

Implementing Citizen Science Activities in Baltic University Libraries: On the Road to a Citizen Science Hub

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Abstract

The current article brings to the fore key results of the implementation of citizen science (CS) practices at universities and their libraries by focusing on five Baltic universities. It observes the improvement of skills and knowledge in the participating organisations. It examines the need and readiness for the institutional change necessary for implementing CS practices in the Baltics and the ways the participating organisations have improved in the field of CS during the LibOCS project (University libraries strengthening the academia-society connection through citizen science in the Baltics, 2022–2024). The study aims to determine to what extent the framework of the current project and the implementation of the BESPOC model (Broad Engagement in Science, Point of Contact) included in the project could act as a blueprint for other organisations wanting to implement institutional and policy changes to advance in the field of CS. These kinds of hubs or knowledge centres have already been established in some Central and Western European countries and it is necessary to create that kind of support system in the Baltic universities.

The article is based on the interviews, surveys, and workshops held on the topics of CS advocacy and implementation of the BESPOC model at Baltic universities led by five university libraries (referred to here as LibOCS HEIs): Tallinn University of Technology (TalTech), University of Tartu (UT), University of Latvia (UL), Kaunas University of Technology (KTU), and Vytautas Magnus University (VMU). The article introduces the core aspects of the LibOCS project, describes the starting point of the participating organisations, and librarians, their level of knowledge about CS and its practices, and proceeds with the changes that took place during the five major project stages and their outputs. The article presents the knowledge growth of the participants, the tools and training materials created for librarians, the practical consultations and workshops that led to the implementation process of the BESPOC model. The more knowledgeable the librarians are, the easier it is to implement CS-related services and establish a central hub. As a result of the project, a positive shift towards the openness to CS activities and its support systems has been identified within participating libraries, and some elements of a single point of contact model are already in development. However, to fully adopt that approach,

universities have to include CS in their strategies and allocate resources, entrusting the leader of the process with the work of creating a CS hub.

Keywords: citizen science; Baltic libraries; citizen science hub

1. LibOCS in the Context of Citizen Science

Citizen science can be defined as the participation of the public in science and research, where citizens are directly involved in research that produces a real science outcome (European Citizen Science Association, n.d.). It allows non-professional scientists to generate discoveries, new insights, and evidence-based policymaking (Fraisl et al., 2022). Unlike traditional research, in which people are subjects of research, the emphasis of CS projects is on volunteers participating in scientific inquiry, increasing public understanding of the science and community empowerment (Collins et al., 2022). However, it is worth noting that the term “citizen science” might not always be preferred, and in some contexts and languages, other terms like “community science” or “public participation in scientific research” are used, especially considering linguistic and cultural differences (Eitzel et al., 2017).

The LibOCS project is a collaborative project between five Baltic university libraries: Tallinn University of Technology (TalTech) and University of Tartu (UT) from Estonia; University of Latvia (UL) from Latvia and Kaunas University of Technology (KTU) and Vytautas Magnus University (VMU) from Lithuania; and two private companies, Immer Besser (IB) from Germany and Web2Learn (W2L) from Greece, under the Erasmus+ KA2 Strategic Partnerships programme. The LibOCS acronym comes from “Libraries for Open and Citizen Science.” The project seeks to understand, promote, and actively engage academic libraries in the Baltic region in CS initiatives, fostering collaboration, providing training, implementing institutional changes, and creating open educational resources for librarians. Through the five main objectives, the project aims to leave its mark on understanding and developing knowledge of CS in the library community. The methods to obtain project objectives are not directly specified in the project description, enabling the leader of each work package to choose the most effective and reasonable way to achieve the set objectives.

The project’s goal is to comprehend the factors impacting civic engagement in open science (OS). The project also focuses on fostering communication and

collaboration among higher education teaching/research staff and librarians in the Baltic states. This collaboration is centred around CS projects involving volunteers. The aim has been to set a strategic focus on the role of libraries in contemporary information societies and develop action plans accordingly.

During the LibOCS project, a training programme to enhance the CS and OS skills of academic and library personnel in the Baltic region has been developed. This open access training course was designed to equip mainly librarians with the necessary knowledge and tools to actively engage in CS initiatives. The universal content and English language of the training programme allows librarians outside the Baltics to develop their CS skills. In addition, an open access toolkit specifically for librarians is being developed. This toolkit covers the topic of CS and provides various tools as open educational resources (OER) for further increase of knowledge.

Although the focus of the LibOCS project and the current article is on CS and libraries in the Baltic states, the achievements of the current project provide a chance to enhance expertise and skills in CS well beyond the scope of Baltic libraries, making it accessible across borders.

1.1. Outstanding Examples of Citizen Science Hubs in European Universities

It was clear from the very beginning of the LibOCS project that due to their inexperience in the field of CS, the partners had to look for inspiration in other European countries. The following list of examples of activities and established knowledge centres is not comprehensive but focuses on Europe as the closest cultural and social reference point.

While CS practices are much older, “citizen science” as a term evolved in the 1990s (Vohland et al., 2021). Early examples of projects in Europe emerged in Austria, Germany, and Spain (Liu et al., 2021).

The need and encouragement to develop librarians’ competencies in OS and related fields, like CS, is expressed in the national policies and strategies of the Czech Republic, France, Spain, and Portugal. In other European Union countries, national regulations do not explicitly identify these priorities, but they are reflected in institutional policies, e.g. Germany, Malta, and United Kingdom (Santos-Hermosa & Atenas, 2022).

Examples of already established CS hubs and knowledge centres include the University of Southern Denmark, which has established a Citizen Science Knowledge Center, providing services for researchers and society as well as easy access to ongoing projects in the university. Free University Brussels (VUB) has established the Citizen Science Contact Point (CSCP) as an initiative of VUB's Research Council and the vice rectorate of research. It is tasked with the following responsibilities: promoting a culture at VUB in which CS is considered a fully-fledged research method, stimulating the number of funded projects at VUB that apply a CS approach, and structurally embedding the Contact Point within the VUB vice rectorate of research. Leiden University hosts a Citizen Science Lab that acts as an incubator for new CS initiatives, as a knowledge centre connecting citizen scientists from different faculties, institutes, and organisations, and as a research centre for the science of CS. Roskilde University Library has a website that contains resources about CS, including reading and video material and information about CS platforms. Additionally, the Aristotle University of Thessaloniki, in Greece, has set up the first Citizen Science Hub at national level.

While academic libraries increasingly promote open access and open science initiatives, CS activities are still relatively new. Nevertheless, librarians, recognising its social value, are actively involved in projects to promote CS initiatives in their regions. The "Citizen-Enhanced Open Science in Southeastern Europe Higher Education Knowledge Hubs" (CeOS_SE) project in the region of Southeastern Europe, in cooperation with LIBER, is similar in nature to the LibOCS project in the Baltic States, with the main aim of raising awareness of CS practices in their countries, empowering library professionals to develop activities as knowledge hubs by upskilling staff in the area of open and citizen science (CeOS Project, n.d.).

2. The Status of Citizen Science and Scale of Activities in the Baltic States

Baltic librarians are novices in the field of CS and therefore the historical background of citizen involvement and engagement in scientific projects in Baltics can lay a foundation for moving toward implementing CS practices in the Baltic universities and countries.

In Central and Eastern Europe, volunteerism has a long tradition, and many amateur and professional initiatives incorporate socially innovative elements that may be seen as prefigurements of CS (Butkevičienė et al., 2021). Cooper and colleagues (2014) found that scientific articles do not make a sufficiently clear reference to the participation of citizen scientists, which is one of the reasons it has been difficult to identify when CS projects first started in the Baltics.

One of the most documented fields where citizens are engaged is ornithology. Estonian ecologist Asko Lõhmus (2011) notes that organised citizen ornithology in Estonia began on 1 May 1921, when 15 people, led by Professor Johannes Piiper and the rector of that time of the University of Tartu, Professor Henrik Koppel, started the Estonian Ornithological Society. As a result, the first ornithological field identification guides in Estonian and an amateur researcher's textbook still used today were published (Lõhmus, 2011). The European Citizen Science Association's (ECSA) Ten Principles of Citizen Science were translated into Estonian in 2016, and in November 2017, Eesti Harrastusteaduse Ühing (Estonian Citizen Science Union) was established.

In the report "Study on Open Science and Development of Policy Roadmap" (*Pētījums par atvērto zinātni un rīcībpolitikas ceļa kartes izstrādi*), it has been argued that like in other Western countries, in Latvia until the beginning of the 19th century, research in natural sciences was more productive outside of universities (scientific societies and the first academies of science) than within them (Bite et al., 2020). The main discoveries were made by unaffiliated scientists, people outside universities and grammar schools. Even though science is primarily conducted in universities and research institutes, there are individuals outside of these institutions collecting data, experimenting, inventing, and contributing to the common good in economics, cultural heritage as well as science (Stradiņš, 2013).

The first phenological observations in Latvia started in the 1930s, but systematic phenological observations have been carried out in Latvia since 1926. This was initiated by 33 volunteer correspondents of the Institute of Meteorology of the University of Latvia. This network of phenologists is operating to this day with varying success and changes in the responsible institution (Kalvāne, 2011).

One of the most popular initiatives in Latvia is the nature observation portal Dabas Dati, which has been operating since 2008. In 2014, the Institute of Literature, Folklore and Art of the University of Latvia (ILFA UL) launched

various campaigns with public participation in research and started crowd-sourcing projects. A valuable development was made in 2019, when these CS projects became more discoverable and accessible in one place, in the digital co-creation platform [Iesaisties.lv](https://iesaisties.lv) (Reinsone & Laime, 2022). A portal with an even broader scope was created by bringing together humanities and arts projects on the HUMMA platform in 2020.

As for the translation of the term “citizen science” into Latvian (*Sabiedriskā zinātne*), it was used for the first time by the Institute for Environmental Solutions when translating the ECSA Ten Principles of Citizen Science. The translation became publicly available in 2016 (Prūse, 2020).

The research conducted by Butkevičienė et al. (2022) revealed that Lithuanian scientists predominantly engage in CS initiatives abroad. This inclination suggests a limited involvement in CS projects within Lithuania. One of the contributing factors to this phenomenon is identified as the relatively low interest among scientific communities within the country.

In recent years, the discourse on CS has gained considerable momentum in Lithuanian academic institutions. It should be noted that since 2016, Kaunas University of Technology (KTU) has been participating in projects aimed at promoting the implementation of CS in academia, such as “Citizen Science Cost Action CA15212”. In the same year, researchers from the Faculty of Natural Sciences of Vytautas Magnus University (VMU) started implementing one of the first CS projects in Lithuania, “On the Trails of Bronė Pajiedaitė”. This initiative involved the analysis and presentation of biodiversity research carried out by VMU students in interwar Lithuania.

Despite the relatively small number of CS initiatives in Lithuania, the public has shown considerable involvement in international projects focusing on the natural environment. Prominent examples include iNaturalist, Species Rally, and the Baltic Sea Project. It is noteworthy that teachers and school children are more actively involved in CS initiatives, as pointed out by Butkevičienė et al. (2022).

The description above provides a background for the current situation of CS activities in LibOCS HEIs and reflects the state of CS in the Baltic countries. Libraries as facilitators of open science can promote CS practices in universities by embracing their new role and getting enough support from university management.

2.1. Understanding the Need for Change

Public involvement in research and working together towards a better society is a base for an open and democratic society. Universities have acknowledged their third mission and feel the need to contribute to project development and science advancement in cooperation with people beyond academia.

Hence, by leveraging their expertise and resources (including human resources), universities are called to support and foster communities' well-being, especially in times of crisis (e.g. war, socio-environmental emergencies, etc.). In challenging times, universities leverage the forms of citizen engagement with the aim of highlighting participatory and open to the public actions, in which academic communities made by students and academic staff in Baltic and European countries have been actively involved (Oikonomou & Zourou, 2023; Zourou et al., 2023). To ensure open and inclusive participation of academic communities and citizens in their social actions, universities embrace open innovation initiatives, including CS, to realise their social mission.

Integrating CS activities into everyday research is an opportunity to engage the community and add value to society. LibOCS HEIs' libraries started to investigate the situation in academia concerning CS and the level of knowledge of CS practices among university leaders, scientists, students, and librarians. When mapping the situation, documenting the current regulation and guidelines on CS on national levels also seemed essential to create a framework for prioritising future actions.

2.1.1. Policies and Regulations

When looking for indications in university documents for CS practices, there is not much to discover – mostly OS as a principle for doing research is acknowledged, but CS as part of OS practice is not specifically pointed out.

2.1.1.a Estonia

Estonia has no agreed OS policy; therefore, CS and volunteer recruitment principles are not very well regulated. In *Estonian Research and Development, Innovation, and Entrepreneurship Strategy 2021–2035*, it is said that the aim

is to support the implementation of the principles of OS to improve access to and use of research results and data by researchers, enterprises, and citizens (Estonian Ministry of Economic Affairs and Communications and the Ministry of Education and Research, 2021). The *Estonian Science Communication Strategy 2020–2035* “Estonia knows” declares that it is important to develop and support CS (The Estonian Research Council, 2019), and the *Estonian Code of Conduct for Research Integrity* calls researchers to work openly, ethically, and to share the results with the society (Centre for Ethics of the University of Tartu, 2023).

Although CS as a methodology for doing scientific work is not new, it is still fairly unused in Estonia (Kaseorg et al., 2022). Volunteers are mainly included in natural sciences (e.g. “Looking for cowslips”, winter birding), and some projects from the field of humanities have been successful (e.g. transcribing historic municipal court proceedings). Still, universities have not developed a support system for researchers to help them with volunteers and communication services. Estonians are keen to participate in different projects, but there is a lack of projects to participate in. One of the reasons may be that every project team starts from scratch with topics concerning volunteers and citizen engagement. This represents a barrier to the accumulation of knowledge and practice. The success of researchers’ activities may depend on previous experience and the possibility of hiring supportive staff or asking for librarians’ help with project management.

Although there are no regulations about CS, the University of Tartu took a big step ahead when the Rectors of the ENLIGHT network endorsed the joint Open Science principles at the ENLIGHT General Meeting in Uppsala in the fall of 2023 (Coucke, 2023). ENLIGHT is an alliance of ten comprehensive research-intensive universities, of which the University of Tartu is a member. The joint statement includes the broad promotion of OS through the training and sharing of good practices, the emphasis on FAIR data principles, the provision of unrestricted open access to publications, the endorsement of open education materials, and the support for Responsible Research Assessment (Coucke, 2023).

Tallinn University of Technology has not established an open science policy and currently has no official documents regulating the practice of CS in the university. The importance of the third mission of universities is mentioned in the university’s statute and strategic plan for 2021–2025, which states that “TalTech conducts open research and provides open education. Study

materials and research results are available to business partners, school students and the public.” (Tallinn University of Technology, n.d.). However, there are no further specific regulative acts.

2.1.1.b Latvia

Much work has been done with normative documents, both in Latvia in general and at the University of Latvia (UL). As the first open access ambassador and implementer in Latvia, the UL Library continues the traditions in the context of OS. The UL Library is proactive in the OS field in several directions. The UL Library developed, and on 12 January 2022, the Rector of the University of Latvia approved the *Open Science Policy of the University of Latvia*, which also includes a section on CS and its development (University of Latvia, 2017). The UL Library also provided advisory support during the development phase of the document *Latvian Open Science Strategy 2021–2027*, which is structured in three pillars, one of which is CS (Ministry of Education and Science Republic of Latvia, 2022). The UL Library is also an active member of the Library Council of Latvia and the Association of Latvian Academic Libraries, whose activities seek to clarify and lobby OS at national level. In 2023, the Ministry of Culture of the Republic of Latvia approved *The Strategy of Library Sector 2023–2027*, which aims to develop competence regarding OS services in the context of the OS movement, as well as promote CS as an OS and knowledge society participatory method (Ministry of Culture of the Republic of Latvia, 2022).

2.1.1.c Lithuania

There are no national legal documents on CS in Lithuania. The Citizen Science Association of Lithuania was established in 2020, following the ECSA Ten Principles of Citizen Science.

In 2016, the Research Council of Lithuania approved the *Guidelines on Open Access to Scientific Publication and Data*, influenced by the participation in the FP7 project “PASTEUR4OA”. After the national guidelines were adopted, several universities – Kaunas University of Technology, Vilnius University, and Vilnius Gediminas Technical University – adopted the institutional open access guidelines to enhance open access to research data and research results in their institutions. However, CS is not mentioned in this document. In recent

years, there has been a growing interest in CS in Lithuanian universities, and there is a need to establish policies and guidelines on how CS projects should be carried out in academic institutions. The Kaunas University of Technology adopted institutional *Guidelines for the Initiation and Conduct of Citizen Science Projects* at the beginning of 2024.

Vytautas Magnus University currently has no official university policy document explicitly dedicated to CS. Some indications or hints of the university's approach towards CS, towards the engagement and involvement of the general public in scientific research activities can be found in the *University's Strategic Plan for 2021–2027*. It does not mention the term “citizen science”, but we can find some points that underline the university's efforts to engage the public in scientific activities. The most relevant part of the strategic plan is section number 5: “University impact on societal development”, which underlines the importance of public engagement, openness to society as a virtual or physical space, sharing knowledge with various stakeholders and overall, making concerted efforts to contribute to society (Vytautas Magnus University, 2020).

The lack of national regulations on CS prompted librarians at LibOCS HEIs to look for opportunities to begin providing CS support services as library services. In order to do this, it was necessary to start by improving our own knowledge, because libraries are already OS experts in universities, but CS is a new topic.

2.1.2. The Experience of Librarians, Researchers, and Other Stakeholders

The scope of the LibOCS project called for exploring the stance of librarians, researchers, and other stakeholders toward CS and their current experience in that field. The methods used to achieve this were roundtable discussions and online surveys. Both tasks resulted in detailed reports about the process of the activity and its findings, which provided valuable information for the next steps to improve librarians' knowledge.

2.1.2.a Roundtable Discussions

At the start of the LibOCS project, the aim was to share detailed insights into academic libraries' role in promoting CS activities in the Baltic region and

determine the barriers and drivers of academic libraries' involvement in CS activities in the Baltics. To achieve this goal, various group discussions took place with stakeholders in all three Baltic states in spring 2022.

To consider all perspectives, three separate roundtables led by librarians were conducted for a) researchers and teaching staff (n=19), b) librarians (n=23), and c) university students (n=20) of Estonia, Latvia, and Lithuania (Kaseorg et al., 2022).

The study uncovered that research librarians possess various skills deemed valuable for engagement in CS projects, with particular emphasis on their expertise in research data management, communication, digital literacy, and extensive international and national networks (Kaseorg et al., 2022). Respondents also saw the potential contribution of research library infrastructure, like rooms and repositories, and experience in training stakeholders in CS projects (Kaseorg et al., 2022).

However, the study highlighted that a significant limitation in research libraries' involvement in civic engagement stems from a lack of knowledge, experience, and information about CS projects. Both librarians and university students acknowledged their limited understanding of CS, various projects, and their potential involvement. This manifested in a lack of collaboration between librarians and researchers, suggesting that the library should proactively take the lead. Consequently, it can be deduced that the shortage of collaborative projects arises not from a lack of interest but rather from insufficient knowledge (Kaseorg et al., 2022).

Other barriers were a lack of skills, visibility of the projects, uncertainty about the role of libraries, insufficient support from universities and policymakers, and a perception issue in how libraries are viewed in the 21st century. Participants believed that if universities were to prioritise CS more, there would be an increase in resources available to hire additional specialists (Kaseorg et al., 2022).

Derived from the analysis of interviews and literature, the authors formulated guidelines to support libraries:

- 1) Train the staff of research libraries on data collection, management, and curation.

- 2) Establish new positions in research libraries focused on civic engagement.
- 3) Appoint a liaison at the research library responsible for uniting citizen scientists with the university faculty.
- 4) Stress the need for stronger support from the universities.
- 5) Establish a central platform that unites information about how to participate, which skills are needed, and which projects are looking for volunteers (Kaseorg et al., 2022).

2.1.2.b Online Surveys

With the insight gained about the drivers and barriers of CS, project partners proceeded to the second phase of the project. During the spring and summer of 2022, two surveys that counted as information campaigns among the employees of higher education and research institutions and other memory institutions in the Baltic States about citizen involvement were conducted in all collaborating libraries. The aim of the study “The Transformative Role of University Libraries and Other Memory Institutions for Citizen Science and Open Science in The Baltics” was to explore the expansion of the roles of memory institutions, especially libraries, and the possibilities of their involvement in research (Rozenberga et al., 2022). Two tasks were identified as part of the study. The first task was to identify the experience – participating in a research project or activities with civic engagement – of the three participating groups of the Baltic countries’ respondents. The second task was to identify the situation and preconceptions regarding CS, as well as possible collaboration among researchers, citizen scientists, and memory institution specialists, especially with libraries (Rozenberga et al., 2022).

The quantitative research method was used for the two surveys. The respondents were professional researchers (n=50), specialists from libraries and other memory institutions (n=101), and citizen scientists or volunteers who participated in research from Baltic countries (n=46) (Rozenberga et al., 2022).

Interestingly, the respondents left the survey question about their associations and understandings regarding citizen engagement unanswered, and many stopped filling out the survey at that point. This may indicate that the CS activity is still unfamiliar and little known or that it is difficult to find

the appropriate words to describe CS activities because they are something unusual (Rozenberga et al., 2022). For further impact, a second needs assessment survey followed, asking professional scientists about their expectations for the library concerning CS projects. In addition, face-to-face meetings with scientists and research office specialists were held to introduce the library's role in CS activities (Rozenberga et al., 2022).

A report with suggestions for memory institutions was published based on the findings of these efforts. Both completed surveys provided a good basis for conclusions and recommendations. The key finding of the research was that all three groups of respondents addressed in the Baltic countries expressed their desire to collaborate with specialists from memory institutions when implementing CS projects and other research activities (Rozenberga et al., 2022). Memory institutions, and libraries in particular, have certainly been noticed as one of the best places for researchers and like-minded people to meet. At the same time, answers to the survey show a lack of understanding of the process and essence of CS, the parties involved in a project, their roles, and the range of services offered by memory institutions, especially libraries (Rozenberga et al., 2022).

The responses suggest that it is only a matter of time before researchers and citizen scientists become better acquainted with the range of services offered by libraries and other memory institutions. As they do so, they are likely to involve libraries and other memory institutions in CS projects when needed, all while maintaining mutual communication and dialogue. Overall, the results and conclusions of the research highlight the valuable potential of collaboration between memory institution professionals, researchers, and citizen scientists for the OS and global challenges, as well as for the development of a knowledge-based society.

The outcomes of the roundtables and the informative surveys enabled to outline the key areas on which to focus:

- 1) Low awareness about the range of library services, especially research support, hinders cooperation possibilities.
- 2) The readiness of librarians to lead CS projects and/or to offer CS support services is low due to the lack of knowledge and skills.
- 3) Making use of CS practices begins with collaborating with the university and educating the librarians.

These conclusions further supported the prior knowledge that librarians in the Baltic states are skilled providers of OS services but they actually need a lot of help on CS topics. Recognising the problems helped carry out the LibOCS project's next stages.

3. From Need to Action

The project continued with the three final steps specified in the project description. First, it required a collection of resources for staff training in Baltic academic libraries on the topic of civic engagement in OS. Providing it via an online course seemed the most suitable, and therefore, the Moodle platform was chosen for its familiarity and wide range of possibilities. The project also prescribed bringing forward an institutional change through testing and implementing a CS single point of contact at universities and suggested using the BESPOC (Broad Engagement in Science, Point of Contact) prototype – first introduced at the LIBER Annual Conference in 2017, developed as a prototype until 2019, and widely promoted after its publication in January 2020. The project's final outcome will be a toolkit for librarians on OS and CS, consisting of the knowledge, resources, and skills collected throughout the project and arranged methodically in categories for better use.

3.1. Online Course for Librarians

In CS activities, libraries usually play the role of a facilitator and mediator between CS participants (scientists, citizens, and other stakeholders) through communication, information gathering and distribution, training, and activities coordination processes (Lorke et al., 2019; Santos-Hermosa & Atenas, 2022). These activities require additional competencies and the ability to adapt them to different contexts and audiences. Librarians need competencies in scientific and digital literacy, communication, mentoring and coordinating activities, and education to become involved in CS projects (Kaseorg et al., 2022; Lorke et al., 2019; Roche et al., 2020; Santos-Hermosa & Atenas, 2022).

To help librarians effectively support CS projects, the LibOCS project partners developed a self-paced online learning course, "Citizen Science for Librarians," on the Moodle platform. The framework of the course was

developed in a unified way, with the cooperation of all project partners. The learning materials and assignments were prepared in English.

The online course consists of 5 modules:

- CS and the role of libraries, providing basic knowledge of CS concepts, their development, and the role of university libraries in building sustainable relations between the scientific community and society;
- Skills for librarians involved in CS projects, explaining skills that a librarian should have to be a mediator between volunteers and researchers in a CS project and to be the initiator or designer of a CS project;
- Project management skills for CS, presenting key aspects of project management, team building, timing, and risk management in the context of CS;
- Engagement and communication in CS projects, delving deeper into the practical aspects of creating communication strategy in CS projects, communicating science to the public, and recruiting volunteers to CS projects;
- Research and data management skills for librarians involved in CS projects, training library staff to be capable of providing qualified support for research data management to participants in CS projects.

The course “Citizen Science for Librarians” was tested for the first time with a group of 51 learners in a full-day training organised by the UL Library. Acknowledging that carrying out training in English may be difficult due to a language barrier, it became evident that conducting training days in the native language of each country was essential. Therefore, both Estonian partners cooperated to create two separate face-to-face training days that they carried out together in Tallinn and Tartu, attracting 46 participants from different types of libraries. Lithuanian partner university libraries also organised full-day training sessions based on the online course material and carried them out in their institutions, involving 43 participants. Around 140 librarians from three Baltic countries have acquired the basic knowledge and skills necessary to support CS projects.

The feedback received from the participants of the training days was good – the trainees liked the novelty of the topic and became aware of the

possibilities of CS. However, some participants in Estonia said that data management could pose a challenge at that level of detail. This may be attributed to the fact that the majority of trainees were employed in public libraries. Some participants from the training session organised in Vilnius (Lithuania) suggested that similar training should also be provided to researchers. Also, society needs to be presented with more knowledge about the concept of CS and the benefits of engaging in CS projects. Participants also emphasised that the training sessions should have given more practical examples, especially the experience of libraries already engaged in CS projects. Librarians from academic libraries shared that researchers are not showing enough support for CS and are not enthusiastic about involving it in their research methodology.

The knowledge and skills of the librarians who prepared the training certainly grew, which is a valuable starting point for developing CS services in libraries and for training colleagues.

The online course was finalised at the beginning of 2023 after some adjustments. Preparing training materials for the course required thorough planning and division of work. As each project partner was responsible for a specific topic, duplication of information was not avoided, as certain aspects overlapped and were repeated in different contexts. For instance, the typology of citizen engagement was described in the first topic about CS background. Similar information about citizen engagement levels was mentioned in another topic, skills for librarians involved in CS projects. Solving the problems that had arisen required joint discussions, during which editing decisions were made. The self-paced online course was also greatly enhanced by the full-day trainings for librarians. The feedback provided by the participants in the training sessions allowed course creators to fill in gaps of missing information and expand and complement some of the topics.

The course will remain available after the end of the project for everyone interested. Furthermore, the course is currently being translated into Lithuanian, with Estonian and Latvian versions under consideration, too. Project partners have seen the need for local versions and will try to find means to pursue that goal.

Librarians can be key players in CS projects, connecting researchers and society. Knowledgeable, confident librarians can help reduce barriers to public engagement in research.

3.2. BESPOC Model Implementation

After creating the online course and carrying out training days, the LibOCS HEIs' libraries focused on developing CS support services in their libraries and universities. The previous activities established that the libraries are expected to have the initiative to support CS projects and that libraries are already offering services, instructions, and training on OS, making the expansion toward CS smoother.

LibOCS HEIs' libraries began creating a structure of support services by consulting with one of the project partners (Immer Besser) to implement the BESPOC single point of contact model and write a CS strategy. The BESPOC model follows the League of European Research Universities (LERU) recommendation on CS for universities. The recommendation refers to a single point of contact for universities, better understood as a central support service for CS at the university level (League of European Research Universities, 2016). The concept of the BESPOC model was first published in 2020, aiming for more collaboration in research through OS (Ignat & Ayris, 2020). As the LibOCS project's analysis report and initial recommendations stated, "By centralising expertise, resources, and advocacy for citizen science, BESPOC could demystify the process for researchers unfamiliar with such methodologies." (Ignat et al., 2023).

Furthermore, integrating a CS hub within the existing library system could capitalise on its strengths and resources. The BESPOC model can help raise the profile of library services in the context of OS, including CS, as well as develop and extend the services themselves. BESPOC is a well-thought-out and already structured approach that outlines the directions to work towards. The model has nine modules that may be used together or separately: policy and development plans; activities portal for CS; templates for CS projects; partnership frameworks; connector with research and administration office; connector with legal and safety offices; gateway to society; community builder; and specific science communication for CS (Scientific Knowledge Services, 2023).

The *Policy and Development Plans* can be seen as the basis of any CS activities in universities, indicating that the topic is supported by the university management and certain research groups are expected to be active in that field. Official documentation, even in the form of recommendations or roadmaps,

can positively impact anyone interested in CS but not quite ready to pioneer without the support of their institution. Developing the *Activities Portal* and *Templates* modules would be consistent with the survey responses, which showed that there is a lack of clarity about what constitutes CS and what public participation projects fit into CS, what constitutes science, the research process, and its purpose (Rozenberga et al., 2022). Researchers' feedback from the workshops further confirms this. When discussing the positive aspects of collaboration with citizen scientists, respondents from memory institutions mention sharing different opinions, perspectives, and knowledge, assisting in formulating research questions, collecting data, and developing an educated and creative community. They recognise that the contribution of researchers in CS projects and communities is invaluable in helping them understand research methods, research design and challenges, enabling teamwork and gaining new experiences in tackling global issues (Rozenberga et al., 2022).

BESPOC's *Partnership Framework*, *Research Office Connector*, and *Legal Office Connector* modules all help maintain CS projects and communities with particular expertise. The *Gateway to Society* module is very important for networking, specifically for identifying and strengthening activities and interest in research and CS within communities. While sharing their experience, the survey respondents appreciated the work of memory institutions, especially libraries, and the services they offer to bring the public together and unite them, including supporting mutual interaction (Rozenberga et al., 2022). This is in line with the *Community Builder* module of the BESPOC model. Conveying the university's research outputs and goals in an understandable language to the public could be a challenge for the academic circle. Employing the specific science communication module could outline the principles of being inclusive and engaging with potential project partners or how to ask for adequate feedback when they are already involved.

The testing and implementation phase of BESPOC began with discussions and workshops with library staff and researchers, first as info meetings to identify and document possible barriers, obstacles, and solutions to implement the BESPOC model at LibOCS HEIs. During the roundtable discussions and workshops in five Baltic universities led by LibOCS project partner Immer Besser, librarians and scientists expressed the need to know more about opportunities to include citizens in research and admitted that skills, knowledge, and sometimes motivation to work with volunteers are not sufficient (Ignat et al., 2023). It turned out that it is necessary to start promoting

the benefits of CS, describe CS in university regulations, secure resources, and integrate support services in the everyday work of research administration offices, librarians, and other support services for faculty specialists. Libraries could use their unrealised potential to offer these services in a CS single point of contact if they have enough resources to allocate (Ignat et al., 2023).

Libraries offer some services to support OS practices, such as repositories for managing, storing, and making data available, as well as help with the storage and systematisation of data collected by citizens. Therefore, there are supply and demand for libraries to act as a CS hub. The proposed next steps would be to create a trustful connection between researchers and libraries and to find a way to build a network to engage citizen scientists.

During consultations, Immer Besser developed tailored and pragmatic plans for each partner university. These plans enable participating partners to effectively apply the skills and information they have acquired in the future. Each LibOCS HEI library started constructing the idea of a CS hub by choosing the most suitable modules from the BESPOC model for a particular university. The starting points of universities and libraries at the beginning of the process were different, some modules had been partly implemented before, and the next stages were started. In some universities, it was necessary to start from the very beginning. The following subchapters give an overview of the activities of the LibOCS project partners in working towards a CS hub.

3.2.1. Tallinn University of Technology (TalTech), Estonia

Tallinn University of Technology Library started by identifying the needs of local researchers in carrying out CS projects. Researchers' experiences from working with volunteers were gathered in roundtable discussions, revealing that the experience was rather small. It was clear from the beginning that researchers seemed to understand CS as something that involves people and volunteers as research subjects, so it needed further explanation. Other obstacles that were pointed out included, for example, the researchers' unfamiliarity with involving citizen scientists, uncertainty about assessing the reliability of non-laboratory science, the need for legal help, and the need for support in communication activities (i.e., conveying scientific content in everyday vocabulary). On the other hand, researchers were more familiar with processing, managing and storage options of the collected data.

Next, TalTech Library gathered information about the CS projects with a short questionnaire and tried to map citizen involvement activities in the university. The aim was to find out if and how many researchers would be interested in CS support services offered by the library. The fact that there were very few responses may indicate that the knowledge about CS practices is quite low in TalTech.

The responses showed that some projects use people as research subjects, but very few projects include people as citizen scientists who would collect data or add value to the work with their knowledge. TalTech's Academy of Architecture and Urban Studies has made some progress in including people in urban design in the city, but public transportation or network of roads, for example, are still analysed based on data collected by devices located in the city. According to researchers, the small volunteer involvement can be attributed to the nature of TalTech's research fields (mechanical engineering, chemical engineering, civil engineering, white biotechnology, etc.), which makes including volunteers more complicated. Cooperation with industries and tech firms is more frequent.

However, it can be said that the library's efforts to introduce the field of CS at the university level have not gone unnoticed. Library representatives have been invited to introduce their activities in OS and CS to a foreign delegation, and connections have been established with researchers active in these areas.

TalTech currently has a public database for laboratory services and scientific equipment, which can be requested for research purposes. TalTech Library provides instructions and a manual for creating data management plans and manages the university's research data repository. A recently launched news portal aims to unite entrepreneurs, the public sector, and researchers. All that could already be put into use for CS activities.

To reach the next level of specialisation, it is crucial that the university agrees on OS and CS strategies and policies together with competent librarians and integrates them into curricula to raise the next generation of students that are aware of those fields. The current services and possibilities should be developed further to utilise them in OS and CS. In this, the library's impact is most likely the greatest in developing and managing the research data repository and incorporating more OS and CS topics in its training programme.

3.2.2. *University of Tartu (UT), Estonia*

The University of Tartu Library attempted to map university members' engagement level in various CS activities. Since there is no catalogue of projects that involve CS, desk research was conducted, and a survey was created and distributed to different university mailing lists. It resulted in 17 answers, and although new projects were discovered, the results could not give a comprehensive overview of university members' engagement in CS activities. Different projects could be found through the Estonian Research Information System (ETIS), the websites of university institutes, or separate project websites. The most projects were found in the Faculty of Science and Technology, with the Natural History Museum being the most active. They are involved in several CS projects that mostly engage citizens in data collection. The university has no general policy that guides researchers in involving citizens, so it can be said that each project has its own set of guidelines for CS activities.

In testing and implementing BESPOC, the UT Library initiated a dialogue with scientists and university staff to understand their needs and expectations regarding CS initiatives better. Most participants could see the library's potential in taking on the role of CS single point of contact but worried about whether it has enough resources and staff to dedicate to it.

However, the participants thought that a centralised point of contact for civic engagement in Estonia would greatly enhance collaboration and streamline communication. Since Estonia is a small country, setting up an independent hub would be impractical. Therefore, a nationwide initiative would be more efficient and viable. The participants suggested exploring the possibility of integrating the BESPOC model with the Estonian Research Information System (ETIS), a pre-existing and reliable platform. This strategic integration could leverage existing infrastructure and enhance the visibility and accessibility of CS activities, fostering collaboration within individual universities and across the entire country.

As the UT Library explores the possibilities of creating an *Activities Portal* (one of the BESPOC modules), integration with the ETIS is one of the options. Another option would be a separate Activities Portal, which collaborates with ETIS but is not built into the already existing system.

Since this process may be time-consuming, the library specialists have directed their efforts towards immediate needs. Specifically, they have concentrated on the *Templates* module, translating the different templates into Estonian and subsequently making them available on the Estonian Open Science website. This proactive measure ensures that scientists across Estonia have access to essential templates, facilitating the seamless initiation and management of CS projects. By offering these resources freely on the Estonian Open Science website, the library aims to foster a collaborative and supportive environment. This dual approach underscores the library's commitment to both immediate impact and the establishment of a more integrated and sustainable CS infrastructure in the long term. The first actions by the library should be to demonstrate and prove its services and skills in the university, so that the library can allocate manpower and other resources to create a support center.

3.2.3. *University of Latvia (UL), Latvia*

For the Library of the University of Latvia, the BESPOC model and a series of workshops organised by LibOCS project partner Immer Besser helped to expand and strengthen existing knowledge, better understand the needs of researchers at the UL and in Latvia, as well as create connections with stakeholders. Experienced CS project implementers were interested in the BESPOC model approach and were willing to share their experiences. There was a great desire from workshop participants for the library to take on the task of bringing together CS stakeholders. Participants also showed an interest in the work already started – to identify and collect information on CS activities at UL and in Latvia.

As a result, a partnership was established with the Institute of Literature, Folklore and Art (ILFA) of the University of Latvia and the Faculty of Geography and Earth Sciences. The organisation of a conference was recognised as a good platform to get to know the needs of the community and gather the community (*Community Builder* module). On 14 March 2024, the conference “Citizen Science in Latvia” was held with 15 presentations and discussions by leading specialists from UL faculties and UL institutes, as well as specialists from various memory institutions in Latvia, who shared their experiences and challenges in the field of CS projects implemented in

Latvia and the EU. In order to be able to broaden the circle of interested parties and disseminate information and offers in the context of CS through correspondence, the registration form for the conference included the question of whether you would like to be included in a mailing list and receive news about CS in different aspects.

Collaboration also led to an opportunity for the UL Library to contribute to the content of the already existing Facebook page “Citizen Science in Latvia” (*Sabiedriskā zinātne Latvijā*). The National Open Access Desk webpage will continue as the gateway to society, offering a CS section with activities and templates. This webpage is accessible to the whole society of Latvia and therefore brings greater benefits and opportunities for networking and collaboration. The UL Library has started creating a partnership frameworks directory, foremost identifying potential stakeholders, and formulating the UL Library’s opportunities and offers. However, there is some uncertainty about the future, resources, and priorities of that activity owing to current changes in the university management system.

The UL Library believes that other Latvian libraries should also be well oriented in CS and that the library network in Latvia is a valuable resource for spreading knowledge and information. UL Library is developing a good collaboration with the Vidzeme University of Applied Sciences Library, which has given a presentation on OS, innovation, and civic engagement in the Vidzeme Innovation Week. In addition, the National Library of Latvia has invited UL Library to create learning activities on OS and CS for public librarians. The main task of the library is to constantly keep the subject in the picture and share information. The impact manifests itself in increased awareness among both researchers and the public.

3.2.4. Kaunas University of Technology (KTU), Lithuania

KTU Faculty of Social Sciences, Humanities and Arts (SHMF) researchers have been involved in CS-related activities since The Citizen Science Cost Action CA15212 in 2016, and the number of projects promoting CS has increased continuously. Since 2020, KTU has been involved in TIME4CS, SMART-ER, YOUCOUNT, PRO-BLEU, and other projects to promote CS while focusing on the training of librarians for involvement in CS projects.

During consultations and workshops with the LibOCS team and KTU administrative staff, including the Research Affairs Department, Doctoral School, and researchers, the BESPOC implementation perspectives at the institutional level were discussed. As the Citizen Science Centre has already been established at KTU with the initiative of the SHMF researchers group, the main task of the discussions was to identify the priorities for developing CS activities at the university. After discussions about the priorities of BESPOC, the KTU team focused on creating connections with society, building a CS community at the university, learning more about specific CS communication, and developing the activities portal. KTU Library has been actively involved in the activities of developing the Citizen Science Centre, sharing activities and responsibilities. KTU Library's responsibilities in the Citizen Science Centre are acting as an ambassador for CS through communication on the CS webpage and disseminating information in university networks (ECIU, FOR-EU Library Group) and on national and international levels.

Applications for two new CS enhancement activities projects have been submitted in cooperation with KTU Library and institutional and international partners. Citizen science portal on the library's website is regularly updated and hosts an archive of CS news.

In the case of KTU, cross-departmental collaboration has been very successful in strengthening the role of CS in the university. The library has assumed the role of connecting and supporting researchers, the library's website collects information about CS and the librarians keep it relevant and up-to-date.

3.2.5. Vytautas Magnus University (VMU), Lithuania

Vytautas Magnus University (VMU) has started exploring the situation of CS in the university, beginning with examining the Vytautas Magnus University Research Management System VMU CRIS. Several projects that are related to CS activities have been identified. It should be acknowledged that CS activities are not very widespread in VMU. Some activities were often not even perceived or identified as part of CS.

The second step was to investigate the university's existing policy regarding CS. It turned out that only the university's strategic plan mentions

interactions with society in an abstract way (Vytautas Magnus University, 2020), which can be seen as related to the phenomenon of CS.

Considering the above-mentioned factors, VMU Library took the initiative to involve the university administration, researchers involved in CS activities, and other stakeholders in a series of discussions aimed at clarifying the needs, possibilities, and timelines for the establishment of a CS hub. After a series of workshops organised by LibOCS project partner Immer Besser, the key elements of a potential CS hub that the university would be able to implement were identified. The VMU has not yet developed a centralised infrastructure and communication channels to ensure the dissemination of information on CS initiatives. It was suggested that the VMU library could leverage its potential to develop a portal utilising the research management system CRIS. This portal could integrate a user-friendly catalogue of CS projects, thereby encouraging researchers to engage and participate more actively in such initiatives. Here, the role and influence of the library are manifested primarily as an introducer of a new topic and as a provider of opportunities.

3.3. Toolkit for Libraries

To support (academic) librarians on the way to creating a CS hub for the universities in cooperation with LibOCS HEIs' libraries, the project prescribes creating an online toolkit. It will offer the necessary tools (an ongoing FAIR collection of resources, training material, references to policies, documents, videos etc.) for librarians to be ready to support university staff in CS and OS activities and will aim to offer a complete and permanent set of tools to upskill librarians in citizen enhanced open science. Every category of tools will have an explanation of how and when to use it, and the modularity feature helps tailor the content to meet librarians' needs in the implementation cycle of CS and OS activities. The toolkit will be further enriched by a peer review by the associated public library partners in the Baltic countries, maximising the toolkit's impact beyond the initial LibOCS partnership.

The product will be released on the project website and contain English, Estonian, Latvian, and Lithuanian resources.

All the above will make the knowledge, resources, and skills accumulated throughout the project openly available for use, reuse, and repurposing,

ensuring that knowledge in this domain is accessible and widely disseminated. The obligation to keep the toolbox up-to-date helps to keep CS issues active in libraries, enables to increase the level of knowledge of library staff, and contributes to initiating projects in cooperation with university researchers.

4. Key Takeaways from the Project

As a result of the surveys, interviews, online course, workshops, and roundtables carried out during the LibOCS project, there has been a positive shift among the participating libraries towards the openness to CS activities and its support systems. The level of knowledge in the project partner libraries has risen through self-education, peer-to-peer training, and the cascade training carried out for colleagues not participating in the project.

One of the project's major results was the shift in the mindset of librarians. The project enabled the participants to reconsider the offered services and a way to envisage libraries as leaders in connecting academia and the public. Accepting this role takes initiative, skills, and persistence. Bringing about the cultural shift in the whole institution requires a great deal of lobbying and support at the library and university management levels.

The courage to turn to academic staff increased through the project as librarians tried to forward their newfound knowledge. The roundtables and workshops have enabled the participating libraries to connect to the university staff and researchers who actively showed their interest, laying a foundation for further fostering of these relationships, which will definitely be valuable in the future. Finding suitable partners at the university and engaging them in the activities is one of the keys to success, for it is very challenging for libraries to work alone towards the required cultural change in their universities.

From the beginning, it was apparent that CS practices need to be implemented in universities in a steadfast and structured way, led by someone willing to lead the process and provided with an encouraging support system. The experience of LibOCS HEIs' libraries confirms that the nature of library work enables them to communicate with different stakeholders in the university and act as a facilitator for CS activities. The best way to support

researchers would be to create a structured framework and practical support unit, which includes staff from relevant university divisions. Creating a single point of contact as a CS support system for scientists may help manage fears concerning the research outcomes, the legal issues related to data management, and issues with multiple authorship. For example, it could be recognised that the results and outcomes of the research conducted by citizen scientists are as valuable, valid, and acceptable as research conducted with university scientists. More confident researchers would emerge if the framework of ethical and legal conditions for projects involving citizen scientists were developed.

Before the project began, LibOCS HEIs' libraries were already working with research data management, carrying out training on OS, and acting as information disseminators. One of the partners, KTU, had already been involved in the work of an established CS centre in their institution. After learning the possibilities of the BESPOC model, LibOCS HEIs' libraries decided to focus on creating an OS and CS policy, activities portal and a template database, acting as community builders, and being a gateway to society, depending on what was needed most in each institution.

To transition from a project to institutional change, it is crucial that the university recognises the need for that change, starting with including CS in its strategies, allocating resources, and entrusting the leader of the process with the work of creating a CS hub. This will encourage the continuous development of the needed support services. However, local conditions and capabilities should also be considered. In the case of Estonia, both project partners acknowledged that it may be wiser to create a central, national portal for all CS-related knowledge and activities, and form cooperating contact points in universities or libraries. The Estonian project partners estimate that a larger supportive framework in a small country encourages libraries to be more active in including volunteers in CS projects and gives the libraries more credibility in the eyes of researchers.

The online course created in the project is one opportunity for librarians to gain more confidence in supporting researchers. The course was well-received by librarians, but the feedback on the training days showed that some librarians would prefer to enrol in a course in their native language. Furthermore, it was suggested that there should be a similar course for researchers, too. Therefore, LibOCS partners recommend creating a native-language

self-paced online course with multiple available learner roles, providing ample local examples.

The framework of the current project gives a broad basis for organisations that want to implement institutional and policy changes to advance in the field of CS. Working with an international team gives new perspectives, and a similar geopolitical background in the Baltic states provides a common ground for cooperation and success. Clear and sensible project objectives (establishing the drivers, barriers, and involvement in CS activities; learning by teaching; getting familiar with a model of a single point of contact; creating a toolkit to educate librarians) helped advance project partners' competencies and work toward implementing the CS hub and services at their institutions.

5. Conclusion

The LibOCS project pinpointed the motivators that foster participation and the obstacles impeding involvement in CS within and beyond academic libraries. The findings additionally indicated that for effective contributions to CS and the augmentation of citizen engagement, research libraries must redefine their role, positioning themselves not merely as supportive entities in the academic endeavour but also for the wider community. The research findings emphasised the substantial capacity for collaboration across memory institutions, academics, and citizen scientists within the framework of OS. This collaboration can address global challenges and foster the development of a knowledge society.

To successfully implement CS activities, institutional change within participating LibOCS HEIs is necessary. This includes testing and implementing an institutional support service for CS to integrate it more deeply into the research and educational processes of these institutions. Thus, the LibOCS project, underlying our research, showed to participating institutions that wider and coordinated CS support in universities is needed while research libraries are valuable service units for delivering this support if resources are properly allocated.

LibOCS partner libraries are motivated to proceed towards establishing a CS hub, recognising its benefits to society and to share their experience to other

international partners. Working on integrating CS activities in their everyday work provides great opportunities to build community trust, improve library services, improve cooperation with academia, and foster public engagement.

Our research brings additional value for wider communities, displaying to the public what is the current state of the art and what the future could hold for their interactions with researchers and academia. The BESCPOC model is dedicating an entire module to creating a gateway to society and the authors of the current study hope that their experience will inspire other higher education institutions to open such gateways to society.

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