution of experiments by Member State
	5) Distribution of experiments by IReC
	6) Distribution of experiments by ARF
Demand for data	7) Number of total hits on the portal
	8) Number of case studies downloaded
	9) Frequency of NACE -related case study downloads
	10) Frequency of material science fields-related case study downloads
	11) Number of registered users to access measurement services
	12) Range and frequency of registered users requesting access to measurement services for product development
	13) Location of registered users requesting access to measurement services
	14) Number of registered users to access raw data
	15) Institutional profile, range and frequency of motivations of registered users requiring access to raw data
	16) Frequency and range of open data requested
	17) Number of downloads of the final report
	18) Frequency and range of registered end user profiles requesting access to raw data and / or the final report
Impact	19) Impact on the business community: *This information is generated also through the IReC and SMEs surveys, and three more questions are added: 1) Did you allow access to the measurements in the open data pilot? 2) Were there follow-up actions? Were you helped further to invest in the findings of the measurements?*

The evaluation report will discuss these findings and will come up with insights, conclusions and recommendations as to what the open data pilot concept could be in the future. The evaluation report will have the following structure:

- Description of data collected
- Description of data in terms of demand for and supply of material measurements and spatial distribution [available to registered end users upon request]
- Description of data in terms of industries benefitting from the open data pilot and spatial distribution [available to registered end users upon request]
- Analysis of the feedback received (through the feedback templates and possible additional interactions)
- Data analysis in terms of the open data concept: usefulness of the pilot, issues to retain, aspects to improve

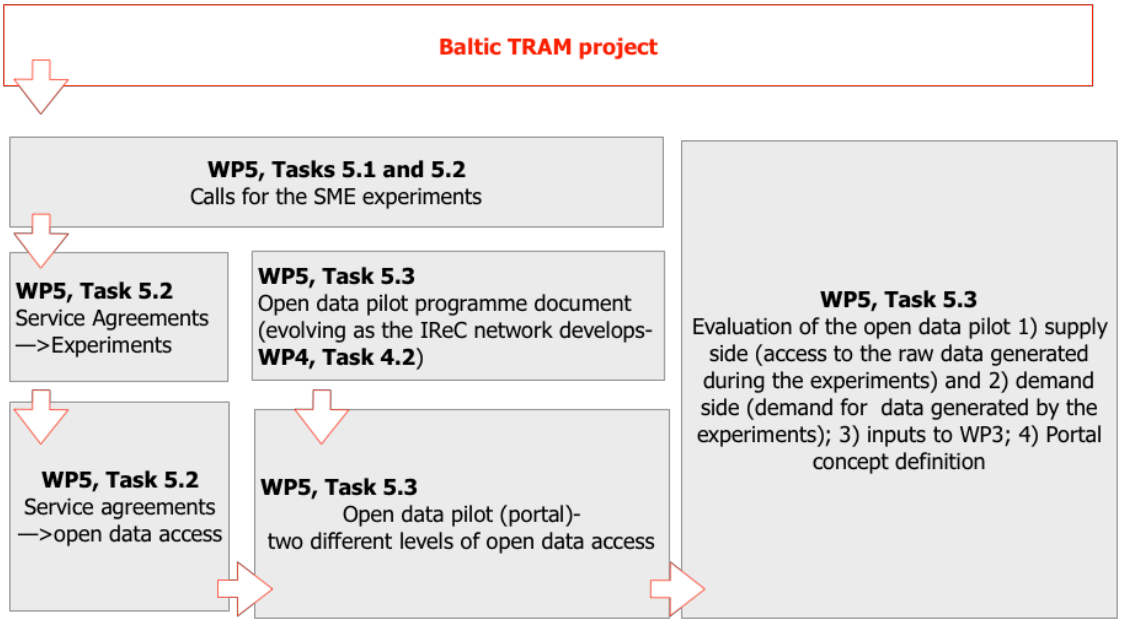
The evaluation report will be drawn by Kainuun Et Oy project partner 4 of the Baltic TRAM project.

2.6.2 Evaluation report

2.6.2.1 Evolution of the data monitoring and evaluation fields

The open data portal (Activity 5.3 of the WP 5 of the Baltic TRAM project), is not an independent task. It is relying on WP 5.2 inputs, and itself forms part of inputs to WP3 and WP4. Thus, WP 5.3, within the Baltic TRAM project plan, is interrelated to various other WPs and activities. Figure 8 maps these interrelations without going into depth for all of them.

Figure 8 The open data portal in the context of the Baltic TRAM project plan



The evaluation takes into account the agreed parametres (section 2.6), however, it also takes into account differentiations that have occurred during the implementation.

- Overall, the open data portal has "suffered" from the relatively slow rhythm of delivery of measurements, which impacted also the operation of the portal and the possibility to gain feedback to all of the evaluation parametres. Nevertheless, in spite of any delays, the portal achieved a level of maturity and generated useful insights, maybe to be explored further by the Baltic TRAM follow up project and probably other initiatives.
- As a result of the relatively slow turn out of the results of the experiments, case studies have been contributed only during the last period of the project, July 2018 – Jan 2019. It implies that there has not been time to test the portal as a data re-use option towards the demand generated by scientists, researchers, teachers, businesses and business intermediaries, or as an IReC network marketing tool -as has been the intention in any case.
- There are more experiments completed than case studies contributed to the open data portal: 51 experiments have been completed and 32 case studies have been contributed. The present report takes into account the 32 case studies since data are missing in relation the 10 case studies that have not been submitted. A comprehensive report on all of the experiments is prepared by the WP 5 coordinator[29]. The types of information discussed in the case studies and the overall analysis of the experiments have been successful in encouraging a deeper understanding of the demand for measurement services and the role of the different institutions (IReCs, ILOs, ARIs).

[29] PP11 IIF (Foundation of Innovative Initiatives).

- The experiments and the case studies have been analysed across a number of parametres. A data base has been organised accordingly. The analysis needs (and therefore also the data base range of parametres) grew during the various face-to-face and online project exchanges. Gradually, the experiments & the case studies constituted a data base important not only for WP5, but also for certain WP3[30] and WP4[31] outputs. For this purpose, additional classification categories were added. This has been, overall, a positive experience as it encouraged deeper insights and increased the cohesiveness of the project. All data were mapped, and the data base maintained within the context of WP 5 implementation[32]. This reinforces the usefulness of the project.

Finally, twenty-eight (28) types of data were collected and discussed. To give a more concise idea of the range and objectives of the 28 data-types, they have been grouped into seven (7) categories, as follows:

A. General information about each experiment
   1) Experiment ID
   2) Company name,
   3) Business location
   4) Type of company (micro / small / medium / large)
   5) Status of application for measurements
   6) Nº call during which the measurement application was made
   7) Status of measurements (completed / ongoing /pending)
   8) Time between submission of application & evaluation review

B. General information related to the case studies (i.e. the experiments that were also submitted as case studies for the open data portal)
   9) Open data portal case study status (for short: case studies) (Y/N)
   10) Open data portal Case study index
   11) Open data portal case study
      a. Review of case study
      b. Case study download
      c. Request for data access
   12) Access to raw measurements data (permission by SMEs)
   13) Actual availability of raw data

C. Profile of the experiment
   14) Cost of each experiment (only the beam time was reported, VAT exclusive)
   15) NACE business activity classification
   16) Technology level classification (of the applying business)
   17) Classification of requested measurements
   18) Contribution of the experiment to industrial development
   19) Contribution of the experiment to materials science

D. Policy relevance
   20) RIS3 relevance
   21) KET relevance

E. Locational aspects
   22) Lead IREC in the experiment and location

[30] Co-ordinator of WP3 is PP14 CBSS (Council of the Baltic Sea States).

[31] Co-ordinator of WP4 is PP4 UTU (University of Turku).

[32] The data bases were made and maintained by the Baltic TRAM partners PP11 IIF (Foundation of Innovative Initiatives) and PP4 KE (Kainuun Etu).

23) Any other IReCs involved
24) ARFs recommended (or in the case of external ARFs - identified / selected), and location

F. Policy relevance of the experiments
25) RIS3 relevance
26) KET relevance

G. Follow up & impact of the experiments
27) Transnational / International collaboration (Y/N)
28) Surveys (linked to WP4, after 3 and 6 months of the provision of measurements)[33]

2.6.2.2 Evaluation activities

The programme document of the open data pilot was reviewed initially by all the Baltic TRAM partners and presented to the 2nd High Level Group meeting that took place in Stockholm on 25.10.2017. The portal was reviewed at two instances: the first review was, at the beginning of November 2018, in view of the 3rd High Level Group meeting on 14.11.2018, and the second review took place during February 2019, i.e. just before the end of the project.

The reviews are structured into two parts: technical progress and case studies analysis and findings.

2.6.2.2.1 Review 1 of the open data portal pilot (version 15.11.2018)

2.6.2.2.1.1 Technical progress

The technical part of the open data portal was implemented by PP3 University of Turku. The task was officially assigned in April 2018, with the approval of the Baltic TRAM internal budget re-distribution. The content coordination remained as was initially planned with PP4 Kainuun Etu. PP3 and PP4 co-operated during the period April 2018 – February 2019 to set up, populate and test the portal.

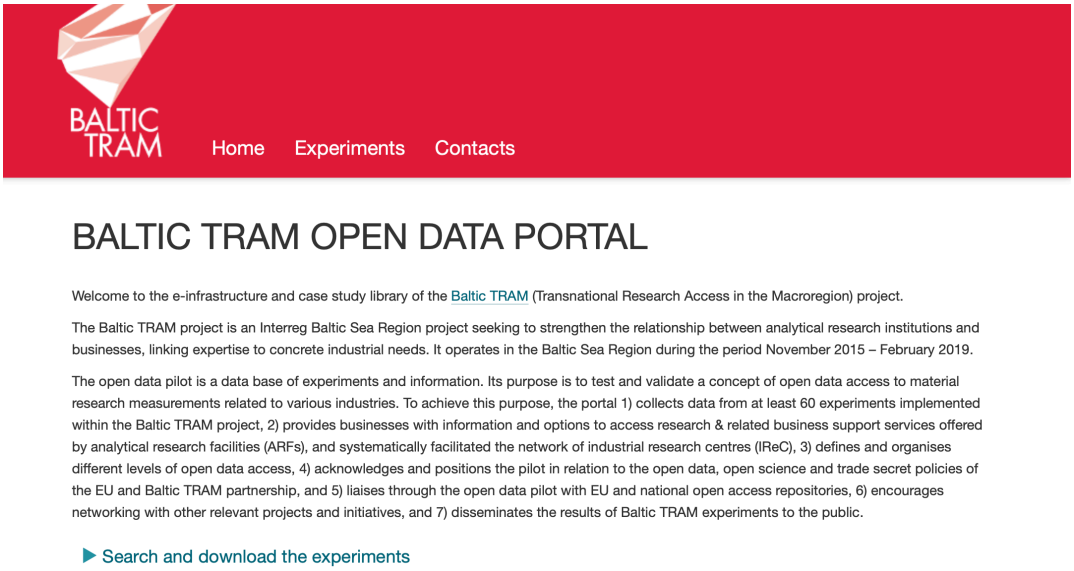
The portal was designed according to the approach & functionalities proposed in 2.3.2 Components & functions of the open data pilot / **Figure 1** Map of the open data pilot and operations. It is linked to the main Baltic TRAM web site and utilises similar colours and design to emphasise the connection between the two locations.

The Open Data Portal was opened to the public on 12th September at the Baltic TRAM partners' meeting in Riga (11 & 12.9.2018).

During September and October 2018, the Case study format went through some further iterations. Inputs for 'NACE-codes' and 'Material research area' -metadata fields for each case study were updated to make them more uniform and more useful. A new metadata field 'Problem addressed' was also added to the scheme to enable the site users to use problem-based filtering in the search function.

To make these kinds of on-going changes and improvements to the metadata scheme and the content of the case studies possible, the case studies were at this point uploaded directly to the portal and not to the B2SHARE. This has been a provisional solution, as it allows flexibility to correct mistakes since, once the case studies are uploaded to the B2SHARE and from there harvested to the portal this kind of iteration is no longer feasible. This approach proved very useful as many iterations were inevitably required. In any case, this differentiation from the original plan is more of a technical and work-flow issue since from the point of the user of the portal it makes no visible difference.

[33] On line surveys were carried out by PP3 UTU (University of Turku) coordinator of WP 4 of the project.



Access to the open data portal at **https://opendataportal.utu.fi/experiments**

2.6.2.2.1.2 Case studies analysis & findings

The case studies are described according to a jointly agreed template by the Baltic TRAM partners. This template, too, evolved with additional information requests by the partners even as late as October-November 2018. It implies that all the case studies were continuously reviewed and updated to reflect the most recent evolutions of the description template.

At the time of the first review, as the open data portal had not been in use yet, *the demand and impact sections* mentioned in Table 3 could not be discussed, while the supply side inputs have been reviewed on the base of the 17 case studies contributed. Seventeen (17) case studies is a very small sample space, but some insights have been possible:

- Open access issues: in principle there does not appear to be a challenge, as ARFs have not refused to share data generated in each one of the experiments and as most businesses appear willing to share "their" raw data: only in 2/17 cases data access has been restricted.
- Technology level of case-studies businesses[34]: most demand came from medium high and medium low tach businesses; only two (2) businesses are high tech.
- Average cost per experiment (consultancy fees & VAT are not included), known for the 17 case studies: 1946,70€. However, prices vary considerably from 400€ to even 4000€.
- Impacts on science and industry: impacts on science do not appear to be significant (i.e. the measurements requested maybe do not motivate towards new research), while impacts on industry appear to be more important since new product development is indicated in most of the cases.
- Importance of intermediaries: demand by businesses has been more IReC- than business- driven. One interesting approach to be replicated is the involvement of national level business support services and portals (Estonia).

[34] Eurostat indicators on High-tech industry and Knowledge – intensive services, Annex 3 – High-tech aggregation by NACE Rev.2. https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf).

- Location:
  - Co-location of SMEs, ARFs and IReCs: mostly at national level, i.e. the national innovation system approach appears to dominate.
  - Transnational solution for delivering services: some 20% of the experiments include transnational exchanges.
  - Potential for interregional clustering: 4 /17 cases, all of them Finland / Estonia (C23.99 x2, C23.49x2 Construction materials).
- Potential for data re-use: the assumption for scientific demand for data re-use, has not been confirmed mostly because the industrial problems solved have not been scientifically challenging for the most part. On the other hand, the demand appears to be coming more from businesses and business intermediaries for the learning potential and for access to services, towards getting in touch with ARFs. The essential linkages between the open data portal and the IReC Net were confirmed during discussions with the WP4 coordinator (PP3 UTU) and in the discussion during the 3rd HLG.

2.6.2.2.2 Review 2 of the open data portal pilot (version 28.2.2019)

2.6.2.2.2.1 Technical progress

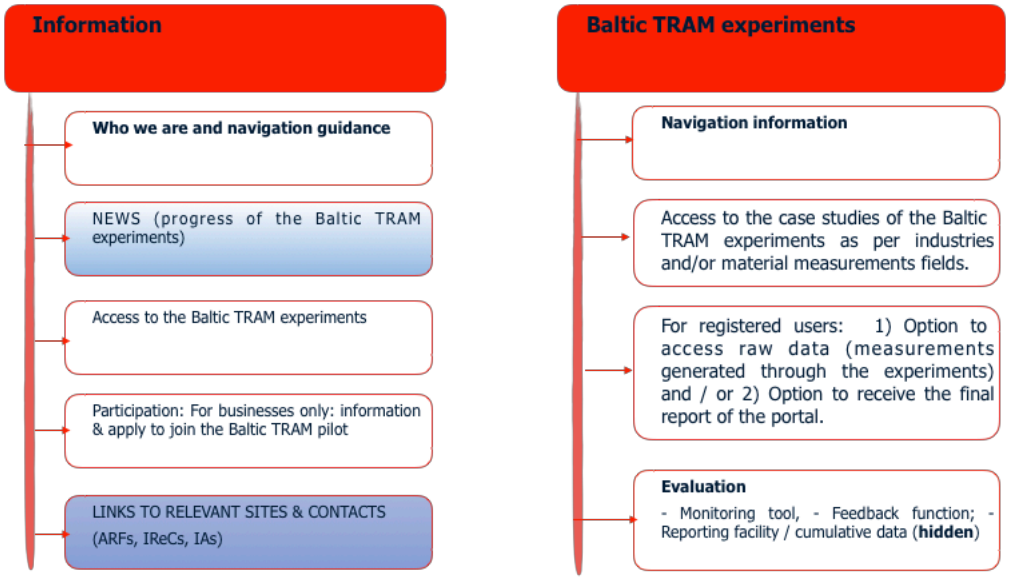
The functionality of the Experiments section in the open data portal was finalised during the period December 2018 – January 2019.

- In December the user registration process was overhauled to make it more automated and streamlined from both user's and administrator's perspective. Search form for the case studies was also re-organized and made cleaner.
- Several user experience enhancements were carried out based on the valuable insights we got from the user testing. Some test users reported that they didn't find any raw data although they were registered and logged in. Data were uploaded, modified, tested (PP3 UTU and PP4 KE)[35] and corrected. A number of bilateral review sessions were organised online involving PP3 UTU and PP4 KE. The case studies were also linked to the relevant WP3 outputs. As a result, a 'Raw data available' -indicator was added to the search results view to those cases which already have raw data available. This improvement made even more apparent for user to see whether they are logged in and what that means in each content (e.g. when viewing single case study page, inform visitors that to access beneficiary info and/or raw data they need to register/login).
- The external demand for access to material research services was also tested, validated, and the related functionality was updated.
- During this period, new cases and raw data documents were added to the portal as they were completed or updated.
- API for the B2SHARE-harvester has been built into the portal and content type for the experiments is created according to B2SHARE data scheme so that the connection is ready to be utilized when feasible.
- Figure 9 above reiterates Figure 1 Map of the open data pilot and operations and summarises the progress towards complete implementation of the portal. White boxes indicate that the related function is completed, light grey boxes (NEWS) indicate completed functionality but operational level requiring reinforcement, and deep grey boxes (CONTACTS) indicate completed functionality but missing inputs, i.e. operational level requiring considerable reinforcement.

[35] Reference to the testing and the results are discussed in the section *Case studies analysis and findings*.

- An important functionality of the portal was establishing more visible links to the IReC Net as a marketing and operational tool of the latter. This option was anticipated already during the planning of the portal (2.3.2 Components & functions of the open data pilot) through the "links to the relevant sites and contacts" functionality. Needs for partner inputs to the portal (news and contacts) were also discussed and missing information was requested in various occasions by PP3 UTU, PP4 KE and PP11 IIF.

Figure 9 Progress of the open data pilot, state of play 28.2.2019



Further processing among the partners that contributed case studies and / or were involved in the evaluation committee of the experiments, indicate that the portal could also be a full support to the operation of the IReC net and a host of a permanent multi competence evaluation team. This finding is discussed more in part 3. Generation of the open data access concept.

During December 2018 – January 2019, the portal was tested for technical and re-use interest. This has been a preliminary testing, organised between the two BT partners, PP3 UTU and PP4 KE. A basic questionnaire was delivered to 10 members (5+5) of the two organisations' regional networks, with the request for anonymous feedback. Table 4 below summarises the internal testing.

Table 4 Summary of the internal testing of the open data portal

Questions	Feedback	
Do you find the portal easy to "read" and access the different types of functions?	Yes	All 10 cases
Have you been able to easily access the case studies?	Yes	All 10 cases
Number of cases reviewed	1- 10	Most testing was done with 5 cases
Did you try to access raw data? did you register?	Yes	There appeared certain technical issues for early testers.
Has the information describing the experiment been sufficient, clear, useful?	Yes	In all cases, except one, where the tester did not read in depth, as the focus was on technical issues for this person.
Comments / recommendations		

Questions	Feedback
Search function: NACE works well (all users); problem definition should be improved (5 users); materials science fields does not wok (since the case study contributors did not follow strictly the indicated classification) (4 users) **Usefulness of information**: The most useful information was the problem or target of the experiment, which methods were used and what was achieved; internal information (BT processes) was not so useful. **Privacy policy**: It was missing and needed to be added (comments to this effect were made in two cases). **Registration issues for raw data access**: for the very early users, there were some technical issues.	

Thanks to this internal testing, remaining technical issues were addressed[36]. However, in regard to other issues, such as the problem definition, there was time to acknowledge but not to address them. This is unfortunate as improvement of the problem definition, clearly, will increase the attractiveness of the portal to users.

Access to the open data portal is at. **https://opendataportal.utu.fi** and to all the case studies at **https://opendataportal.utu.fi/experiments**.

2.6.2.2.2.2 Case studies analysis & findings

A pdf insertion summarising and classifying all the 32 case studies contributed during the Baltic TRAM project can be found in 6. Summary of the case studies. By referring to the pdf and Tables 5,6, and 7, below, allow to draw some useful conclusions:

(1) Table 5 Demand for measurements: demand came for the most part from the secondary sector (manufacturing), approximately 84% (27/32) while 18% (6/32) of the demand came from service businesses. Most of the demand (20/32 about 63%) came from medium and lower technology level businesses, while 10/32 cases are high tech or knowledge intensive services. Most of the demand was focused on product development (new or existing) and only few of the cases on satisfaction of compliance requirements.

It follows that while measurement research and technology are high tech, demand for applications is shared across all types of industries. Therefore, there is considerable demand to be identified in the future.

(2) Table 5 policy alignment: Item (1) insights are seconded by the findings on policy alignment, indicating that out of the 32 cases, only 7 are not aligned to RIS3 strategies, i.e. about 22%, while 78% have RIS3 relevance. It follows that the intensification of the RIS3 implementation, foreseen for the next period of the Structural funds, will imply considerable demand for measurements.

(3) Table 6 location: IReCs and ARFs reveal, first of all, the predominance of the national innovation system as relevant reference, more than the regional or transnational level; about 50% of the cases make use of national level resources, 10 cases are regionally bound, and 7 cases have

[36] Kainuun Etu, BT PP4, thanks each and every one of the persons who tested the portal and provided their very valuable feedback.

sought the services of transnationally located ARFs. This finding indicates considerable potential for transnational cooperation, however the types of demand and location of services

(4) Problem (-s) solved (i.e. the reason why a business needed measurement services)[37]: Most of the demand was focused on product development and product improvement, with only a few of the cases on satisfaction of compliance requirements. In one case, there was research into methodological issues ('which method would be better for improving product X'). Problems were, overall, more of industrial than research nature. It implies that the open data portal as a data re-use source for scientists does not appear to be very high.

(5) Access to raw data[38]: The term "raw data" here refers to the original measurements done by the research institutes for each experiment. In general, research institutes have been hesitant to share the original measurements, while only four (4) out of the thirty-two (32) businesses refused access to measurement data or tracing of their identity. We have received some level of measurement data in 14 / 32 cases. Therefore, we have noticed a hesitation to share data both from businesses and from research institutes. As a first step towards deeper understanding, we have tried to correlate data-access business attitudes with (a) the technology level of a business and (b) the beam price (Table 7).

Results indicate, even with such a small sample, that open access probability appears to be linked to the technology level of a business & to the (higher) cost of measurements: as all of the four businesses that refused data access are classified as high tech or medium high tech, it might be reasonable to propose to research in the future the correlation between the technology classification of a business with its willingness to share measurements. In conclusion, open access is not yet a demonstrable aquis, at least in the context of the Baltic TRAM 32 experiments' case studies.

Table 5 Overview of the profiles of the contributed case studies

Country	Case studies	NACE "/(…)" = number of cases	Technology level	Policy alignment =RIS3 and/or KET
DE	1	C27.20	Medium-high tech	RIS3 and KET
EE	10	C23.99 /(2) M72.19 C22.21 C32.99 C10.7.3 D35.30 C20.30 /(2) G47.91	Medium -low technology High-tech knowledge-intensive services Medium -low technology Low technology Low technology Medium high technology Less knowledge- intensive services (LKIS)	RIS3 at different levels of connection for C23.99 to C20.30 No
FI	14	C23.49 /(2) C21.20 C32.30 C10.30 /(3) F43.39 B8.1 A01.13 M71.20 C22.29 C25.61 M72.1	Medium -low technology High tech Low tech Low tech Medium-low tech Low tech High-tech knowledge-intensive services Medium-low tech Medium-low tech	No RIS3 No No RIS3 RIS3 RIS3 RIS3 No No No

[37] More detailed information per case-study can be found at https://opendataportal.utu.fi/experiments and, alternatively, in the *Case studies corpus EXPERIMENTS* addendum to the 5.3 document report.

[38] Ibid., above.

Country	Case studies	NACE "/(…)" = number of cases	Technology level	Policy alignment =RIS3 and/or KET
			High-tech knowledge-intensive services	
LT	4	C26.40 /(2) C21.20 M72	High tech High tech High-tech knowledge-intensive services	RIS3 all
PL	3	M72.19 /(2) C28.93	High-tech knowledge-intensive services Medium high-tech	RIS3 all

Note: NACE codes industrial activity explanations are here[39]

Table 6 Overview of the contributed case studies locational aspects

Country	Number of case studies	Location of operations including transnational aspects
DE	1	All operations took place in the same region; no transnational aspects
EE	10	Out of the 10 cases, 8 were nationally based; for the remaining 2, 1 ARF was located in Germany, and 1 in Lithuania.
FI	14	Out of the 14 cases: 9 were regionally bound, for 2 cases the ARF was in Germany, for 1 case the ARF was in Estonia, 1 in Lithuania and 1 in Latvia.
LT	4	All 4 cases regionally and nationally- bound.
PL	3	All 3 cases nationally bound.

[39] NACE codes and industries, EUROSTAT (2008). NACE Rev.2, Statistical classification of economic activities in the European Community, http://ec.europa.eu/eurostat .

A01.13	Growing of vegetables and melons, roots and tubers
B8.1	Quarrying of stone, sand and clay
C10.30	Processing and preserving of fruit and vegetables
C10.73	Manufacture of macaroni, noodles, couscous and similar farinaceous products
C20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics.
C21.20	Manufacture of pharmaceutical preparations
C22.21	Manufacture of plastic plates, sheets, tubes and profiles
C22.29	Manufacture of other plastic products
C23.49	Manufacture of other ceramic products
C23.99	Thermal insulation products for construction
C25.61	Treatment and coating of metals
C26.40	Manufacture of consumer electronics
C27.20	Manufacture of batteries and accumulators
C28.93	Manufacture of machinery for food, beverage and tobacco processing
C32.30	Manufacturing of sporting goods
C32.99	Other manufacturing n.e.c.
D35.30	Steam and air conditioning supply
F43.39	Other building completion and finishing
G47.91	Retail sale via mail order houses or via internet. The company manufactures compost among other activities.
M72	Scientific research and development
M72.1	Research and experimental development on natural sciences and engineering.
M72.19	Other research and experimental development on natural sciences and engineering
M71.20	Technical testing and analysis

Table 7 Overview of the contributed case studies beam prices (no VAT) & correlation to data access

Price range	Number of cases	Raw data access	
		Yes	No
Up to 999€	13	12	1
1000-1999€	6	6	
2000-2999€	6	5	1
3000 -3999€	2	2	
4000-4999€	3	2	1
5000-5999€	1		
6000 – 7999€	0		
8000€ and higher	1		1

3. Generation of the open data access concept

In the introductory part (1. Reminder of Activity 5.3 of the Baltic TRAM project plan, page 5) of the document the output of activity 5.3 was described as follows: "**Output description:** The output will consist of a concept for open data access addressed to companies of selected branches. The aim is to provide company information about analytical research facilities (ARF) offers for possible research activities in relation to the companies' basic research needs. The test infrastructure will contain data from the 60 pilot projects, describe the problem/research activity, the used methods and instruments, and the received results".

The preceding case studies analysis revealed that open access is not a given yet, neither for businesses nor for research units. However, the usefulness of the portal as a networking tool effectively supporting the IReC network and industrial applications of research, appears plausible. This option was explored further during January – February 2019; bilateral interviews were organised between the partners that contributed case studies and the WP 5.3 coordinator. The interview concept was organised into two parts, *A. Questions relating to the evaluation committee function* and *B. Questions relating to the IReCs function*. In practice however, during the discussions, there were inevitable overlaps between group A and B questions, as this helped to make cross-references between the two and gain further insights. Table 8 summarises the partners who were interviewed and dates of interviews[40].

Table 8 Bilateral discussions on the concept of the open data portal

Date	Baltic TRAM partner name and number	
16.1.2019	University of Tartu (as IReC)	PP 11
28.1.2019	University of Turku (the evaluation function)	PP 3
31.1.2019	Kainuun Etu (only the IReC staff)	PP 4
4.2.2019	Agency for Science, Innovation and Technology (as IReC, but the discussion included also references to evaluation aspects)	PP 15
5.2.2019	Foundation of Innovative initiatives (for IReC & evaluation functions)	PP 11

A. Questions relating to the evaluation committee function

1.- Experience from the evaluation committee? Would it be a necessity in the future?

2.- What have been the most important difficulties/insights/interesting/stuff in assessing cases in the Evaluation Committee?

B. Questions relating to the IReCs function

1.- What have been the most useful and & or promising cases and why? What have been the most important difficulties?

2.- The value of the transnational connections (i.e. services from abroad) and would that be possible to maintain after the project.

3.- Is there available sufficient demand for measurement services in the first place

[40] Kainuun Etu thanks warmly all the partners listed in Table 8 who gave time to be interviewed and comment on the interviews.

4.- Are there available funding channels for that purpose (of providing measurements)?

5.- Is the demand explicit and / or realised, i.e. that a more systematic application of regional policies could contribute creating a steady flow of demand? How important is the national level (national innovation system?

6.- In the case of the open data portal, the bottom line is that there would be needed more time and resources to develop the operational side (not so much the technological level). However, we also see that the open access issue is not working, i.e. we do not have the raw data in most cases and the refusal comes from the institutions that performed the measurements. During the project we saw the open access issue evolve at policy level (especially at EU level), but the real benefit for any researcher to allow access to data openly is not yet identified. Would you have something to comment on the issue?

Summary of findings

The summary is a synthesis of all the answers provided during the bilateral interviews.

1.- The Evaluation Committee was important because of the multi sided expertise it provided. It would be necessary in the future and more types of scientists could be involved, such as geologists, chemists, biologists, and so on. Experience from the Baltic TRAM indicates that it is important to define and describe from the beginning, the competences, processes, evaluation channels, and time-targets for the evaluation process, so as to reduce delays as much as possible. The bottom line is that the evaluation committee is an essential part in the process, but certain aspects, such as tools of interaction and objective qualifications should be revised and made clearer and more comprehensive.

2.- The most important experiments have been those that are linked to market access (new product development) as well as those where the product and/or business managers have knowledge of the importance of materials science and measurements applications. The reason is the expertise absorptiveness of the SME. For example, one of the most interesting cases involved a business in which the entrepreneurs were scientists in earlier life, so they knew what to expect and what to ask, and how to appreciate measurements.

The biggest challenges came from the type of business and the type of measurements requested: a) businesses with 'experience in research and/or with own R&D department, these cases were more open and benefitted most; b) businesses without R&D experience were the most difficult to benefit from measurements. *Another source of challenges* is access to multi-disciplinary expertise resources (science, industry, multi sided), on demand. Multi-disciplinary expertise is needed by IReCs during the definition phase of the problem and following the generation of measurements, to support their interpretation and the action recommendations to businesses. On the other hand, *ARFs have also a role to play*: by making sure that they make accessible (=understandable) to businesses the constantly updated research results, so that there is a constant access to information leading to business-based demand.

Real problem in a nutshell: Linking measurements to actual product issues. Analytical expertise and industry expertise need to be present from the very beginning in order to shape the discussion with businesses. There need to be inputs from materials science as well as from sciences and interdisciplinary competences should be available as a matter of principle, to make the offers from ARFs cognitively accessible to businesses in the first place. Trust is also very important.

3.- Importance of consultation services The consulting process, consisting of various steps: 1) attracting the offer (implies specialisation for different types of industries); 2) signing the NDA and cooperation agreements with the businesses (bureaucracy a challenge); 3) supporting the businesses to fill in the application for measurements; 4) checking out the measurement process; 5) participating in the measurements repots preparations; 6) participating in the interpretations of measurements and guidance to businesses; 7) preparing case studies, case registries, survey reports and evaluation reports.

4.- *Market demand or revealed demand? National innovation networks? Funding tools? Are transnational services important?* Bottom up, business-to-research solutions should be supported, i.e. the scaling up of businesses and the increase of their absorptive capacity are important. The explicit demand can be reinforced by reinforcing the cognitive proximities between science & industry. There is also a latent, a revealed demand, that can be identified through pro-active regional policies, for example KET applications in advanced materials, which is part of the RIS3 provisions.

For accessing demand for measurement services, national networks and connections are important. Funding tools, as well exist at national level. Transnational exchanges are possible but need to be explored better to become consolidated. At the moment there do not appear to exist sufficient funding tools at transnational level.

5.- Open data portal, focus and constraints Access to raw data seems to pose challenges for research units; re-use of data might be of interest to industrial actors and intermediaries more than to scientific actors.

Implications for the open data portal and an evolved concept
The main conclusion is that the portal would be more useful as an industrial networking- and case study library learning- tool. The participatory function would need to be strengthened, linkages to relevant scientific portals should be included, and the portal should evolve as a core operational tool of the IReC network. Improvements could include more functionalities, for example:

(1) The core competence and raison-d' être of the portal would be linking measurements to actual product issues. Analytical expertise and industry would be present from the very beginning, facilitating the relevance of the portal to businesses. There would be inputs from materials science as well as from sciences and interdisciplinary competences should be available as a matter of principle, to make the offers from ARFs cognitively accessible to businesses.

(2) Marketing tool of the IReC net.

(3) Information, learning & teaching channel, linking businesses to materials science excellence and the IReC options.

(4) Standardisation of the services offered by the IReCs ((i) attracting the offer (implies specialisation for different types of industries); (ii) signing the NDA and cooperation agreements with the businesses (bureaucracy a challenge); (iii) supporting the businesses to fill in the application for measurements; (iv) checking out the measurement process; (v) participating in the measurements repots preparations; (vi) participating in the interpretations of measurements and guidance to businesses; (vii) preparing case studies, case registries, survey reports and evaluation report).

(5) Hub for accessing multi-disciplinary expertise.

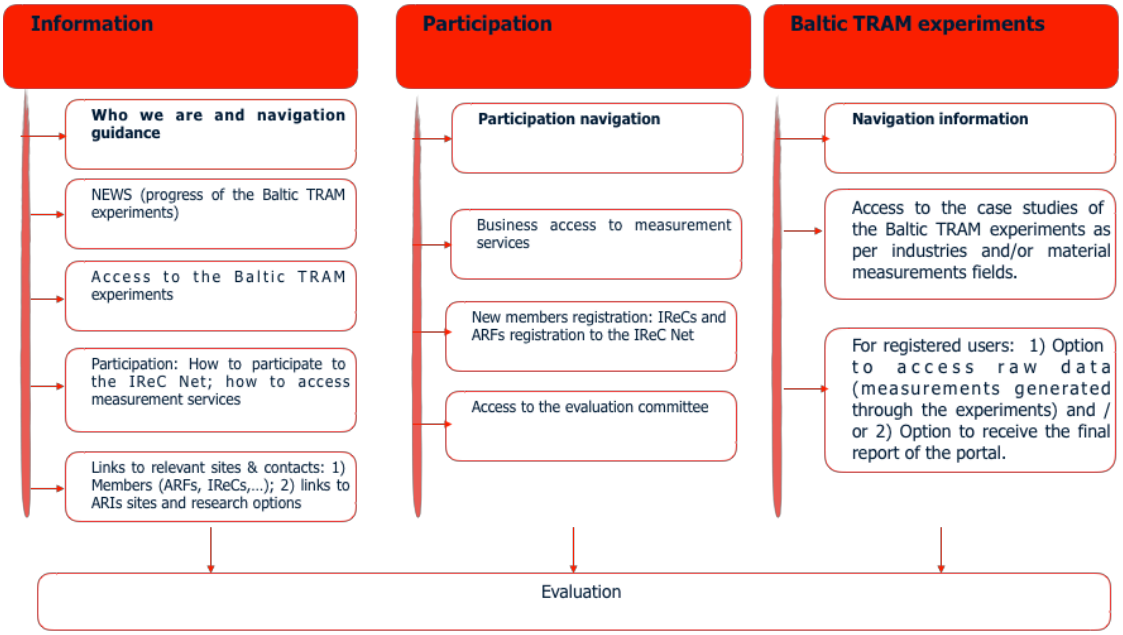
(6) The updated portal should have a well-defined strategy for attracting demand under the revised considerations.

(7) The framework of the feasibility of the evolved portal would require institutionalisation by the members or the establishment of an independent entity most probably.

……

The evolved portal concept is shown in Figure 10 below.

Figure 10 Evolved concept and suggestion for the open data portal



The portal, at the present stage, is technically complete and has a multi-sided potential to become a sustainable useful tool once time & resources are invested into the exploration of its options. To address all of the above issues, there would be needed some 6-8 additional months and it would require the involvement of all the Baltic TRAM partners and beyond. As this is hard to achieve within the time-limits of the Baltic TRAM project, maybe a follow up project could dedicate resources to this effort.

4. Fields of materials science research

We have accepted a broad definition, list retrieved from UTU pages in July 2016.

Life Sciences			
a.	Biology		
	I.	Basic Biological and Medical Research	
		1.	Biochemistry
		2.	Biophysics
		3.	Cell Biology
		4.	Structural Biology
	II.	Plant Sciences	
		1.	Plant Biochemistry and Biophysics
b.	Medicine		
	I.	Medicine	
		1.	Clinical Chemistry and Path biochemistry
		2.	Pharmacy
		3.	Pharmacology
		4.	Dentistry, Oral Surgery
		5.	Biomedical Technology and Medical Physics
c.	Agriculture, Forestry, Horticulture and Veterinary Medicine		
	I.	Agriculture, Forestry, Horticulture and Veterinary Medicine	
		1.	Soil Sciences
		2.	Plant Nutrition
		3.	Agricultural and Food Process Engineering
		4.	Basic Veterinary Medical Science
		5.	Basic Research on Pathogenesis, Diagnostics and Therapy and Clinical Veterinary Medicine
Natural Sciences			
a.	Chemistry		
	I.	Molecular Chemistry	
	II.	Chemical Solid State and Surface Research	
	III.	Physical and Theoretical Chemistry	
	IV.	Analytical Chemistry, Method Development (Chemistry)	
	V.	Biological Chemistry and Food Chemistry	
	VI.	Polymer Research	
b.	Physics		
	I.	Condensed Matter Physics	
	II.	Optics, Quantum Optics and Physics of Atoms, Molecules and Plasmas	
	III.	Particles, Nuclei and Fields	
	IV.	Statistical Physics, Soft Matter, Biological Physics, Nonlinear Dynamics	
c.	Geosciences		
	I.	Geology and Palaeontology	
	II.	Geochemistry, Mineralogy and Crystallography	
	III.	Water Research	
Engineering Sciences			
a.	Mechanical and Industrial Engineering		
	I.	Production Technology	
		1.	Metal Cutting Manufacturing Engineering
		2.	Primary Shaping and Reshaping Technology
		3.	Micro-, Precision, Mounting, Joining, Separation Technology
		4.	Plastics Engineering
		5.	Production Automation, Factory Operation, Operations Management
	II.	Mechanics and Constructive Mechanical Engineering	
		1.	Construction, Machine Elements
		2.	Mechanics
		3.	Lightweight Construction, Textile Technology
		4.	Acoustics

b.		Thermal Engineering/Process Engineering
	I.	Process Engineering, Technical Chemistry
	II.	Heat Energy Technology, Thermal Machines, Fluid Mechanics
		1. Energy Process Engineering
		2. Technical Thermodynamics
		3. Fluid Mechanics
		4. Hydraulic and Turbo Engines and Piston Engines
c.		Materials Science and Engineering
	I.	Materials Engineering
		1. Metallurgical and Thermal Processes, Thermomechanical Treatment of Materials
		2. Sintered Metallic and Ceramic Materials
		3. Composite Materials
		4. Mechanical Behaviour of Construction Materials
		5. Coating and Surface Technology
	II.	Materials Science
		1. Thermodynamics and Kinetics of Materials
		2. Synthesis and Properties of Functional Materials
		3. Microstructural Mechanical Properties of Materials
		4. Structuring and Functionalisation
		5. Biomaterials
d.		Computer Science, Electrical and System Engineering
	I.	Systems Engineering
	II.	Electrical Engineering
e.		Construction Engineering and Architecture
	I.	Construction Engineering and Architecture
		1. Construction Material Sciences, Chemistry, Building Physics

5. The case study description template (version Oct. 2018)

Case study index XX

Beneficiary index XX.1

Case study partner number YYY

,

1.- INTRODUCTORY INFORMATION

Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity):
- Materials research area:

- Problem addressed (mark all options that apply)

Measuring materials' structure	
Measuring materials performance	

-

Focus of the experiment (-s)

What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Date(-s) of the experiment(-s)

Which technique(-s) was/were used for carrying out the experiment(-s)?

Are there any follow-up actions anticipated?

Contact information

- ARF:
- IReC: 1) Business contact:

2) Case study preparation and communication contact:

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

Material(-s) involved in the experiment(-s).

Measurement findings and their contribution to / implications for materials science.

Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

Method for involving businesses

Cost of the pilot

Difficulties confronted (if any)

Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

4.- IDENTIFICATION OF THE BENEFICIARY – Beneficiary index XX.1

Name of business

Business contacts, location, address

Business is part of the Baltic TRAM partnership (or not)

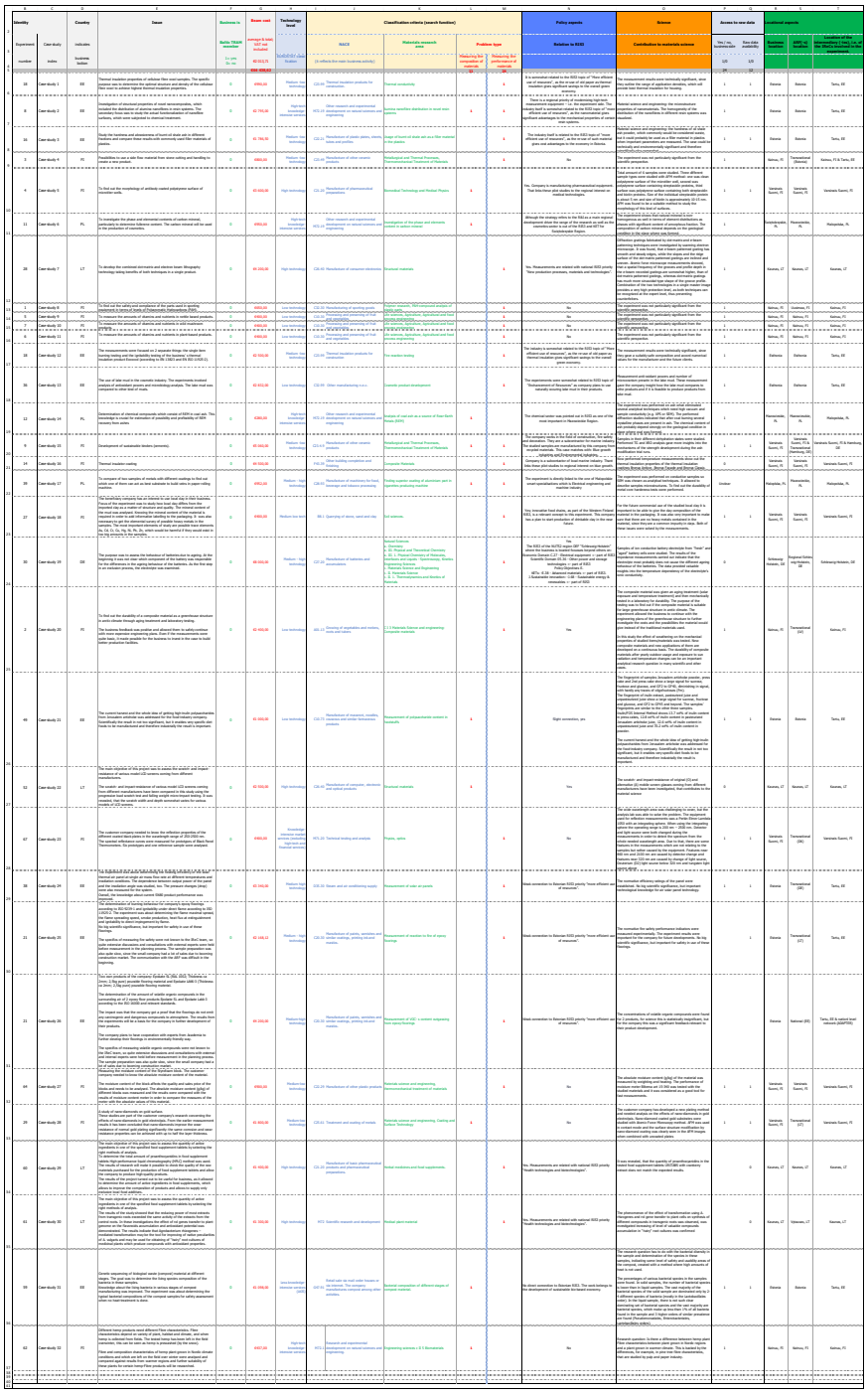
Based on the business feedback, how useful was the experiment for the business?

Achievements and follow-up [to be added after the pilot]

5.- OPTION TO ACCESS MEASUREMENT DATA – Beneficiary index XX.1

Request for access to the measurements data of the experiment. To have access to this link, the end user must register.

6. Summary of the case studies



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NISO (2004) Understanding Metadata, Bethesda, MD: NISO Press. ISBN 1-880124-62-9, http://www.niso.org/publications/press/UnderstandingMetadata.pdf

Open Data Indexes: http://index.okfn.org/place/

Open Data site http://ec.europa.eu/digital-agenda/en/open-data-0

OPEN KNOWLEDGE FINLAND, http://fi.okfn.org Open Knowledge Finland ry and the Elinkeinoelämän tutkimuslaitos (ETLA) toteuttavat parhaillaan projektia *"Avoimen datan kustannustehokas hyödyntäminen =Cost- effective utilization of open data and basic registers*". The research project's goal is to better understand and measure the impacts of open data and the use of the basic public registers. As outcome, we expect policy recommendations and suggestions for new methods, processes or technical changes, to help improve cost-efficient publishing of open data and increase the impact of the basic registers. … More specifically, the goal of producing proposals as to what kind of policy actions, practices and / or registers, structural changes are needed to improve the exploitation of public sector information resources. Later, the proposals are prioritized". *Contact mika.honkanen@okf.fi (project manager), teemu.ropponen@okf.fi.* The project closing report will be published in 2017 http://fi.okfn.org/posts/avoimen-datan-vaikuttavuus/.

Open knowledge foundation, https://okfn.org including access to personal data used by businesses http://blog.okfn.org/2016/12/21/personaldata-io-helps-you-get-access-to-your-personal-data/.

Position of the European Parliament of 13 June 2013 and decision of the Council of 20 June 2013.

Public sector information (PSI) is information produced by central and local government or any other public body. https://www.nationalarchives.gov.uk/ >Information management; https://www.nationalarchives.gov.uk/information-management/ >Re-using public sector information; https://www.nationalarchives.gov.uk/information-management/re-using-public-sector-information/ >About PSI; http://www.nationalarchives.gov.uk/information-management/re-using-public-sector-information/about-psi/, page 1: "Any information (content) whatever its medium (form) – including print, digital or electronic, and sound recordings – produced, held or disseminated by a public sector body is considered public sector information".

StR-ESFRI project (2016) *Strategy report on research infrastructures, Roadmap 2016*; publication developed for the European Strategy Forum on Research Infrastructures by the StR-ESFRI project and with the support of the ESFRI Secretariat; H2020 grant agreement n° 654213 StR-ESFRI project.

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8. Addendum

The experiment descriptions of the 32 case studies.

Case study index 1

Case study partner number 18.1

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): C23.99 Thermal insulation products for construction.
- Material research area: thermal conductivity.
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment(-s)

The measurements were focused on thermal insulation properties of cellulose fibre wool samples. The specific purpose was to determine the optimal structure and density of the cellulose fibre wool to achieve highest thermal insulation properties.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

After measuring the thermal insulation properties of 9 different-density samples the company was able to determine the optimal structure of the product, which helps improve resource (raw material) efficiency of the manufacturing process while at the same time maintaining the best thermal insulation properties.

4. Date(-s) of the experiment(-s)

November 2017 – January 2018.

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

The experiment was carried out according to standard EVS-EN 12667:2001. The samples were held at 22-23 temperature before the experiment. The instrument used was LaserComp FOX-304 and the sample size was 0.289m x 0.289m x 0.1m. The heating was done from below the samples.

6. Are there any follow-up actions anticipated?

No, but a good contact was established between the ARF and the company, so that further steps can be taken any time.

7. Contact information

- ARF: Tallinn University of Technology, the Experimental and Scientific Laboratory of Fuels and Air Emissions, Gert Kuldma, gert.kuldma@ttu.ee, +372 620 3912
- IReC: 1) Business contact: prof. Marco Kirm, marco.kirm@ut.ee, +372 737 4629
- 2) Case study preparation contact: Ott Rebane, ott.rebane@ut.ee, +372 56 299 145
- 3) Communication contact: Ott Rebane, ott.rebane@ut.ee, +372 56 299 145

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Cellulose fibre wool made of recycled waste paper.

9. Measurement findings and their contribution to / implications for materials science.

The main finding is that relatively different densities of the fibre wool still isolate thermally very well but at certain densities the thermal conductivity was lower than at other densities. The manufacturer has now the knowledge at which density range to develop and use their product.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Material science and material engineering: the macroscopic thermal properties of the thermal insulation. The measurement results were technically significant, since they outline the range of application densities, which will provide best thermal insulation for housing.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

Enterprise Estonia provided the contacts for the company and the company contacted the IreC directly.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

Discussion via e-mail, application through ADAPTER network and the official Baltic TRAM application preceded the actual work.

13. Method for involving businesses

Directly contacting by e-mail, phone and then face-to-face meeting in fairs.

14. Cost of the pilot

990€ without VAT.

15. Difficulties confronted (if any)

No difficulties. The company got good contact with the ARF.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

The industry is somewhat related to the RIS3 topic of "More efficient use of resources", as the re-use of old paper as thermal insulation gives significant savings to the overall green economy.

Case study index 2

Case study partner number 18.2

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): M72.19 Other research and experimental development on natural sciences and engineering
- Material research area: alumina nanofibre distribution in novel resin systems.
- Problem addressed (mark all options that apply)

Measuring materials' composition	X
Measuring materials performance	

2. Focus of the experiment(-s)

The main purpose of the research was the investigation of structural properties of novel nanocomposites, which included the distribution of alumina nanofibres in resin systems. The secondary focus was to study the actual functionalization of nanofibre surfaces, which were subjected to chemical treatment.

3. What was improved through the experiment? What the experiment was about, and what it achieved, what was the impact of the experiment?

The company was able to continue product development of multiple new products by getting factual information about the nano-scale distribution of nanofibres and the structure of the resin in the 5 sample materials.

4. Date(-s) of the experiment(-s)

September 2017 – December 2017

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

The slices of the samples were cut by the SEM-FIB method. The Slices were measured by Titan G2 80-200 Transmission Electron Microscope with increasing resolution in the areas, where the fibres were expected to be found and where the structural defects of the cured resin were expected to be seen.

6. Are there any follow-up actions anticipated?

Possibly, because the company found a local partner to continue their product development and to better understand the effect of surface functionalization and different components in the resin system.

7. Contact information

- ARF: Väino Sammelselg, vaino.sammelselg@ut.ee, +372 737 4705
- IReC: 1) Business contact: prof. Marco Kirm, marco.kirm@ut.ee, +372 737 4629

  2) Case study preparation contact: Ott Rebane, ott.rebane@ut.ee, +372 56 299 145

  3) Communication contact: Ott Rebane, ott.rebane@ut.ee, +372 56 299 145

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Alumina nanofibres in multiple different composite resin systems.

9. Measurement findings and their contribution to / implications for materials science.

The composition of alumina nanofibres in resin system samples were studied by means of Transmission Electron Microscopy. The main result was that the nanofibres tend to be too agglomerated and not distributed homogeneously enough in these new systems. The other result was that specialty resins did not peel into layers as was feared and behaved well, even though they had micro meter-size droplets of oily material distributed inside.

The main implication was that the company might need an even more uniform distribution of nanofibres into the resin system: either increase the hydrophobic functionalization or mixing activity of the highly viscous systems before curing, etc.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Material science and engineering: the microstructure properties of nanomaterials. The homogeneity of the distribution of the nanofibres in different resin systems was visualized.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, or the IReC? How was the initial contact done?

The company was found via the hints of the scientific circles of the University of Tartu and a direct contact was made by the IReC.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

After first meeting, the company indicated a clear need for local high-resolution-microscopy partner for product development needs. The pilot was initiated by acknowledging collaboration interests between the company and the ARF. Then the company just applied to Baltic TRAM through the web application.

13. Method for involving businesses

Directly contacting by e-mail, phone and then face-to-face meeting.

14. Cost of the pilot

2795€.

15. Difficulties confronted (if any)

https://www.baltic-tram.eu

Some communication issues appeared.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

There is a regional priority of modernizing high-tech measurement equipment – i.e. the experiment side. The industry itself is somewhat related to the RIS3 topic of "more efficient use of resources", as the nanomaterial gives significant advantages to the mechanical properties of certain resin systems. There was no explicit relation to industrial renewal or KET applications.

Case study index 3

Case study partner number 18.3

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): C22.21 Manufacture of plastic plates, sheets, tubes and profiles.
- Material research area: usage of burnt oil shale ash as a filler material in the plastics.
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	x

2. Focus of the experiment(-s)

The focus of the experiment was to study the hardness and abrasiveness of burnt oil shale ash in different fractions and compare these results with commonly used filler materials of plastics.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The experiment improved the knowledge of the company about the Mohs and Vickers hardness of the burnt oil shale ash fractions. The measured value can now be put into the safety datasheet of this ash, so that plastics manufacturers know how much abrasion wear is expected to the machinery when using oil shale ash as a filler material.

The 1st part of experiment was about scratch testing Mohs scale minerals with 3 fractions (0-25um, 25-45um and 45-90um particle size) of burnt oil shale ash powder and determining the hardness value of the ash. The 2nd part of the experiment was to move aluminium rods inside the powder for several hours and days and measure the mass of aluminium, which was removed by the abrasion. The measurement achieved a concrete connection between Mohs hardness, Vickers hardness and the abrasiveness of the filler material studied.

The impact was that the company can now refer to study results, when inserting data about the recycled filler material in their plastics.

4. Date(-s) of the experiment (-s)

December 2017 – February 2018.

5. Which technique(-s) was/ were used for carrying out the experiment(-s)?

The technique for Mohs testing was to scrape the surfaces of the 4 first minerals in the Mohs scale with a metal file and then use the 3 fractions of oil shale ash to remove the markings of the file with the ash powder material on a soft material to hold it.

The technique for Vickers testing was to spark plasma sinter the material into a small ceramic tablet and micro-indent this surface to measure the hardness.

The abrasion was measured by moving aluminium rods in a special mill/grinder with a constant force for up to 13 days (24h for 3 fractions, but longer test was done to confirm result) continuously and then measure the mass loss of the aluminium rods.

6. Are there any follow-up actions anticipated?

No concrete follow-ups are intended. But contact between ARF and company was good and abrasiveness on steel material could be a next step in this research if needed.

7. Contact information

- ARF: Fjodor Sergejev, fjodor.sergejev@ttu.ee, +372 620 3346
- IReC: 1) Business contact: Ott Rebane, ott.rebane@ut.ee, +372 56 299 145

  2) Case study preparation contact: Ott Rebane, ott.rebane@ut.ee, +372 56 299 145

  3) Communication contact: Ott Rebane, ott.rebane@ut.ee, +372 56 299 145

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

3 fractions of burnt oil shale ash: 0-25um, 25-45um and 45-90um. The re-use of such material is seen as an environmentally-friendly move, since less of such material is sent to landfill.

9. Measurement findings and their contribution to / implications for materials science.

The Mohs hardness of the oil shale ash powder was found to be around 3.5 units for all fractions, although it was clearer for the larger fractions. The Vickers hardness was found to vary between 170 and 280 units, which basically agreed with the Mohs measurement value. The abrasiveness was found to be negligible when aluminium rods were used: smallest fraction just polished the rods, but no mass decrease was obvious, larger fractions made the rod surfaces into matte surfaces, but no mass decrease was obvious there either. At larger forces some brown residue material was seen on the aluminium – so that the powder might adhere onto the surface of aluminium, but this is less than chalk does in same conditions, because oil shale ash was found to be "flowing" under pressure, while comparative filler materials did not do so. As a last thing, the oil shale powder was compared to silicon oxide (sand) on its abrasion properties and it was about 50 times less abrasive in that comparison.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Material science and engineering: the hardness of oil shale ash powder, which commonly would be considered waste, but it could probably be used as a filler material in plastics when important parameters are measured. The case could be technically and environmentally significant and therefore scientifically also somewhat. As far as the ARF, the company and the IReC know, such concrete values were never before measured anywhere.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done

The company found Baltic TRAM probably through Enterprise Estonia's widespread letter about Baltic TRAM opportunities to Estonian clusters and unions. The company contacted Baltic TRAM Estonian contact persons through e-mail first.

12. How the need for analytical research services was identified, how the pilot was initiated

After some exchange of e-mails, the Estonian IReC met with the company through Skype and made it clear enough what is needed. A relevant ARF was found though direct upper-level contact between TTÜ and TÜ.

13. Method for involving businesses

Directly contacting by e-mail, phone, Skype and much later face-to-face meeting.

14. Cost of the pilot

1786, 50€.

15. Difficulties confronted (if any)

Some communication issues appeared at the first stages due to the difficult nature of the research.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

The industry itself is related to the RIS3 topic of "more efficient use of resources", as the re-use of such material gives cost advantages to the economy in Estonia. No direct connection to KET.

Case study index 4

Case study partner number 1

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C23.49 Manufacture of other ceramic products
- Material research area: Metallurgical and Thermal Processes, Thermomechanical Treatment of Materials
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment(-s)

Finding out the possibilities to use a side flow material from stone cutting and handling to create a new product.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The experiment gave the information about the composition of the side flow product and made it possible for the company to continue the development of the new product from the material.

4. Date(-s) of the experiment(-s)

September 2017

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

The mineral composition of samples was studied by means of X-ray diffractometry.

Bulk chemical composition was measured using pressed powder preparations on Rigaku Primus II X-fluoresence spectrometer using SQX matching library quantification method.

The leaching test was conducted in water-to-rock ratio of 1:10 for 24 hours by EN 12457-3 standard.

Grainsize distribution was measured using two methods, wet sieving and Laser diffraction analysis.

6. Are there any follow-up actions anticipated?

The steps needed after the measurements were conducted were the following

- Interpreting the results
    - University of Tartu gave some further information on the results and where to look for more information on the specific application of the material.
- Product development
    - The IReC guided the company to seek support from industry specific regional development project to find suitable partners to continue the development further.

7. Contact information

- ARF: University of Tartu: Prof. Marco Kirm, marco.kirm@ut.ee, +372 737 4629

- IReC: 1) Business contact: Kainuun Etu Oy: Markus Leinonen, markus.leinonen@kainuunetu.fi, +358 44 551 3831; 2) Case study preparation: Markus Leinonen, markus.leinonen@kainuunetu.fi, +358 44 551 3831

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Stone soya. A sludge created as a side flow product when cutting and handling stone.

9. Measurement findings and their contribution to / implications for materials science.

Not relevant

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The experiment was not particularly significant from the scientific perspective.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The possibility of the research support through the Baltic Tram project was introduced to the company. The company had the idea of the use of the side flow product for certain products and the idea moved forward to development, by linking to another product development project in Kainuu.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The company indicated the need for the analysis and it was further discussed with Kainuun Etu, University of Turku before application. After the accepted application of the measurement, the details were discussed with the ARF (University of Tartu).

13. Method for involving businesses

Direct contacting.

14. Cost of the pilot

800 €

15. Difficulties confronted (if any)

The co-operation between the company, IReC and ARF was on very good level. Discussions before the experiment ensured the correct sampling and delivery of the sample. After the measurements additional support from the ARF was given for the company to understand the results.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No

Case study index 5

Case study partner number 34

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): C21.20 Manufacture of pharmaceutical preparations
- Material research area: Biomedical Technology and Medical Physics
- Problem addressed (mark all options that apply)

Measuring materials' structure	X
Measuring materials performance	

2. Focus of the experiment(-s)

The focus of the experiment was to find out the morphology of antibody coated polystyrene surface of microtiter wells.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Company produces immunoassay designs that consist of antibodies coated onto the polystyrene surface of microtiter wells. The experiments were planned to investigate how the antibodies are oriented and packed onto the surface. These measurements gave information on the morphological characteristics of the coated surface.

4. Date(-s) of the experiment(-s)

February 2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Atomic Force Microscopy (AFM)

Instrument was Bruker Innova Atomic Force Microscope, method of measurement was contact mode imaging, cantilevers MLCT-AUMT-BF, cantilevers C and E were used.

6. Are there any follow-up actions anticipated?

Since these measurements show out that AFM is suitable method for this kind of surfaces, now similar measurements are planned for differently manufactured surfaces.

7. Contact information

- ARF: University of Turku, Taina Laiho (taina.laiho@utu.fi)
- IReC: 1) Business contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

  2) Case study preparation and communication contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material (-s) involved in the experiment.

Proteins on polystyrene surface

9. Measurement findings and their contribution to / implications for materials science.

Atomic Force Microscopy (AFM) images of protein coated polystyrene surfaces were measured.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Immunoassay designs that consist of antibodies coated onto the polystyrene surface of microtiter wells were studied. The experiments were planned to investigate how the antibodies are oriented and packed onto the surface.

A total of 6 samples were studied. Three different sample types were studied with AFM method: one was clean polystyrene surface of the microtiter well, second was polystyrene surface containing streptavidin proteins, third surface was polystyrene surface containing both streptavidin and biotin proteins. Size of the individual streptavidin protein is about 5 nm and size of biotin is approximately 10-15 nm.

AFM was found to be a suitable method to study the morphology of this kind of surfaces.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, orther IReC? How was it done?

The pilot was initiated by the local IReC. Pilot measurements were standard laboratory measurements. No special equipment was needed.

12. How the need for analytical research services was identified, how the pilot was initiated

The need for the analytical research was identified by the company itself. They need more specific information of the surfaces to develop new products. AFM method was chosen in the discussion between the company representative and IReC representative and it was accepted by evaluation committee.

13. Method for involving businesses

A representative of the company participated in the Materials research seminar organised by Turku Science Park. Possibility to take part to the Baltic TRAM project was presented there in the seminar and the company representative contacted local IReC. After a discussion they decided to apply to Baltic TRAM.

14. Cost of the pilot

3600 €

15. Difficulties confronted (if any)

All went fluently.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Yes. Company is manufacturing pharmaceutical equipment, which links these pilot studies to the regional interest on medical technologies.

Case study index 6

Case study partner number 10

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): M72.19 Other research and experimental development on natural sciences and engineering.
- Material research area: investigation of the phase and elements content in carbon mineral
- Problem addressed (mark all options that apply)

Measuring materials' composition	x
Measuring materials performance	

2. Focus of the experiment(-s)

The main goal of the performed experiments was to investigate the phase and elemental contents of carbon mineral, particularly to determine fullerene content. The carbon mineral will be used in the production of cosmetics.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The mineral was investigated by spectroscopic and diffraction methods. The studies were performed for mineral in form of lump and powder as well for the water after 96 hours of extraction from the mineral. For estimation of element contents and mapping the electron scanning microscopy with energy dispersive spectroscopy and photoelectron spectroscopy were used. Next to find the presence of fullerenes the FTIR and RAMAN spectroscopy was applied. All applied techniques indicated that content of fullerene in investigated samples is below the limit of their sensitivity. Several elements beside carbon were found in mineral (Si, Fe, K, Al, S, O). Additionally, the XPS measurements reported non homogeneously distributed Rh and Nd. The XRD measurements confirmed that dominant crystalline phase is the SiO2 , the minority phases were (Al3H2KO12Si3) and/or (Al2H2KO12Si4).

4. Date(-s) of the experiment(-s)

December 2017- January 2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

SEM, XPS, XRD, FTIR and RAMAN

6. Are there any follow-up actions anticipated?

The chromatographic experiments were recommended to confirm existence of fullerenes.

7. Contact information

- ARF: Please insert here name of ARF, researcher and researcher contacts

  Institute of Physics Polish Academy of Sciences, Warsaw

https://www.baltic-tram.eu

Prof. Krystyna Jablonska jablo@ifpan.edu.pl

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University of Warsaw

Dr Piotr Piotrowski ppiotrowski@chem.uw.edu.pl

- IReC: 1) Business contact: Piotr Piwowarczyk piotr.piwowarczyk@fii.org.pl
- 2) Case study preparation contact: Prof. Krystyna Jabłońska, Piotr Piwowarczyk
- 3) Communication contact: Prof. Krystyna Jabłonska

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Carbon mineral

9. Measurement findings and their contribution to / implications for materials science.

The phase and element contents in the mineral were estimated. The distribution of elements was found to be non-homogeneous.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The experiment shows that natural mineral is non-homogenous as well in terms of element distributions as phases with significant content of amorphous fraction. The composition of carbon mineral depends on the geological condition in the place where was formed.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, orther IReC? How was it done?

The contact to Cossi was set up by IReC Poland through Kielce Technology Park. The BT offer was sent to the Park and two companies were interested in. One of these was Cossi.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

Cossi was aware of the research needs. IReC Poland with a great support from Institute of Physics PAS assist Cossi in defining the research problem to be solved and searching for external ARF for HPLC measurements. The application was submitted in Polish and was converted into English in order to be evaluated by EC.

13. Method for involving businesses

Mailing to Kielce Technology Park, phone call, direct contact to Cossi

https://www.baltic-tram.eu

14. Cost of the pilot

4000 PLN which is around 950 EUR

15. Difficulties confronted (if any)

Very low content of fullerenes at the limit of detection in applied methods.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Although the strategy refers to the R&I as a main regional development driver the range of the research as well as the cosmetics sector is out of the RIS3 and KET for Swiętokrzyskie Region.

Case study index 7

Case study partner number 17

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C26.40 Manufacture of consumer electronics.
- Material research area: Structural materials
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment(-s)

The main objective of this project was to develop the combined dot-matrix and electron beam lithography technology benefitting from both techniques in a single product.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Advanced optical security device was created by combining the dot-matrix and electron beam lithography techniques in a single master image. Patterning of holopixels arranged with different grating orientations and pitches was done using a dot-matrix master shooting machine equiped with a laser diode PMMF 608-G operating at a wavelength of 405 nm. For the patterning of nanotext and diffraction gratings in the specified areas of the same sample we have used Raith e-LiNE^{plus} high resolution electron beam lithography and ultra-high resolution imaging & analysis system. The ratio of areas patterned by dot-matrix technique and e-beam lithography is about 16:1, thus relatively more expensive and slower e-beam writing time was not very large to form a combined image. The layout of combined image was investigated by optical, scanning electron and atomic force microscope. It was shown, that e-beam patterned gratings have smooth and steady edges, while the slopes and the ridge surface of the dot-matrix patterned gratings are inclined and uneven. Measurements showed differences in spatial frequency and shape of the grooves as well as profile depth between the e-beam and dot-matrix patterned gratings. These differences can be easily recognized at the expert level, thus providing a very high security degree and preventing counterfeiters.

4. Date(-s) of the experiment(-s)

14 February 2018 – 15 April 2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Dot-matrix master shooting machine equiped with a laser diode PMMF 608-G operating at a wavelength of 405 nm; Raith e-LiNE^{plus} high resolution electron beam lithography and ultra-high resolution imaging & analysis system; OAI Model 200 IR Mask Aligner; Atomic force microscope NanoWizard®3 (JPK instruments AG); Optical microscope with a micro-meter scale and a digital video camera (Optika^{TM} Vision Pro).

6. Are there any follow-up actions anticipated?

Created technique will be used for the origination of optical devices with the increased level of security.

7. Contact information

- ARF: Material Science Institute at Kaunas University of Technology, Senior researcher, dr. Viktoras Grigaliūnas, email: viktoras.grigaliunas@ktu.lt
- IReC: 1) Business contact: assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt ; 2) Case study preparation contact: assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt ; 3) Communication contact: assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt .

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Photoresist, KOH developer, polymethyl methacrylate (PMMA) 4% solution in Anisole, conductive polymer L1_XP, methyl isobutyl ketone (MIBK) and isopropyl alcohol, CR-14 type chromium etchant (9%CH_3COOH + 22%$Ce(NH_4)_2(NO_3)_6$ + 69%H_2O)

9. Measurement findings and their contribution to / implications for materials science.

An advanced optical security device was created by combining the dot-matrix and electron beam lithography techniques in a single master image. Important issue in this research was precise alignment of topographies patterned by different techniques.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Diffraction gratings fabricated by dot-matrix and e-beam patterning techniques were investigated by scanning electron microscope. It was found, that e-beam patterned grating has smooth and steady edges, while the slopes and the ridge surface of the dot-matrix patterned gratings are inclined and uneven. Atomic force microscope measurements showed, that a spatial frequency of the grooves and profile depth in the e-beam recorded gratings are somewhat higher, than of dot-matrix patterned gratings, whereas dot-matrix gratings have much more sinusoidal-type shape of the groove profile. Combination of the two technologies in a single master image provides a very high protection level, as both techniques can be recognized at the expert level, thus preventing counterfeiters.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The pilot was initiated by JSC Holtida (the business).

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

JSC Holtida wanted to improve their product quality employing analytical and technological facilities.

13. Method for involving businesses

https://www.baltic-tram.eu
E-mail; face to face meeting.

14. Cost of the pilot

4200€ including VAT

15. Difficulties confronted (if any)

The challenge was precise alignment of topographies patterned by different techniques.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Yes. Measurements are related with national RIS3 priority "New production processes, materials and technologies".

Case study index 8

Case study partner number 2

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C32.30 Manufacturing of sporting goods.
- Material research area: Polymer research, PAH-compound analysis of plastic parts.
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment(-s)

To find out the safety and compliance of the parts used in sporting equipment in terms of levels of Polyaromatic Hydrocarbons (PAH). Previously used parts were found to have high levels of certain PAHs that would make it the product non-compliant with some of the industry standards essential in certain markets.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The experiment gave the PAH composition of the parts and gave the company a chance to apply for industry standards such as ProdSG in Germany. This is essential in terms of finding distribution channels in certain markets. Also, the company had the required information to choose the optimal supplier for the tested parts.

4. Date(-s) of the experiment(-s)

August 2017

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Gas and/or High-performance liquid chromatography (HPLC)

6. Are there any follow-up actions anticipated?

The results confirmed that the products are safe enough. German standard for product safety (ProdSG) was introduced to the company, and their possibility to apply for such standard (e.g. using Finnish innovation voucher to cover the standardisation costs). At the time the company is considering the options.

7. Contact information

- ARF: Finnish National Institute Health & Welfare, (external ARF)
- IReC: 1) Business contact: Kainuun Etu Oy: Markus Leinonen, markus.leinonen@kainuunetu.fi, +358 44 551 3831; 2) Case study preparation and open data portal contact: Markus Leinonen, Kainuun Etu Oy, markus.leinonen@kainuunetu.fi, +358 44 551 3831.

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Plastic part of a sporting equipment.

9. Measurement findings and their contribution to / implications for materials science.

Not relevant.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The experiment was not particularly significant from the scientific perspective.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, or the IReC? How was it done?

The pilot was initiated by IReC contact to the company, who clearly identified a case they wanted to proceed with through Baltic Tram project.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

Discussions between IReC and the company. The company had a clear case and were willing to co-operate with the Baltic Tram project.

13. Method for involving businesses

Direct contact.

14. Cost of the pilot

650€.

15. Difficulties confronted (if any)

The co-operation between the company, IReC and ARF was on very good level. Some delay was had with the supplier providing the samples, but otherwise the service worked as was expected by the company.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No.

Case study index 9

Case study partner number 3

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C10.3 Processing and preserving of fruit and vegetables
- Materials research area: Life sciences, Agriculture, Agricultural and food process engineering
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment(-s)

The focus of the experiment was to measure the amounts of vitamins and nutrients in nettle-based products.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

In the market of natural products, the vitamin and nutrient content is essential information to be provided to consumers and regulative bodies. When bringing new products made of plants that are not commonly used, this information also helps the product development and in finding the correct customer groups potentially interested in the product. Nettle is a plant growing prolifically in the region and thus makes an interesting base for many products with potential markets in foods as well as other health products.

4. Date(-s) of the experiment(-s)

January 2018

5. Which technique (-s) was/ were used for carrying out the experiment (-s)?

Hydrid-ICP-OES

ISO 11885:2007(E)

HPLC-DAD analysis

KE 001

KE 002

KE 005

KE 006

KE 009

KE 105

NMKL 129; Fibertec

AOAC 996.06

6. Are there any follow-up actions anticipated?

The results of the analysis will be uploaded to a national database for food products. This is important for any products that are sold to public sector food providers (hospitals, schools…). The data will also be used as base for new product development and marketing of existing products.

7. Contact information

ARF: University of Oulu, Mari Jaakkola, mari.jaakkola@oulu.fi, +358

ARF: Seilab Oy, Elina Alho (external ARF)

IReC: 1) Business contact: Kainuun Etu Oy: Markus Leinonen, markus.leinonen@kainuunetu.fi, +358 44 551 3831; 2) Case study preparation and communication contact: Markus Leinonen, Kainuun Etu Oy, markus.leinonen@kainuunetu.fi, +358 44 551 3831;

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material (-s) involved in the experiment (-s).

Nettle leaves and stems

9. Measurement findings and their contribution to / implications for materials science.

Not relevant.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The experiment was not particularly significant from the scientific perspective.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, orther IReC? How was it done?

The pilot was initiated by IReC contact to the company through local agricultural support agency (ProAgria), the company clearly identified a case they wanted to proceed with through Baltic Tram project.

12. How the need for analytical research services was identified, how the pilot was initiated

Discussions between IReC and the company. The company had a clear case and were willing to co-operate with the Baltic Tram project.

13. Method for involving businesses

Direct contact.

14. Cost of the pilot

400 €.

15. Difficulties confronted (if any)

There was a delay from the company side to send the samples to the laboratories. Comsiderable facilitation and consulting was required.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No.

Case study index 10

Case study partner number 4

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): C10.3 Processing and preserving of fruit and vegetables
- Material research area: Life sciences, Agriculture, Agricultural and food process engineering
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment (-s)

The purpose of the experiment was to measure the amounts of vitamins and nutrients in wild mushroom products.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

In the market of natural products, the vitamin and nutrient content is essential information to be provided to consumers and regulative bodies. This information also helps the product development and in finding the correct customer groups potentially interested in the product. Wild mushrooms grow prolifically in the region and thus makes an interesting base for many products with potential markets in foods as well as other health products.

4. Date (-s) of the experiment (-s)

January 2018

5. Which technique (-s) was/ were used for carrying out the experiment (-s)?

Hydrid-ICP-OES

ISO 11885:2007(E)

HPLC-DAD analysis

KE 001

KE 002

KE 005

KE 006

KE 009

KE 105

NMKL 129; Fibertec

AOAC 996.06

6. Are there any follow-up actions anticipated?

The results of the analysis will be uploaded to a national database for food products. This is important for any products that are sold to public sector food providers (hospitals, schools…). The data will also be used as base for new product development and marketing of existing products.

7. Contact information

- ARF: University of Oulu, Mari Jaakkola, mari.jaakkola@oulu.fi, +358
- ARF: Seilab Oy, Elina Alho (external ARF)
- IReC: 1) Business contact: Kainuun Etu Oy: Markus Leinonen, markus.leinonen@kainuunetu.fi, +358 44 551 3831; 2) Case study preparation and communication contact: Markus Leinonen, Kainuun Etu Oy, markus.leinonen@kainuunetu.fi, +358 44 551 3831.

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material (-s) involved in the experiment (-s).

Mushrooms

9. Measurement findings and their contribution to / implications for materials science.

Not relevant.

10. Analytical research issues addressed by the experiment. Brief description of the analytical research issue addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The experiment was not particularly significant from the scientific perspective.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The pilot was initiated by IReC contact to the company through local agricultural support agency (ProAgria), the company clearly identified a case they wanted to proceed with through Baltic Tram project.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

Discussions between IReC and the company. The company had a clear case and were willing to co-operate with the Baltic Tram project.

13. Method for involving businesses

Direct contact.

14. Cost of the pilot

400 €.

15. Difficulties confronted (if any)

There was a delay from the company side to send the samples to the laboratories. Some support was needed from the IReC in this matter.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No.

Case study index 11

Case study partner number 5

1.- INTRODUCTORY INFORMATION

1. . Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): C10.3 Processing and preserving of fruit and vegetables
- Materials research area: Life sciences, Agriculture, Agricultural and food process engineering
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment (-s)

To measure the amounts of vitamins and nutrients in plant-based products.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

In the market of natural products, the vitamin and nutrient content is essential information to be provided to consumers and regulative bodies. This information also helps the product development and in finding the correct customer groups potentially interested in the product. Wild mushrooms grow prolifically in the region and thus makes an interesting base for many products with potential markets in foods as well as other health products.

4. Date (-s) of the experiment (-s)

January 2018

5. Which technique (-s) was/ were used for carrying out the experiment (-s)?

Hydrid-ICP-OES

ISO 11885:2007(E)

HPLC-DAD analysis

KE 001

KE 002

KE 005

KE 006

KE 009

KE 105

NMKL 129; Fibertec

AOAC 996.06

6. Are there any follow-up actions anticipated?

The results of the analysis will be uploaded to a national database for food products. This is important for any products that are sold to public sector food providers (hospitals, schools…). The data will also be used as base for new product development and marketing of existing products.

7. Contact information

- ARF: University of Oulu, Mari Jaakkola, mari.jaakkola@oulu.fi, +358
- ARF: Seilab Oy, Elina Alho (external ARF)
- IReC: 1) Business contact: Kainuun Etu Oy: Markus Leinonen, markus.leinonen@kainuunetu.fi, +358 44 551 3831; 2) Case study preparation and communication contact: Markus Leinonen, Kainuun Etu Oy, markus.leinonen@kainuunetu.fi, +358 44 551 3831

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material (-s) involved in the experiment (-s).

Plants: common yarrow, angelica

9. Measurement findings and their contribution to / implications for materials science.

Not relevant.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The experiment was not particularly significant from the scientific perspective.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The pilot was initiated by IReC contact to the company through local agricultural support agency (ProAgria), the company clearly identified a case they wanted to proceed with through Baltic Tram project.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

Discussions between IReC and the company. The company had a clear case and were willing to co-operate with the Baltic Tram project.

13. Method for involving businesses

Direct contact.

14. Cost of the pilot

400 €.

15. Difficulties confronted (if any)

There was a delay from the company side to send the samples to the laboratories. Some support was needed from the IReC in this matter.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No.

Case study 12

Case study number 18.4

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): C23.99 Thermal insulation products for construction.
- Materials research area: fire reaction testing.
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	x

2. Focus of the experiment(-s)

The measurements were focused on 2 separate issues: the single item burning testing and the ignitability testing of the business' s thermal insulation product Ecowool (according to EN 13823 and EN ISO 11925-2).

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The measurements enabled the company to determine the most fire-retardant material composition for their product and make it safer. The measurement was about determining how much heat, smoke and flaming droplets occur when a nearby object is burning for predetermined time and if the product can be ignited with a bare flame. The experiment achieved a reaction to fire classification of B-s1,d0 for the cellulose fibre wool and this enables this the company to provide a much needed reference when trying to export their products.

4. Date(-s) of the experiment(-s)

April 2018 – May 2018.

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

The experiment was carried out according to standards EN 13823 and EN ISO 11925-2.

In EN 13823 the test is based on a fire scenario of a single burning item (SBI), e.g. a wastebasket, located in a corner between two walls covered with the lining material to be tested. SBI test specimens are installed on a specimen holder with two vertical wings made of non-combustible board. The specimen holder wings of sizes 1,0 m × 1,5 m and 0,5 m × 1,5 m form a right-angled corner configuration. The thermal exposure on the surface of the specimen is produced by a right-angled triangle-shaped propane gas burner placed at the bottom corner formed by the specimen wings. The heat output of the burner is 30 kW resulting in a maximum heat exposure of about 40 kW/m^2 on an area of approximately 300 cm^2. The burner simulates a single burning item. Combustion gases generated during a test are collected by a hood and drawn to an exhaust duct equipped with sensors to measure the temperature, light attenuation, O_2 and CO_2 mole fractions and flow-induced pressure difference in the duct. The performance of the specimen is evaluated for an exposure period of 20 minutes. During the test, the heat release rate (*HRR*) is measured by using oxygen consumption calorimetry. The smoke production rate (*SPR*) is measured in the exhaust duct based on the attenuation of light. Falling of flaming droplets or particles is visually observed during the first 600 seconds of the heat exposure on the specimen. In addition, lateral flame spread is observed to determine whether the flame front reaches the outer edge of the larger specimen wing at any height between 500 and 1000 mm during the test.

In the ignitability test EN ISO 11925-2, the specimen is subjected to direct impingement of a small flame. The test specimen of size 250 mm × 90 mm is attached vertically on a U-shaped specimen holder. A propane gas flame with a height of 20 mm is brought into contact with the specimen at an angle of 45 °. The

application point is either 40 mm above the bottom edge of the surface centreline (surface exposure) or at the centre of the width of the bottom edge (edge exposure). Filter paper is placed beneath the specimen holder to monitor the falling of flaming debris.

6. Are there any follow-up actions anticipated?

No.

7. Contact information

- ARF: TÜV Eesti OÜ, Fred Haas, fhaas@tuev-nord.ee, +372 679 306
- IReC: 1) Business contact: prof. Marco Kirm, marco.kirm@ut.ee, +372 737 4629
- 2) Case study preparation contact: Ott Rebane, ott.rebane@ut.ee, +372 56 299 145
- 3) Communication contact: Ott Rebane, ott.rebane@ut.ee, +372 56 299 145

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(s-).

Cellulose fibre wool made of recycled waste paper.

9. Measurement findings and their contribution to / implications for materials science.

The main finding is that with proper additions the cellulose fibre wool has really low reaction to fire and can be used quite safely in thermal insulation of constructions. The flame did not spread across 150mm vertically during EVS-EN ISO 11925-2:2010 ignitability testing. According to EN 13823 the fire growth rate index at 0,2MJ heat release threshold was measured to be 54W/s and at 0,4MJ therhold 36W/s. The total heat release during 600s was 3,6MJ. The smoke growth rate index was did not reach the threshold at all, so this product really doesn't produce a lot of smoke. The total smoke production was 31 m^2. There were no flaming droplets coming from the fire either. Implication is that the company now has determined the safest composition for the wool product and may use this knowledge to improve their market situation.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Material science and material engineering: the fire safety properties of the thermal insulation wool made out of recycled paper. The measurement results were technically significant, since they gave a suitably safe composition and accord numerical values for the manufacturer and the future clients.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, other IReC? How was it done?

Enterprise Estonia provided the contacts for the company and the company contacted the IReC directly.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

Discussion via e-mail, application through ADAPTER network and the official Baltic TRAM application preceded the actual work.

13. Method for involving businesses

Directly contacting by e-mail, phone and then face-to-face meeting in fairs.

14. Cost of the pilot

2500€ without VAT for the measurements by the ARF. The company itself paid further 1100€ for classification report.

15. Difficulties confronted (if any)

No difficulties. The company got good contact with the ARF.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

The industry is somewhat related to the RIS3 topic of "More efficient use of resources", as the re-use of old paper as thermal insulation gives significant savings to the overall green economy.

Case study index 13

Case study partner number 18.5

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): C32.99 Other manufacturing n.e.c.
- Materials research area: cosmetics product development
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	x

2. Focus of the experiment(-s)

The measurements focused on the use of lake mud in the cosmetics industry. The experiments involved analysis of antioxidant powers and microbiology analysis. The lake mud was compared to other kind of muds.

3. What was improved through the experiment? What the experiment was about, and what it achieved, what was the impact of the experiment?

The experiments were designed to provide insights of the potential use of lake mud in the cosmetics industry. Analysis of antioxidant powers and microbiological analysis were carried out and compared to other commercial and non-commercial muds. These results allow the company to further develop their products.

4. Date(-s) of the experiment(-s)

April 2018 – August 2018

5. Which technique(-s) was/ were used for carrying out the experiment(-s)?

Spectroscopic complex analysis of the antioxidant powers of the samples (ABTS radical, DPPH radical, FRAP, through the reduction of hydroxyl-radical). Microbiological seeding of the samples together with characterization of the colonies of microorganisms. Ultrasonic processing of the samples with high-intensity sonic power. High-temperature and low-temperature treatment and fractioning with organic solvent of the samples.

6. Are there any follow-up actions anticipated?

No

7. Contact information

- ARF: Tallinn University, Rando Tuvikene, rantuv@tlu.ee
- IReC: 1) Business contact: prof. Marco Kirm, marco.kirm@ut.ee, +372 7374629
- 2) Case study preparation contact: Marek Oja, marek.oja@ut.ee, +372 7374741
- 3) Communication contact: Marek Oja, marek.oja@ut.ee, +372 7374741

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Differently processed cake mud, sea mud, peat mud; compared to AHAVA dead sea mud, Värska water and Blue lagoon, slica mud mask.

9. Measurement findings and their contribution to / implications for materials science.

Freezing and ultrasonic treatment of lake mud decreased the antioxidant powers. Heating the lake mud does not affect significantly the antioxidant powers. Using different preservatives did not affect the antioxidant powers. Lake mud had similar antioxidant powers as sea mud but lower than peat mud. The lake mud had less microorganisms than sea and peat mud. Different additives lowered the number of micro-organism in the lake mud, but this does not mean that all micro-organisms were destroyed by the additives.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Measurement of anti-oxidant powers and number of micro-organisms present in the lake mud. These measurements provided the company with insights in how lake mud compares to other products and whether it is feasible to produce products from lake mud.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, orther IReC? How was it done?

Company contacted the IReC directly after attending Demoday presentation at the University of Tartu

12. How the need for analytical research services was identified, how the pilot was initiated

Discussion via e-mail and phone, application through ADAPTER network and discussion with scientists found through ADAPTER to have a good research plan preceded the official Baltic Tram application and actual work.

13. Method for involving businesses

Directly contacting by e-mail, phone and then face-to-face meeting in fairs.

14. Cost of the pilot

2832€ without VAT for the measurements by the ARF.

15. Difficulties confronted (if any)

No difficulties. The company had good contact with the ARF.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

The experiments were somewhat related to RIS3 topic of ”Enhancement of Resources” as company plans to use naturally produced lake mud in their products.

Case study index 14

Case study partner number 10

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): M72.19 Other research and experimental development on natural sciences and engineering.
- Materials research area: Analysis of coal ash as a source of Rear-Earth Metals (REM)
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment(-s)

The main goal of the performed experiments was to determine the REM (rare earths metals) content of chemical compounds in coal ash. This knowledge is crucial for estimating the feasibility and profitability of REM recovery from ashes.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Several experimental methods to solve the problem was proposed for testing. The successful was the x-ray diffraction which identified main, secondary and tertiary phases in investigated ash. One of the main phase may contain REM. The photoelectron spectroscopy was eliminated due to low conductivity of material and problem to compact the ash. The content of REM was too low to use the x-ray absorption spectroscopy. The company declare to attempt to condense the phase which may content the REM according to results of x-ray diffraction studies. The performed experiment indicated the most probable phase which may content the REM, therefore answered the main question asked by company.

4. Date(-s) of the experiment(-s)

21.10.2017 – 31.10.2017

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

X-ray diffraction, X-ray photoelectron spectroscopy

6. Are there any follow-up actions anticipated?

After condensation of the fraction of ash with the REM content the x-ray absorption spectroscopy was recommended to estimate more precisely the chemical binding of REM.

7. Contact information

ARF: Institute of Physics Polish Academy of Sciences, Warszaw

Prof. Krystyna Jablonska, Dr Marcin Klepka

IReC: 1) Business contact: Piotr Piwowarczyk piotr.piwowarczyk@fii.org.pl

2) Case study preparation contact: Prof. Krystyna Jabłońska, Piotr Piwowarczyk

3) Communication contact: Prof. Krystyna Jablonska.

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Coal ash.

9. Measurement findings and their contribution to / implications for materials science.

The dominant and minority phases in the ash were determinate and these which may contain REM indicated.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The experiment was performed on ash what eliminated several analytical techniques which need high vacuum and sample conductivity (e.g. XPS or SEM). The performed diffraction studies indicated that after coal burning several crystalline phases are present in ash. The chemical content of ash probably depend strongly on the geological condition in place where coal was formed.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, other IReC? How was it done?

The contact to Recometal was set up by Institute of Physics Polish Academy of Sciences

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The company contacted Institute of Physics, PAS and was directed to Baltic TRAM project.

13. Method for involving businesses

Recometal found Institute of Physics and asked for measurements commercially. Prof. Jabłońska proposed to perform the measurements under the umbrella of BT.

14. Cost of the pilot

280 EUR, 1200 PLN

15. Difficulties confronted (if any)

Powder with low conductivity what eliminated several analytical methods, very low content of REM.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

https://www.baltic-tram.eu

The chemical sector is identified in the RIS3 as one of the most important in Mazowieckie Region.

Case study index 15

Case study partner number 9

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1.- INTRODUCTORY INFORMATION

1. Identifier options of the open data portal: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C23.49 Manufacture of other ceramic products
- Materials research area: Metallurgical and Thermal Processes, Thermomechanical Treatment of Materials
- Problem addressed (mark all options that apply)

Materials' composition	X
Materials' performance	X

2. Focus of the experiment(-s)

Development of sustainable binders (cements).

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The company has developed a concept where nonreactive biomass ash can be transformed into reactive cement. The process involves modifying the biomass ash in situ by using combustion additives. These studies are about concept development: getting the ash modification from pilot to industrial level production by implementing a quality control system. Analytical methods are used to gain further insight into the actual effect that the modification has on the biomass ash in comparison to other traditional methods of binder modification.

4. Date(-s) of the experiment(-s)

December 2017 - January 2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Technique 1) Thermogravimetric analysis (TGA)

Instrument was TA Instruments SDT 2960 Simultaneous DTA-TGA. Measurements were performed in air 100 cm^3/min. Temperature was increased 5 °C/min.

Technique 2)

Synchrotron based X-ray Diffractometry (XRD) at beamline P02.1 (powder diffraction and total scattering) of the synchrotron PETRA III of Deutsches Elektronen-Synchrotron (DESY) in Hamburg, Germany.

P02.1 provides high-resolution powder X-ray diffraction in the hard X-ray regime, with a fixed energy of 60 keV, making it particularly useful for high Z materials. The high-energy also allows total scattering data to be collected (typical Q_{Max} = 20 $Å^{-1}$) for Pair Distribution Function Analysis. A range of sample environments for non-ambient (e.g. variable temperature measurements) are available.

6. Are there any follow-up actions anticipated?

No.

https://www.baltic-tram.eu

7. Contact information

- ARF 1: University of Turku
- ARF 2: Deutsches Elektronen-Synchrotron
  Synchrotron PETRA III
  Beamline P02.1 – Powder Diffraction and Total Scattering
  web: photon-science.desy.de/facilities/petra_iii/beamlines/index_eng.html, accessed 05.10.2018
- IReC:
  1) Business contact:
  University of Turku,
  Taina Laiho (taina.laiho@utu.fi)

  2) Case study preparation and communication contact:
  TGA measurements:

  University of Turku,
  Taina Laiho (taina.laiho@utu.fi)

  XRD measurements:

  Deutsches Elektronen-Synchrotron
  Innovation & Technology Transfer
  Service Group Industry
  web: photon-science.desy.de/users_area/industrial_users/index_eng.html, accessed 05.10.2018

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment (-s).

Biomass ash, sustainable binders (cement).

9. Measurement findings and their contribution to / implications for materials science.

Determination of the crystalline fraction of the chemical composition of samples aged to different degrees.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Samples in their different dehydration states were studied. Performed TG and XRD analysis gave more insights into the mechanisms of the strength development during the ash modification trial runs.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, orther IReC? How was it done?

The first part of the pilot was initiated by the local IReC. These pilot measurements were standard laboratory thermogravimetric measurements.

More measurements were performed at DESY (Deutsches Elektronen-Synchrotron) in Hamburg, Germany. The beamline P02.1 for powder diffraction and total scattering was utilised.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The need for the analytical research was identified by the company itself. They need more specific information of the samples in order to develop new products. TGA and XRD methods were suggested by the company itself and they were accepted by the scientific evaluation committee of Baltic TRAM.

13. Method for involving businesses

This company is one of the companies located in the Smart Chemistry Park of Turku Science Park. Possibility to take part to the Baltic TRAM project was presented there in their weekly seminar and the company representative contacted local IReC. After a discussion they decided to apply to Baltic TRAM.

14. Cost of the pilot

5060 €

15. Difficulties confronted (if any)

It all went smoothly.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

The company works in the field of construction, fire safety and decoration. They are a subcontractor for marine industry. The studied samples are manufactured by this company from recycled materials. This case matches with: Blue growth industries and Environmental industries.

Case study index 16

Case study partner number 14

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below

- NACE & industry (main business activity): F43.39 Other building completion and finishing
- Material research area: Composite Materials
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	x

2. Focus of the experiment(-s)

The purpose of the experiment was to measure bronya thermal insulator coating.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Temperature measurements for determining the thermal conductivity coefficient of bronya coating were done. Fair/neutral information about the product was obtained, which was the purpose of the measurements.

4. Date(-s) of the experiment(-s)

August 2017.

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Temperature measurements.

6. Are there any follow-up actions anticipated?

Yes. The company has been advised about a possibility for further analysis of the materials with a different method. They will contact the presented analytical research facility directly. The company has also started a new research project about the now studied materials.

7. Contact information

- ARF: University of Turku, Taina Laiho (taina.laiho@utu.fi)
- IReC: 1) Business contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

2) Case study preparation and communication contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Bronya thermal insulator coatings.

9. Measurement findings and their contribution to / implications for materials science.

Laboratory tests were performed for three kind of thermal insulation coatings: Bronya Anticor, Bronya Facade and Bronya Classic. Based on the now performed measurements together with parameters provided by the manufacturer, the thermal conductivity coefficient λ was calculated for the studied insulators.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Now performed temperature measurements show out the thermal insulation properties of the thermal insulation coatings Bronya Anticor, Bronya Facade and Bronya Classic.

Further measurements were recommended for the company.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the pilot, i.e. the business, the ARF, or the IReC? How was it done?

The pilot was initiated at the local IReC.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

Discussions between IReC and the company. The company had a clear case and were willing to co-operate with the Baltic Tram project.

Pilot measurements were standard laboratory tests. No special equipment was needed.

13. Method for involving businesses

This company contacted the local university and was directed to the local IReC.

14. Cost of the pilot

4500 €

15. Difficulties confronted (if any)

Selecting suitable research method for the purpose was challenging.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Yes. Company is a subcontractor of the regional marine industry. As a result, these pilot studies are linked to regional interest in blue growth.

Case study index 17

Case study partner number 11

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C28.93 Manufacture of machinery for food, beverage and tobacco processing
- Material research area: Finding superior coating of aluminium part in cigarettes producing machine.
- Problem addressed (mark all options that apply)

Measuring materials' structure	X
Measuring materials performance	X

2. Focus of the experiment (-s)

The focus of the study was to compare of two samples of metals with different coatings to find out which one of them can act as best substrate to build veins in paper rolling machine.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The aim of the research was to perform imaging of phosphate layers surfaces of both samples as well as analysis of their chemical composition. Electron microscopy (SEM) was used for this purpose with analysis with elemental composition mapping (EDS). Experiment showed that the surface of the coatings of both samples are almost the same. Further study, in that case hardness test, showed that core of samples differ and one of them is more durable than the second one.

4. Date(-s) of the experiment(-s)

29.03.2018 SEM, EDS; 03.07.2018 Hardness Test

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Scanning electron microscopy (SEM), Energy dispersive spectroscopy (EDS), Hardnes Test with use of Brindell Method.

6. Are there any follow-up actions anticipated?

Scanning electron microscopy (SEM), Energy dispersive spectroscopy (EDS), Hardnes Test with use of Brindell Method.

7. Contact information

- ARF:

  Institute of Physics Polish Academy of Sciences, Warsaw; Prof. Krystyna Jablonska jablo@ifpan.edu.pl; Dr Marcin Klepka mklepka@ifpan.edu.pl

- IReC:

  1) Business contact: Jakub Chajdecki

  2) Case study preparation and communication contact: Jakub Chajdecki, Dr Marcin Klepka

  3) Open data pilot contact (person who would give more information for example): prof. Krystyna Jablonska.

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Differently processed kake mud, sea mud, peat mud. As a comparison AHAVA dead sea mud, Värska water and Blue lagoon, slica mud mask.

9. Measurement findings and their contribution to / implications for materials science.

Measurements allowed to collect images of surfaces and compare samples morphologies, identify elements and estimate their content. The hardness of core materials was also measured.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The experiment was performed on conductive samples so SEM was chosen as analytical techniques. It allowed to describe samples microstructures. To find out the durability of metal core hardness tests were performed.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The contact to Bamet was set up by Foundation of Innovative Initiatives (IReC).

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

IReC/FII set up the contact with Bamet. During first meeting the scope of the measurements was described. Based on this information, the application was sent to the evaluation committee.

13. Method for involving businesses

It was not the first contact with Bamet. IReC/FII and Bamet knew each other before the BT contact was initiated. It was much easier to start cooperation.

14. Cost of the pilot

952 EUR, 4000 PLN

15. Difficulties confronted (if any)

ARF did not want to sign the standard BT service agreement, IReC/FII creates service order to perform measurements.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

The experiment is directly linked to the one of Malopolskie smart specialisations which is Electrical engineering and machine industry.

Case study index 18

Case study partner number 27

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): B8.1 Quarrying of stone, sand and clay
- Materials research area: Soil sciences
- Problem addressed (mark all options that apply)

Measuring materials' structure	
Measuring materials performance	X

2. Focus of the experiment (-s)

Applying company has an interest to use local clay in their business.
Focus of the experiment was to study how local clay differs from the imported clay as a matter of structure and quality.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The mineral content of the mud was analysed. Knowing the mineral content of the material is required in order to add informative labelling to the packaging. It was also necessary to get the elemental survey of possible heavy metals in the samples. The most important elements of study are possible trace elements As, Cd, Cr, Cu, Hg, Ni, Pb, Zn, which would be harmful if they would exist in too big amounts in the samples.

4. Date(-s) of the experiment(-s)

May 2018.

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

X-Ray Fluorescence, XRF, and X-Ray Diffractometry, XRD.

6. Are there any follow-up actions anticipated?

Not at this stage, perhaps later.

7. Contact information

- ARF: University of Tartu
- IReC: 1) Business contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

  2) Case study preparation and communication contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Clay, mud.

9. Measurement findings and their contribution to / implications for materials science.

Mineral composition of the studied mud was identified using X-Ray diffractometry, XRD. Elemental composition of the studied mud was analysed by X-Ray Fluorescence, XRF, method.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

For the future commercial use of the studied local clay it is important to be able to give the clay composition of the material in the packaging. It was also very important to make sure that there are no heavy metals contained in the material, since they are a common impurity in clays. Both of these issues were solved by the measurements.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

Head of this company met IReC representative at a seminar where IReC services were introduced.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The most important measurements for the company were decided together by discussions between IReC and the company.

13. Method for involving businesses

E-mails and face-to-face meetings.

14. Cost of the pilot

400€

15. Difficulties confronted (if any)

No difficulties.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Innovative food chains, as part of the Western Finland RIS3, is a relevant concept to this experiment. This company has a plan to start production of drinkable clay in the near future.

Case study index 19

Case study partner number 1

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C27.20 Manufacture of batteries and accumulators
- Materials research area

Natural Sciences

a. Chemistry
a. III. Physical and Theoretical Chemistry
a. III. 1. Physical Chemistry of Molecules, Interfaces and Liquids - Spectroscopy, Kinetics

Engineering Sciences

c. Materials Science and Engineering
c. II. Materials Science
c. II. 1. Thermodynamics and Kinetics of Materials

- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment (-s)

It can be observed that some batteries age much faster than others. This behaviour can be caused by different components of the battery. Within the framework of this case study the ionic electrolyte of rapidly and normally aged batteries was characterised to check whether the different behaviour of the batteries is caused by the ageing of the electrolyte.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

At the beginning of the project it was not clear which component of the battery was responsible for the differences in the ageing behaviour of the batteries. As the first step in an exclusion process, the electrolyte was examined.

4. Date(-s) of the experiment(-s)

July 2018.

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

The case study compared the dc ionic conductivity of rapidly and normally aged electrolyte at variable temperature (temperature dependent impedance spectroscopy).

The temperature program was as follows: +20 °C, +25 °C, +30 °C, +40 °C, +50 °C, 10 °C, 0 °C, -10 °C, -20 °C. Before starting a measurement, the hold time was set to 900 s to allow the sample to reach thermal equilibrium.

Impedance measurements for determination of the temperature-dependent dc-ion conductivity were performed over a frequency range from 1 MHz - 0.1 Hz with an ac voltage amplitude of 10 mV (rms).

6. Are there any follow-up actions anticipated?

No

7. Contact information

ARF: rhd instruments GmbH & Co. KG, Otto-Hesse-Straße 19 T3, 64293 Darmstadt, Germany, www.rhd-instruments.de

IReC: 1) Business contact: Deutsches Elektronen-Synchrotron (DESY)
Projektträger DESY
Notkestraße 85, 22607 Hamburg, Germany
http://pt.desy.de/

2) Case study preparation and communication contact:

Deutsches Elektronen-Synchrotron (DESY)
Projektträger DESY
Notkestraße 85, 22607 Hamburg, Germany
http://pt.desy.de/

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Ion conductive electrolyte for lithium batteries.

9. Measurement findings and their contribution to / implications for materials science.

Determination of the dc ion conductivity of the electrolytes extracted from "fresh" and "aged" cells.

The dc ion conductivities of the electrolytes extracted from "fresh" cells are slightly lower than the values determined for the samples collected from "aged" cells. Since only one temperature-dependent series for each of the samples was recorded, rhd instruments recommends carrying out at least three-fold measurements to confirm that this is a general trend.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Samples of ion conductive battery electrolyte from ”fresh” and ”aged” battery cells were studied. The results of the impedance measurements carried out indicate that the electrolyte most probably does not cause the different ageing behaviour of the batteries. The data provided valuable insights into the temperature dependency of the electrolyte's ionic conductivity.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

Liacon GmbH applied for funding after a consultation with the IReC.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The need for analytical measurements was identified by the company itself. The company was looking for a way to determine the information they needed about the ionic conductivity of the battery electrolyte they were using. On the one hand, they wanted to know how the conductivity behaves at different temperatures and, on the other hand, whether the different ageing behaviour of batteries is due to changes in the electrolyte.

Based on their needs and based on the research question, Liacon GmbH proposed to carry out temperature dependent impedance measurements.

13. Method for involving businesses

Liacon GmbH developed a new method on how to press liquid electrolyte out of battery pouch cells.

14. Cost of the pilot

8 000€ (estimate) + VAT

15. Difficulties confronted (if any)

None.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

The RIS3 of the NUTS2 region DEF “Schleswig-Holstein” where the business is located focusses beyond others on:

Economic Domain	C.27 - Electrical equipment <- part of RIS3
Scientific Domain	05.36 - Other power and storage technologies <- part of RIS3
Policy Objectives	**E. KETs:**
	-E.38 - Advanced materials <- part of RIS3
	J. Sustainable innovation
	-J.68 - Sustainable energy & renewables <- part of RIS3

Case study index 20

Case study partner number 6

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): A01.13 Growing of vegetables and melons, roots and tubers
- Materials research area: C I 3 Materials Science and engineering: Composite materials
- Problem addressed (mark all options that apply)

Measuring materials' structure	
Measuring materials performance	X

2. Focus of the experiment (-s)

To find out the durability of a composite material as a greenhouse structure in arctic climate through aging treatment and laboratory testing.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The composite material was given an aging treatment (solar exposure and temperature treatment) and then mechanically tested in a laboratory for durability. The purpose of the testing was to find out if the composite material is suitable for large greenhouse structure in arctic climate. The experiment allowed the business to continue with the engineering plans of the greenhouse structure to further investigate the costs and the possibilities the material would give instead of the traditional materials used.

4. Date(-s) of the experiment(-s)

May – August 2017

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Samples of glass fibre rods were weathered by cyclic solar test based on IEC60068-2-5. Then the rods were mechanically tested by the 3 point bending method on the basis of the standard ASTM D 4475-02 (2016) and ASTM D 790-10 (2016).

6. Are there any follow-up actions anticipated?

The company will continue the engineering plans of the greenhouses with engineering consultants to find out the feasibility of such structure.

7. Contact information

- ARF: University of Latvia

IReC: 1) Business contact: Markus Leinonen, Kainuun Etu Oy, markus.leinonen@kainuunetu.fi, +358 44 551 3831

2) Case study preparation and communication contact: Markus Leinonen, Kainuun Etu Oy, markus.leinonen@kainuunetu.fi, +358 44 551 3831; Ninetta Chaniotou, Kainuun Etu Oy, ninetta.chaniotou@kainuunetu.fi , +358 44 551 4559

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Glassfibre composite rods of 4 different types of thickness.

9. Measurement findings and their contribution to / implications for materials science.

Four painted in different colours (red, yellow, white, and green) pairs of pultruded reinforced plastic composite rods (length of 24 cm) were at first weathered and then mechanically tested. Weathering was done by exposing the test items to solar radiation and hot and cold temperatures. The aim was to study how the test items withstand sunny and warm conditions in summer and cold in winter. Mechanical testing was done by the 3 point bending method. For getting information about maximal handled force and Young's modulus for each sample, load – deflection diagram was built. It was found that the ageing treatment performed for these items did not affect the durability of the composite rods.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

In this study the effect of weathering on the mechanical properties of studied items/materials was tested. New composite materials and new applications of them are developed on a continuous basis. The durability of composite materials after yearly outdoor usage and exposure to sun radiation and temperature changes can be an important analytical research question in many scientific and other cases.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The business was contacted by the IReC and the research problem was identified by the business. The supplier for the composite rods provided the samples.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

Based on business needs. The durable and cost effective material was needed for the new style of greenhouse and the business identified the possibility to use composite material if the laboratory test results support the possibility.

13. Method for involving businesses

Direct contact.

14. Cost of the pilot

2400€

15. Difficulties confronted (if any)

Some variance in results. A larger number of samples would have provided more statistically significant data.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No.

Case study index 21

Case study partner number 49

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C10.73 Manufacture of macaroni, noodles, couscous and similar farinaceous products
- Materials research area: measurement of polysaccharide content in foodstuffs
- Problem addressed (mark all options that apply)

Measuring materials' composition	x
Measuring materials performance	

2. Focus of the experiment (-s)

Inulin content measurement of 6 samples of Jerusalem artichoke powder and juice.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Improved knowledge about the chemical content as well as the exact percentage of inulin in this year's Jerusalem artichoke harvest.

4. Date(-s) of the experiment(-s)

16.11.2018 to 30.11.2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

The chromatographic fingerprinting of the sample was done by high performance anion-exchange chromatography (HPAEC-PAD). The obtained chromatograms have been compared with the fingerprinting of our standard mixture of FOS and inulin (mixture of small inulins (GFn) and oligofructoses (Fm) and long chain inulin (mixture of long inulins (GFn)).

6. Are there any follow-up actions anticipated?

No.

7. Contact information

- ARF: Eurofins Environment Testing Estonia OÜ
- IReC: 1) Business contact: Ott Rebane

  2) Case study preparation and communication contact: Ott Rebane

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

6 samples identified: Jerusalem artichoke powder, press cake (2), extract, unpasteurized juice and pasteurized juice.

9. Measurement findings and their contribution to / implications for materials science.

The fingerprint of samples Jerusalem artichoke powder, press cake and 2nd press cake, show a large signal for sucrose, fructose and glucose, and GF2 to GF40, diminishing in signal, with hardly any traces of oligofructoses (Fm).

The fingerprint of inulin extract, pasteurized juice and unpasteurized juice show a large signal for sucrose, fructose and glucose, and GF2 to GF45 and beyond. The samples' fingerprints are similar to the other three samples.

Inulin/FOS Internal Method shows 13.7 wt% of inulin content in press cakes, 12.8 wt% of inulin content in pasteurized Jerusalem artichoke juice, 12.6 wt% of inulin content in unpasteurized juice and 70.2 wt% of inulin content in powder.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The current harvest and the whole idea of getting high-inulin polysaccharides from Jerusalem artichoke was addressed for the food-industry company. Scientifically the result in not too significant, but it enables very specific diet foods to be manufactured and therefore industrially the result is important.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The Estonian network ADAPTER (IReC extension) got the contact and sent it to Baltic TRAM Estonian IReC team to resolve.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The requirements of the experiment and possible services to be provided were defined quite specifically, by a joint team that included the client, University's scientific experts and later the industrial research experts.

13. Method for involving businesses

ADAPTER network's webpage.

14. Cost of the pilot

1000€.

15. Difficulties confronted (if any)

The chromatographic fingerprinting necessity was established after discussions with client and industry, therefore not only the weight percentage of the inulin was measured, but also the chemical content of this sample.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

There is a small connection to Estonian RIS3 priority "more efficient use of resources".

Case study index 22

Case study partner number 52

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C26.40 Manufacture of consumer electronics.
- Material research area: Structural materials
- Problem addressed (mark all options that apply)

Measuring materials' structure	
Measuring materials performance	X

2. Focus of the experiment (-s)

The main objective of this project was to assess the scratch- and impact-resistance of various model LCD screens coming from different manufacturers.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The scratch- and impact-resistance of various model LCD screens coming from different manufacturers have been compared in this study using the progressive load scratch test and falling weight micro-impact testing. It was revealed, that the scratch width and depth somewhat varies for various models of LCD screens. Under minimum load of 1.2 N, scratches are almost invisible to the naked eye in the iPhone 6S Plus (A), S8 (A) and S7 Edge (A) models, whereas scratches become clearly visible in the all types of investigated specimens, when the load increases to 7.1 N. It was established that iPhone 6S Plus (A) and S6 Edge (O) models are more impact-resistant than S8 (A), S7 Edge (A), J710 (O) and J530 (O) glasses. Force vs. time diagram for iPhone 6S Plus (A) glass showed similar elastic properties to that seen for the S8 (A) glass, as similar amount of energy was absorbed through non elastic mode. Force vs. time diagrams of LCD glasses impacted with different kinetic energies showed that the J710 (O) and J530 (O) glasses have a higher elasticity than other models, while the impact-resistance of these two models is the worst from the all tested screens.

4. Date(-s) of the experiment(-s)

15 October 2018 – 01 December 2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Technique 1: Custom-made PC controlled scratch testing device;

Technique 2: Falling weight micro-impact testing equipment with a strain gauge load cell in a wheatstone bridge configuration;

Technique 3: Calibrated optical microscope with a digital video camera (OptikaTM Vision Pro);

Technique 4: Atomic force microscope NanoWizard®3 (JPK instruments AG).

6. Are there any follow-up actions anticipated?

The results will be used in the company's activities.

7. Contact information

- ARF: Material Science Institute at Kaunas University of Technology, Senior researcher, dr. Viktoras Grigaliūnas, email: viktoras.grigaliunas@ktu.lt .
- IReC: 1) Business contact: assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt ; 2) Case study preparation contact: assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt ; 3) Open data pilot contact (person who would give more information for example): assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt .

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

The subject of this study were original (O) and alternative (A) mobile screen glasses coming from different manufacturers.

9. Measurement findings and their contribution to / implications for materials science.

The scratch- and impact-resistance of original (O) and alternative (A) mobile screen glasses coming from different manufacturers have been investigated, that contributes to the material science.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

It was revealed, that the width and depth of the scratch very somewhat for various models of LCD screens. Under minimum load of 1.2 N, scratches are almost invisible to the naked eye in the iPhone 6S Plus (A), S8 (A) and S7 Edge (A) models, whereas scratches become clearly visible in all types of investigated specimens, when the load increases to 7.1 N. It was established that iPhone 6S Plus (A) and S6 Edge (O) models are more impact-resistant than S8 (A), S7 Edge (A), J710 (O) and J530 (O) glasses. Force vs. time diagram for iPhone 6S Plus (A) glass showed similar elastic properties to that seen for the S8 (A) glass, as similar amount of energy was absorbed through non elastic mode. Force vs. time diagrams of LCD glasses impacted with different kinetic energies showed that the J710 (O) and J530 (O) glasses have a higher elasticity than other models, while the impact-resistance of these two models is the worst from the all tested screens.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The pilot was initiated by the business.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The business wanted to select the best suppliers of glass in order to ensure the most suitable service for the customer.

13. Method for involving businesses

e-mail; face-to-face meeting.

14. Cost of the pilot

2500 Eur including VAT.

15. Difficulties confronted (if any)

There were no major difficulties.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Yes. Measurements are related with national RIS3 priority "New production processes, materials and technologies".

Case study index 23

Case study partner number 67

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): M71.20 Technical testing and analysis
- Material research area: physics, optics
- Problem addressed (mark all options that apply)

Measuring materials' structure	
Measuring materials performance	x

2. Focus of the experiment (-s)

Testing of the performance of prototypes of Black Panel Thermometers.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Customer company has manufactured prototypes of Black Panel Thermometers. This experiment was planned to test the performance of differently manufactured prototypes. After testing the customer company can produce Black Panel Thermometers for their own use.

4. Date(-s) of the experiment(-s)

December 2018.

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

The equipment used for reflection measurements was a Perkin Elmer Lambda 1050 with an integrating sphere.

6. Are there any follow-up actions anticipated?

No.

7. Contact information

- ARF: Aalborg University
- IReC: 1) Business contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)
- 2) Case study preparation and communication contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Black Panel Thermometer.

9. Measurement findings and their contribution to / implications for materials science.

The spectral reflectance curves were measured for prototypes of Black Panel Thermometers. Six prototypes and one reference sample were analysed.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The customer company needed to know the reflection properties of the different coated black plates in the wavelength range of 250-2500 nm. The wide wavelength area was challenging to cover, but the analysis lab was able to solve the problem. The equipment used for reflection measurements was a Perkin Elmer Lambda 1050 with an integrating sphere. When using the integrating sphere the operating range is 200 nm – 2500 nm. Detector and light source were both changed during the measurements in order to detect the spectrum from the whole needed wavelength area. Due to that, there are some features in the measurements which are not relating to the samples but rather caused by the equipment. Features near 860 nm and 2100 nm are caused by detector change and features near 320 nm are caused by change of light source, Deuterium (D2) light source below 320 nm and tungsten light source above.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

Local IReC contacted the company by email and asked if they have any challenges that the research network of Baltic TRAM could solve.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The company itself identified the need for research services. The experiments were then planned together with ARF, IReC and the company itself.

13. Method for involving businesses

email

14. Cost of the pilot

about 400 eur + VAT

15. Difficulties confronted (if any)

It was difficult to find an ARF with a suitable instrumentation for this kind of measurements.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Not directly or explicitly.

Case study index 24

Case study partner number 51

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): D35.30 Steam and air conditioning supply.
- Materials research area: efficiency measurement of solar air panels.
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment (-s)

The efficiency ratings measurement of solar air panel according to EN ISO 9806:2017.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The knowledge about current SN80 product performance was improved. The experiment was about determining the heating efficiency of the solar thermal air panel at single air mass flow rate at different temperatures and irradiation conditions. The dependence between output power of the panel and the irradiation angle was studied, too. The pressure changes (drop) were also measured for the system.

4. Date(-s) of the experiment(-s)

11.07.2018 (delivery) – 19.12.2018 (test report)

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

According to ISO 9806 the panel was illuminated indoors using a high precision-wattage radiant source operating to similar outdoor conditions at 3 different irradiation levels: blue sky (1000W/m2), hazy sky (700W/m2) and grey sky (400W/m2). The panel output power was characterised as a function of the outdoor and in-panel air temperature difference. The efficiency rating was calculated according to these experimental results. The panel was also illuminated at different angles of incidence and the output power was calculated for every 10 degree step from 0 degrees to 90 degrees. The pressure drop of the panel was measured at air? mass flow rates from 100kg/h to 400kg/h.

6. Are there any follow-up actions anticipated?

No quick follow-ups anticipated.

7. Contact information

- ARF: TestLab Solar Thermal Systems, Fraunhofer Institut for Solar Energy Systems.
- IReC: 1) Business contact: Ott Rebane, ott.rebane@ut.ee

2) Case study preparation and communication contact: Ott Rebane, ott.rebane@ut.ee

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Solar thermal air panel by Sol Navitas of type SN80.

9. Measurement findings and their contribution to / implications for materials science.

The solar air panels were found to produce 1240 watts power at its maximum performance and the efficiency curves were established for different illumination levels and angles. The panel behaved well up to large incident angles (>70 degrees). The pressure drop was found to be ~10 Pa at the mass flow rate of 200kg/h and the pressure change relationship was determined.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The normative efficiency ratings of the panel were established. No big scientific significance, but important technological knowledge for air solar panel technology. With additional comparative measurements, this knowledge could be the base for improved technology and new products.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The business got information about Baltic TRAM at the special meeting to promote Baltic TRAM which was organised in Tehnopol Tallinn. There was the first contact established.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The company was looking for a certified service provider able to study the performance of solar thermal air panel. To answer this need the IReC-s (in collaboration with German IReC) did an extensive search in the European market for the service in question. In addition to giving the concrete performance data for the panel, such measurements also act as an external quality control.

13. Method for involving businesses

Face to face meeting, phonecalls, e-mails, consultations with foreign experts.

14. Cost of the pilot

3340€.

15. Difficulties confronted (if any)

It was really difficult to hand over the proposed measurement to the German IReC (a large organisation) which just could not agree on the legal terms of the service with the ARF (a large organisation) discussing these for many months and the whole service to be provide was stopped by the legal dispute on the contract to be signed. In order to solve this, the service organising IReC was changed back to Estonia and the 2-way contract with the ARF was signed smoothly. The solar panel itself was damaged during transportation and there were additional costs for the client for reparation of the unit.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No direct connection to Estonian RIS3. The work belongs to the development of sustainable energetics on renewables.

Case study index 25

Case study partner number 52

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C20.30 Manufacture of paints, varnishes and similar coatings, printing ink and mastics.
- Material research area: measurement of reaction to fire of epoxy floorings.
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment (-s)

The determination of burning behaviour for company's epoxy floorings according to ISO 9239-1 and ignitability under direct flame according to ISO 11925-2.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The knowledge about current product performance was improved. The experiment was about determining the flame maximal spread, the flame spreading speed, smoke production, heat flux at extinguishment and ignitability to direct impingement by flame.

4. Date(-s) of the experiment(-s)

05.10.2018 – 13.12.2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

According to ISO 9239-1 the samples (with given thickness on the selected substrate and of given composition) were exposed to a radiant heat source and the distance between the zero point and the flame spread at different times were measured in seconds. Also, the time was determined for moment when the flame reached each 50mm mark and the heat flux at different times and at extinguishment were measured.
According to ISO 11925-2 the samples were subjected to direct impingement of a small flame. The flame was exposition period was 15s. It was checked if the ignition of the specimen takes place and if the flame spreads on the sample.

6. Are there any follow-up actions anticipated?

No follow-ups anticipated.

7. Contact information

- ARF: Products Research Division, Fire Research Centre, Fire and Rescue Department under the Ministry of the Interior of the Republic of Lithuania.

- IReC: 1) Business contact: Marek Oja, marek.oja@ut.ee

  2) Case study preparation and communication contact: Ott Rebane, ott.rebane@ut.ee

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Multiple samples of epoxy flooring "Epokate LAKK" and "Epokate SL" with "Epokate KRUNT" primer.

9. Measurement findings and their contribution to / implications for materials science.

The test according to ISO 9239-1 gave a critical heat flux of 10.8 kW/m^2 for "Epokate LAKK" and 9.4 kW/m^2 for "Epokate SL". There occurred also smoke production which was below the threshold value for the fire performance class of B_{fl}.

The test according to ISO 11925-2 showed that no ignition of specimen takes place and therefore also no spreading of fire on the specimen for both types of flooring.

The epoxy floors were found to have reaction to fire performance class of B_{fl}.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The normative fire safety performance indicators were measured experimentally. The experiment results were important for the company for future developments. No big scientific significance, but important for safety in use of these floorings.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The business got information about Baltic TRAM from Enterprise Estonia and initiated the contact through the ADAPTER network.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The company was looking for various testing methods for their products by different methods and hold long consultations with the Baltic TRAM team (Estonia), University experts and various analytical research infrastructures about which kinds of measurements would be actually possible in the frame of Baltic TRAM and which of those are most useful in product development.

13. Method for involving businesses

E-mails, meetings with experts, they were the interested party.

14. Cost of the pilot

2168.12€.

15. Difficulties confronted (if any)

The specifics of measuring fire safety were not known to the IReC team, so quite extensive discussions and consultations with external experts were held before measurement in the planning process. The sample preparation was also quite slow, since the small company had a lot of sales due to booming construction market. The communication with the ARF was difficult in the beginning.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Weak connection to Estonian RIS3 priority ”more efficient use of resources”.

Case study index 26

Case study partner number 53

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C20.30 Manufacture of paints, varnishes and similar coatings, printing ink and mastics.
- Materials research area: measurement of VOC- s content outgassing from epoxy floorings.
- Problem addressed (mark all options that apply)

Measuring materials' composition	
Measuring materials performance	X

2. Focus of the experiment (-s)

The determination of the amount of volatile organic compounds in the surrounding air of 2 epoxy floor products Epokate SL and Epokate Lakk-3 according to the ISO 16000 and relevant standards.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The exact content of VOC-s in the surrounding air gives the company indication on what steps (if any) are still needed to improve the product quality for the 2 flooring mixtures. The impact was that the company got a proof that the floorings do not emit any carcinogenic and dangerous compounds to atmosphere. The results from the experiments will be a basis for the company in further development of their products.

4. Date(-s) of the experiment(-s)

25.09.2018 – 09.11.2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

According to EN 16516, ISO 16000 -3 -6 -9 -11 and ASTM D5116-10: the samples were held in a fixed-ventilation stainless steel enclosure for 3 days and 28 days and then the air above the samples was sampled and analysed with HPLC-UV (aldehydes) and ATD-GC/MS (VOC-s).

6. Are there any follow-up actions anticipated?

The company plans to have cooperation with experts from Academia to further develop their floorings in environmentally friendly way.

7. Contact information

- ARF: Eurofins Environment Testing Estonia OÜ, Sander Sannik, SanderSannik@eurofins.com
- IReC: 1) Business contact: Marek Oja, marek.oja@ut.ee

2) Case study preparation and communication contact: Ott Rebane, ott.rebane@ut.ee

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

2 own products of the company: Epokate SL (RAL 1002; Thickness ca 2mm; 2,5kg pure) pourable flooring material and Epokate LAKK-3 (Thickness ca 2mm; 2,5kg pure) pourable flooring material.

9. Measurement findings and their contribution to / implications for materials science.

For Epokate LAKK – after 3 and 28 days no carcinogenes were identified. Emission of some aldehydes and volatile organic compounds (VOC-s) were identified. No very volatile organic compounds (VVOC-s) and semi-volatile organic compounds (SVOC-s) were identified.

For Epokate SL – after 3 and 28 days no carcinogenes were identified. Emission of some aldehydes, volatile organic compounds (VOC-s) and semi-volatile organic compounds (SVOC-s) were found. No very volatile organic compounds (VVOC-s) identified.

All emissions after 28 days were lower than after 3 days.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The concentrations of volatile organic compounds were found for 2 products, for science this is statistically insignificant, but for the company this was a significant feedback relevant to their product development.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The business got information about Baltic TRAM from Enterprise Estonia and initiated the contact through ADAPTER network.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The company was looking for various testing methods for their products anyways and hold long consultations with Baltic TRAM team, University experts and various analytical research

infrastructures about which kinds of measurements would be actually possible in the frame of Baltic TRAM and which of those are most useful in product development.

13. Method for involving businesses

E-mails, meetings with experts, they were the interested party.

14. Cost of the pilot

4200€.

15. Difficulties confronted (if any)

The specifics of measuring volatile organic compounds were not known to the IReC team, so quite extensive discussions and consultations with external and internal experts were held before measurement in the planning process. The sample preparation was also quite slow, since the small company had a lot of sales due to booming construction market.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

A weak connection to Estonian RIS3 priority ”more efficient use of resources”.

Case study index 27

Case study partner number 64

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C22.29 Manufacture of other plastic products
- Material research area: materials science and engineering, thermomechanical treatment of materials
- Problem addressed (mark all options that apply)

Measuring materials composition	
Measuring materials performance	x

2. Focus of the experiment (-s)

Measuring the moisture content of the Styrofoam block.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Customer company has produced blocks made from recycled expanded polystyrene. The moisture content of the block affects the quality and sales price of the blocks and needs to be analysed. The absolute moisture content (g/kg) of different blocks was measured and the results were compared with the results of moisture content meter in order to compare the measures of the meter with the absolute values of this material.

4. Date(-s) of the experiment(-s)

December 2018.

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

The absolute moisture content (g/kg) of the material was measured by weighting and heating. Moisture meter Biltema art 15-340 was used for fast measurements of the relative moisture content of different polystyrene blocks.

6. Are there any follow-up actions anticipated?

No. From now on the company can perform similar measurements by themselves.

7. Contact information

- ARF: University of Turku, Taina Laiho (taina.laiho@utu.fi)
- IReC: 1) Business contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

2) Case study preparation and communication contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Expanded polystyrene, EPS.

9. Measurement findings and their contribution to / implications for materials science.

The absolute moisture content (g/kg) of the material was measured by weighting and heating. The performance of moisture meter Biltema art 15-340 was tested with the studied materials and it was considered as a good tool for fast measurements.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Polystyrene is a synthetic aromatic hydrocarbon polymer made from the monomer styrene. The phenyl groups in polystyrene are randomly distributed on both sides of the polymer chain. This random positioning prevents the chains from aligning with sufficient regularity to achieve any crystallinity. Polystyrene is in a solid (glassy) state at room temperature, but it flows if heated above its glass transition temperature of about 90 °C. Then it becomes rigid again when cooled.

Water in expanded polystyrene is in the interstitial gaps between the expanded closed-cell pellets that form an open network of channels between the bonded pellets.

The customer company needed to know the absolute moisture content of the material. This is done by determining the amount of water in a material, and by comparing that to the weight of everything else in the product.

In this study the heating was done at 60 °C and continued until no weight loss was observed due to heating. At that point it was supposed that there is no more water loss from the material by evaporation.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The initial contact with the company was at a seminar. During the Baltic TRAM call for companies the local IReC contacted this company by email and asked if they have any challenges that the research network of Baltic TRAM could solve.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The company itself identified the need for research services. The experiments were then planned by IReC.

13. Method for involving businesses

email

14. Cost of the pilot

about 900 eur + VAT

15. Difficulties confronted (if any)

Some delay in service agreement signing and sample delivery.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No.

Case study index 28

Case study partner number 29

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C25.61 Treatment and coating of metals
- Materials research area: Materials science and engineering, Coating and Surface Technology
- Problem addressed (mark all options that apply)

Measuring materials composition	x
Measuring materials performance	

2. Focus of the experiment (-s)

A study of nano-diamonds on gold surface.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

These studies are part of the customer company's research concerning the effects of nano-diamonds in gold electrolysis. From the earlier measurement results it has been concluded that nano-diamonds improve the wear resistance of normal gold plating significantly: the same corrosion and wear resistance properties can be achieved with up to half the layer thickness.

For these studies the company produced nano-diamonds and gold coatings on metal plates. The quality of coatings was studied & the composition analysed by Atomic Force Microscopy.

4. Date(-s) of the experiment(-s)

December 2018.

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Atomic Force Microscopy, AFM.

6. Are there any follow-up actions anticipated?

Additional analysis by SEM combined with elemental analysis was suggested for the company.

7. Contact information

- ARF: University of Turku, Taina Laiho (taina.laiho@utu.fi)
- IReC: 1) Business contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

  2) Case study preparation and communication contact: University of Turku, Taina Laiho (taina.laiho@utu.fi)

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Nano-diamonds on gold, NANODAU.

9. Measurement findings and their contribution to / implications for materials science.

The surface structure modification by nano-diamond coating was clearly seen in the AFM images when combined with uncoated plates.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The customer company has developed a new plating method and needed analysis on the effects of nano-diamonds in gold electrolysis. Nano-diamond coated gold substrates were studied with Atomic Force Microscopy method. AFM was used in contact mode and the surface structure modification by nano-diamond coating was clearly seen in the AFM images when combined with uncoated plates.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The initial contact with the company was at a materials research seminar of Turku Business Region.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The company itself identified the need for research services. The experiments were then planned by Baltic TRAM evaluation committee.

13. Method for involving businesses

e-mail.

14. Cost of the pilot

about 1800 eur + VAT

15. Difficulties confronted (if any)

Some delay in sample delivery.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No.

Case study index 29

Case study partner number 60

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): C21 Manufacture of basic pharmaceutical products and pharmaceutical preparations.
- Materials research area: Herbal medicines and food supplements.
- Problem addressed (mark all options that apply)

Measuring materials composition	
Measuring materials performance	X

2. Focus of the experiment (-s)

The main objective of this project was to assess the quantity of active ingredients in one of the specified food supplement tablets by selecting the right methods of analysis.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

JSC Aconitum manufactures herbal medicines, food supplements and homeopathic medicines since 1999. The company is constantly improving its product mix, seeking to market only exclusive local herbal medicines and food supplements. Currently, the company has developed new food supplements and wants to select appropriate analytical methods and determine the amount of active ingredients in food supplements. One tablet of food supplements URITABS with cranberry extract contains 500 mg of cranberry extract and 100 mg of vitamin C. These 500 mg cranberry extract should contain about 100 mg of proanthocyanidins. To determine the total amount of proanthocyanidins in food supplement tablets High-performance liquid chromatography (HPLC) method was used. The results of research will make it possible to check the quality of the raw materials purchased for the production of food supplement tablets and allow the company to produce high-quality products.

4. Date(-s) of the experiment(-s)

22 November 2018 – 31 December 2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Technique 1: Electronic Laboratory Scales. CPA225D-OCE (Sartorius);
Technique 2: pHmetras. inoLab Multi 720 tester;
Technique 3: High-performance liquid chromatography (HPLC)-Nexera. Shimadzu;
Technique 4: Water deionization system IWA 30, Watek (Czech Republic)

6. Are there any follow-up actions anticipated?

The results will be used in the company's activities.

7. Contact information

- ARF: Vytautas Magnus University, Senior researcher, Prof. Dr. Saulius Mickevičius, Faculty of Natural Sciences at Vytautas Magnus University: saulius.mickevicius@vdu.lt
- IReC: 1) Business contact: assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt; 2) Case study preparation contact: assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt; 3) Open data pilot contact (person who would give more information for example): assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt .

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

The subject of this study was the food supplement tablets URITABS with cranberry extract.

9. Measurement findings and their contribution to / implications for materials science.

Thirty food supplement tablets URITABS with cranberry extract produced in JSC "Aconitum" company have been investigated, that contributes to the material science.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

It was revealed, that the quantity of proanthocyanidins in the tested food supplement tablets URITABS with cranberry extract does not match the expected results.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The pilot was initiated by the business.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The business wanted to determine the quantity of active ingredients in one of the specified food supplement tablets by selecting right methods of analysis.

13. Method for involving businesses

e-mail; face-to-face meeting.

14. Cost of the pilot

1694 Eur including VAT.

15. Difficulties confronted (if any)

There were no major difficulties.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Yes. Measurements are related with national RIS3 priority "Health technologies and biotechnologies".

Case study index 30

Case study partner number 61

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1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): M72 Scientific research and development
- Materials research area: Medical plant material
- Problem addressed (mark all options that apply)

Measuring materials composition	
Measuring materials performance	X

2. Focus of the experiment (-s)

The main objective of this project was to assess the quantity of active ingredients in one of the specified food supplement tablets by selecting the right methods of analysis.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

The content of flavonoids in the roots and leaves of the control plants cultivated in vitro were compared. Flavonoids content in all studied transgenic root lines was greater than in the control roots. Based on these data we consider that the genetic transformation has led to alteration of flavonoids content in "hairy" root cultures.

The scavenging activity of extracts obtained from transgenic root lines was studied and compared to the content of flavonoids in the same roots. The increase of content of flavonoids in some "hairy" root lines correlated with the increase of ability of extracts to scavenge DPPH* radical.

The results of the study showed that the reducing power of most extracts from transgenic roots exceeded the same activity of the extracts from the control roots. In these investigations the effect of rol genes transfer to plant genome on the flavonoids accumulation and antioxidant potential was demonstrated. The results indicate that Agrobacterium rhizogenes – mediated transformation may be the tool for improving of native peculiarities of A. vulgaris and may be used for obtaining of "hairy" root cultures of medicinal plants which produce compounds with antioxidant properties.

4. Date(-s) of the experiment(-s)

1 December 2018 – 31 December 2018

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Technique 1: Retsch Mixer MM400
Technique 2: Labcycler Sensoquest personal Thermocycler;
Technique 3: Spektrofotometer, Shimadzu UV-1800;
Technique 4: Centrifuge 5415R (Eppendorf);
Technique 5: BioPhotometer (Eppendorf)
Technique 6: Gio Gyrotory Shaker, USA

6. Are there any follow-up actions anticipated?

The results will be used for the company's activities.

7. Contact information

- ARF: Vytautas Magnus University, Senior researcher, Prof. Dr. Saulius Mickevičius, Faculty of Natural Sciences at Vytautas Magnus University: saulius.mickevicius@vdu.lt
- IReC: 1) Business contact: assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt; 2) Case study preparation contact: assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt; 3) Open data pilot contact (person who would give more information for example): assoc. prof. dr. Artūras Mickus, email: arturas.mickus@kaunomtp.lt .

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

The subject of this study were the *Artemisia vulgaris* "hairy" roots cultures grown in bioreactor.

9. Measurement findings and their contribution to / implications for materials science.

Some "hairy" root lines studied in this work can be used for production of biologically active compounds used in medicine and cosmetology as antioxidants and antiradical compounds.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The phenomenon of the effect of transformation using A. rhizogenes and rol gene transfer to plant cells on synthesis of different compounds in transgenic roots was observed, was investigated increasing of level of valuable compounds accumulation in "hairy" root cultures was confirmed. In our study alteration in artemisinin and carbohydrates in Artemisia tilesii "hairy" root was demonstrated. In these investigations the effect of rol genes transfer to plant genome on the flavonoids accumulation and antioxidant potential was demonstrated. transformation has lead to changes in biosynthetic activity in A. vulgaris plant cells and in increase or decrease of flavonoids content and antioxidant activity in transgenic roots. The results indicate that Agrobacterium rhizogenes – mediated transformation may be the tool for improving of native peculiarities of A. vulgaris and may be used for obtaining of "hairy" root cultures of medicinal plants which produce compounds with antioxidant properties.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The pilot was initiated by JSC Frazija (the business).

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

JSC Frazija wanted to identify and determine amount of the flavonoids and phenol compounds accumulated in "hairy" roots.

13. Method for involving businesses

e-mail; face-to-face meeting.

14. Cost of the pilot

1573 Eur including VAT.

15. Difficulties confronted (if any)

There were no major difficulties.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

Yes. Measurements are related with national RIS3 priority "Health technologies and biotechnologies".

Case study index 31

Case study partner number 59

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): G47.91 Retail sale via mail order houses or via internet. The company manufactures compost among other activities.
- Material research area: Bacterial composition of different stages of compost material.
- Problem addressed (mark all options that apply)

Measuring materials' composition	X
Measuring materials performance	

2. Focus of the experiment (-s)

Genetic sequencing of biological waste (compost) material at different stages. The goal was to determine the living species composition of the bacteria in these samples.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Knowledge about the living bacteria in various stages of compost manufacturing was improved. The experiment was about determining the typical bacterial compositions of the compost samples for safety assessment when no heat-treatment is done.

4. Date(-s) of the experiment(-s)

09.01.2019 (start of tests) – 25.01.2019 (test report)

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Gene sequencing of the bacteria: metagenetic analysis of bacterial compositions of 6 samples using 16S rRNA sequencing methods.
RNA was separated from the sample material, onto which a complementary cDNA sequence was synthesized. This cDNA was the basis to DNA multiplication and sequencing using 16S rRNA method.

6. Are there any follow-up actions anticipated?

Possibly some follow-ups anticipated, but this is up to TFTAK and Nutriloop.

7. Contact information

- ARF: Centre of Food and Fermentation Technologies (TFTAK AS), Ene Viiard, ene@tftak.eu
- IReC: 1) Business contact: Ott Rebane, ott.rebane@ut.ee
  2) Case study preparation and communication contact: Ott Rebane, ott.rebane@ut.ee

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

1) Fermented foodstuff before pressing and pelleting (solid wet material). 2) The same material after pressing out the liquids but before pelleting (more solid, less wet material). 3) Same material after pelleting, if pressed with big holes, low pressure and low heat (solid material). 4) Same material after pressing with small holes, high pressure and high heat (solid material). 5) The liquid which came out after pressing, immediately after pressing. 5) The liquid which came out after pressing, 30 days after pressing.

9. Measurement findings and their contribution to / implications for materials science.

The percentages of various bacterial species in the samples were found. In solid samples, the number of bacterial species is lower than in liquid samples. The vast majority of the bacterial species of the solid sample are dominated only by 2-4 different species of bacteria (mostly in the *Lactobacillales* order). In the liquid sample, there is not such clear dominating set of bacterial species and the vast majority are bacterial species, which make up less than 1% of all bacteria found in the sample and 3 higher orders of similar prevalence are found (*Pseudomonadales*, *Enterobacteriales*, *Lactobacillales* orders). Out of the dominating bacterial species in all samples, most are lactic acid bacteria of the family *Lactobacillus*. The second big group are from the *Enterobacteriaceae* family. After 30 days (60 actually in this test) in the liquid sample, other bacteria (each with very small percentage of total) begin to dominate.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

The research question has to do with the bacterial diversity in the sample and determination of the species in these samples, indicating some level of safety and usability areas of the compost, created with a method where high amounts of heat is not used.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

The business initiated the experiment after the initial contact was achieved through Cleantech ForEst manager Erki Ani.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The company has a list of research work required before their compost pellets get safely approved and can confidently enter the market with their product. The sequencing work was just one of many items on that list, which fit the timeframe and budget of the BT funding project.

13. Method for involving businesses

Face to face meeting, phonecalls, e-mails, consultations with local experts.

14. Cost of the pilot

1098€.

15. Difficulties confronted (if any)

Due to ending of the project and ambitions of the company to measure everything, only a very small and quick fraction of the required measurements was done under Baltic TRAM project. There was some difficulty in defining what exactly should be measured in this project.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No direct connection to Estonian RIS3. The work belongs to the development of sustainable bio-based economy.

Case study index 32

Case study partner number 62

1.- INTRODUCTORY INFORMATION

1. Identifier options: the case study is identifiable by any and all of the search variables below.

- NACE & industry (main business activity): M72.1 Research and experimental development on natural sciences and engineering.
- Materials research area: Engineering sciences c II 5 Biomaterials
- Problem addressed (mark all options that apply)

Measuring materials' structure	X
Measuring materials performance	

2. Focus of the experiment (-s)

Fibre and composition characteristics of hemp plant grown in Nordic climate conditions and which are left on the field over winter were analysed and compared against results from warmer regions and further suitability of these plants for certain hemp-Fibre products will be researched.

3. What was improved through the experiment? What was the experiment about? what did it achieve? what was the impact of the experiment?

Different hemp products need different Fibre characteristics. Fibre characteristics depend on variety of plant, habitat and climate, and when hemp is collected from fields. The tested hemp has been left in the field overwinter, this can be seen as hemp is prewashed (by the snow). Experiment and result comparison will reveal if leaving hemp in the field has made separating fibres easier, and if it has affected characteristics of Fibres. If the hypothesis of the fibre characteristics differences is correct, this would allow feasible cultivation of hemp plants in Northern regions.

4. Date(-s) of the experiment(-s)

January 2019

5. Which technique(-s) was/were used for carrying out the experiment(-s)?

Fibre properties were analysed with Valmet FS5 Fibre analyser.

Sugar analysis by capillary electrophoresis.

6. Are there any follow-up actions anticipated?

Test results are compared with existing data from hemp Fibre samples in other regions. After this the follow up actions are decided.

7. Contact information

ARF: University of Oulu, Mari Jaakkola mari.jaakkola@oulu.fi, +358 294 48 4636

- IReC: 1) Business contact: Markus Leinonen, Kainuun Etu Oy, markus.leinonen@kainuunetu.fi, +358 44 551 3831
- 2) Case study preparation and communication contact: Markus Leinonen, Kainuun Etu Oy, markus.leinonen@kainuunetu.fi, +358 44 551 3831

  Ninetta Chaniotou, Kainuun Etu Oy, ninetta.chaniotou@kainuunetu.fi, +358 44 551 4559

2.- CONTRIBUTION OF THE EXPERIMENT TO MATERIALS SCIENCE

8. Material(-s) involved in the experiment(-s).

Stem and separated Fibres of the hemp plant grown in Nordic climate conditions.

9. Measurement findings and their contribution to / implications for materials science.

Study of hemp plant characteristic grown in Nordic conditions has not been conducted before.

10. Analytical research question addressed by the experiment. Brief description of the analytical research question addressed, and further scientific significance. Was the experiment important in terms of materials science? In what way?

Research question: Is there a difference between hemp plant Fibre characteristics between plant grown in Nordic regions and a plant grown in warmer climate. This is backed by the differences, for example, in pine tree fibre characteristics, that are studied by pulp and paper industry.

3.- CONTRIBUTION OF THE EXPERIMENT TO INDUSTRIAL DEVELOPMENT

11. Brief explanation on who initiated the experiment, i.e. was it the business, the ARF, the IReC? How was the initial contact done?

Business initiated the research and contacted IReC as Baltic TRAM project was recommended as a way to execute the measurements needed.

12. How were the needs for analytical research services identified? how was / were the experiment (-s) initiated?

The business had a clear plan of the measurements needed. The ARF in question was able to execute necessary amount of requested analysis.

13. Method for involving businesses

Local networks, direct contact by the business.

14. Cost of the pilot

435€+VAT

15. Difficulties confronted (if any)

Some breakage in the Fibres during the sample preparation has led into significant amount of fines in the analysis.

16. Was the regional policy relevant to the industry & experiment in question? Was the experiment related to RIS3? Was the experiment related explicitly to industrial renewal and / or KET applications?

No