# CodeRefinery – Evaluation Summary Report

The numerical evaluation is made with a rating ranging from 1 (poor) to 7 (outstanding).
1=poor; 2=weak; 3=fair; 4=good; 5=very good; 6=excellent, 7=outstanding

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**Application ID: 108705**
**Title: CodeRefinery**

**Overall rating**: 6

The CodeRefinery Sustainability project proposal is a continuation of an existing project which aims at advancing the FAIRness of software and development practices so that researchers can collaboratively develop, review, discuss, test, share, and reuse codes. The project aims in this phase to ensure the long-term success of the lessons developed during previous project phases by funding a central coordination for the in-kind contributions brought in by the members of the consortium, which consist of training events, maintaining the community of practice and increasing the number of training instructors.

The CodeRefinery project is very significant to the research community. The project has proven to be successful in the past and wants, with this sustainability phase, to address the formal continuation. The project is important as there is a growing need to write and reuse FAIR digital objects as data and code. Sharing resources and in-kind contributions will create synergies between the partners. There is a great significance of this community for the research community. CodeRefinery has already established itself as a highly successful initiative that improves coding skills at an intermediate level, bridging the gap between Software Carpentry for beginners, and the more advanced/bespoke training offered by the NCCs/other HPC initiatives. This project, in fact, is an ideal example of the types of wide-ranging infrastructural improvements that are only possible through collaborations such as those facilitated by NeIC, and the transition to a sustainability phase is apt and appropriate at this time. CodeRefinery has filled a gap that is not addressed by the different research institutions and addresses all research disciplines. Software must be written within some conventions to make it reusable or reproduce research outputs. This phase of the CodeRefinery project will coordinate the in-kind training activities to level up research software development skills, maintain the existing community of practice and increase the number of instructors. A strong foundation of computational skills is essential for improving the quality and reproducibility of science. Core to this is a supportive, inclusive community that will engage with scientists at all levels to promote good practice and provide training. The scale at which training needs to be provided is extensive, and the model proposed in this development project recognises the importance of a central organisation that can provide resources for use by third parties, as well as integrate good practice from the wider community. The project will help to connect existing efforts and promote the reach and reuse of existing training resources. If successful, this will further democratise an important area of skill development, thus significantly improving the quality and reproducibility of the resulting science.

CodeRefeney is relevant to an international context.: The CodeRefinery team are well-connected to international initiatives, most significantly the Carpentries. It should be noted that worldwide there are relatively few opportunities focused on this form of intermediate-level training; indeed, the Software Sustainability Institute in the UK has identified it as an important area for growth in provision. CodeRefinery is already recognised internationally as an example of good practice in this area and will

be working with international partners to fill an important gap in the provision of computational skills training. Open science and reproducibility as well as software sharing are crucial topics in research and the project fills an important gap and accelerates science and research. The potential for a world class e-infrastructure is high and fits to national and international associations and activities around Research Software Engineers. The relevance for EOSC and ESFRI is also high and the project has existing collaborations to these projects.

The project plan as well as the planned steps seem reasonable and the implementation of the project is feasible. The different steps regarding training and train-the-trainer models are well thought through and complementary to each other as well as to providing project space. The collaboration contributes to more cost-efficient development and use of e-Infrastructure by lowering the hurdle for these tasks via training methods that are on a level that is not well supported yet and between Carpentries and software engineering curricula. The task that is not planned or not well addressed yet is a close analysis of the uptake by domain researchers regarding demographics and how to improve the outreach for fields that show room for improvement in the participation.

The total budget and resources are in line with the stated goals. There are no major risks. It's very probable that this project will achieve the stated goals. The combination of training, infrastructure and connections with institutions (libraries, software institutes, and the Carpentries) are excellent and likely to contribute toward success. The project wants to coordinate the in-kind contributions of the different providers and needs a coordinator to continue the core activities of CodeRefinery and to help develop the sustainability options. This project will operate for a duration of 3 years and is requesting 1 FTE funded by NeIC. This budget is justified for the coordination of cross border and cross organization training activities, community building, outreach and onboard new potential interested parties. The other activities concern in-kind contributions from the project partners. These in-kind activities are delivering the training workshops and developing, maintaining training material for researchers and instructors, and exploiting a GitLab service. The event organization (travel/budget) will require that also in-kind staff receive support to travel and attend events and therefore request some budget.

The consortium is strong and each partner has the expertise for the project and brings a unique community and connections with them. The qualifications are well suited for the collaborations. The partners of CodeRefinery have all the digital training competences for their local and regional target audience. They cover a range of training activities, from basic training to advanced HPC driven coding techniques. Most of the Nordic countries are represented in this consortium, as well as the major HPC providers. The partners have been experienced in this collaboration for a long time. Partners from Estonia and Iceland are not currently involved, but this will not affect the success of the project, and the team appear to be inclusive in who they wish to reach. The added value of this project for NeIC is to combine efforts instead of every country trying to solve this on their own. This will reduce pressure and work for individual organizations and amplify the training portfolio and network of available trainers. This project is also beneficial for the whole Nordic research community as it is addressing and improving the sustainability of research software helping researchers to make their software more open and more FAIR which are key criteria for reuse and access to European infrastructures. There is an interest from several Nordic e-infrastructure providers to collaborate in this field and to contribute to competence building, task sharing and common training activities. The partner organisations are already involved in digital training activities, but by collaborating they can offer complementary (basic / advanced) skills to their user base and have a greater reach for their training portfolio.

As a conclusion, CodeRefinery is an interesting initiative which was created some years ago with qualified partner institutions dealing with training for coding of research software. The activity is

maturing and for the final round the project is asking a 1 FTE to continue the ongoing activities, onboard new partners and develop a sustainability plan which is the right way to do it.
The project addresses a timely and crucial topic of training researchers basic to intermediate software engineering practices. The team is well qualified and has proven to collaborate well together. The letters of support show a wide network and project plan is suitable for a sustainability phase. The in-kind contribution is very high. The added value is proven and support from all partners is given. Training is needed for a continuous improvement process for creating FAIR enabled and enabling software components, which are in line with international developments and this effort is better done in a Nordic sustainable consortium.

### *Assessment by NeIC*

The consortium has proved to be innovative and capable in the past. The project is at the stage of transitioning from NeIC support to self sufficiency.

This is the third generation of CodeRefinery projects. Sustainability seems to be one of the main goals in the proposal and they are applying again, despite having sustainability as an explicit goal of the second project. The part of the activity funded by NeIC is coordination and this is something that should devolve to another institution in the future. This should be the termination of the support from NeIC. The prospects for longer term viability are positive.

The project aims to increase the general level of education/capability in the region in specific technical topics. Introducing FAIR ways and the principles of open science for research software engineers so that they can produce better and more reusable code can be seen as a contribution to ethics and sustainability. This has a general benefit for society and a lesser benefit for sustainability. Chapter 1.4 in the project plan is very impressive.

The consortium has an excellent record of training from previous projects. There is already plenty of evidence of increasing competences through CodeRefinery, and it is and has been a central if not the most central part of the project. There would be a significant effect on competence in technical software development.

This has proved to be a strong consortium. They have the experience, partners and network needed to execute their plan regarding activities and work. The tasks are well defined and scoped.

The Nordic added value is considered to be high.

The average and the range of the rankings by the national e-infrastructure providers is included in the table below. Ranking was from 1-11, with 1 being the highest.

The rating from the Summary of the assessment and review committee discussion is included as the External review panel rating.

| National Provider Ranking | CodeRefinery |
|---|---|
| Average | 4.8 |
| Range | 6 |
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| External review panel rating | 6 |

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| Nordic prioritisation by NeIC | High |
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| Aggregate priority | High |