2019-11-18

Mid-term evaluation of

SwedNESS

National Graduate School in Neutron Scattering -

Swedish Neutron Education for Science and Society

Swedish Foundation for Strategic Research, SSF

Content

1. Introduction.

This document constitutes the mid-term evaluation of the SwedNESS Graduate School. The School is funded by the Swedish Foundation for Strategic Research (SSF). The first phase of the project runs 2016-08-01 to 2021-08-31, funded with MSEK 120. A possible extension of MSEK 100 in funding is conditional on the outcome of this mid-term evaluation, for the period of 2020-08-01 to 2025-08-31.

The purpose of the mid-term evaluation is to get a set of recommendations related to the different dimensions in the call, primarily on an overall project level, but if called for on sub-project level, and on SSF programming level. The recommendations will form the basis for SSFs decision on continuation of SwedNESS. The evaluation will also include proposed improvements of the graduate school to the SwedNESS management. It can also be used as strategic information for other research graduate school initiatives from SSF.

The midterm evaluation was performed during November 4-8, 2019. The evaluation was performed by analyzing the mid-term report sent in by the management of SwedNESS, and by interviewing all (20) of the PhD-students in the program, and most of the appointed study directors and PIs. Furthermore, the management and one representative of the board of SwedNESS was interviewed.

The evaluation panel consisted of:

- Prof. Kell Mortensen, KU, DK (Chair)
- Dr. Helen Walker, ISIS, UK
- Dr. Ulf Rolander, Sandvik, SE

Dr. Joakim Amorim from SSF was secretary to the committee. All the background material, such as the application, mid-term report and terms of reference for the evaluation is found in the appendices.

2. University nodes in SwedNESS

In total 20 PhD-students are enlisted in SwedNESS distributed over six universities. Each university has a local principal investigator (PI) and a local Director of Studies (local DoS). SwedNESS has an operative management with a Director and an overall Director of Studies. The management answers to the program board. For the description of SwedNESS and the different roles see the appendices 2.4 and 2.6, as well as section 3 below.

2.1 Uppsala University

Four students are based at Uppsala University (UU) and their research covers all four SwedNESS priority areas: engineering, life sciences, functional materials and basic physics and chemistry. The students have all appreciated the training provided by SwedNESS, with particular praise for the hands-on training, which they view as a unique selling point of the network. However, it should be noted that for some of the students the credit requirements for SwedNESS, when combined with the requirements coming from their own departmental PhD programmes, can prove rather onerous. Every effort should be made to encourage these departmental programmes to be more flexible in recognising the credits coming from SwedNESS, which are vital to the study plans of the students. The students have been very successful in their beamtime applications, covering a wide range of techniques and sources, but some focusing may be required in some cases for the second half of

their PhD. Appropriate extended stays have been planned, or are currently ongoing, contributing to the independence of the students.

The local PI is the primary supervisor of one of the students, but appears to be very disconnected from SwedNESS, while the local DoS takes his role very seriously indeed, and has extra support from another member of staff, so that they can provide the level of one to one support and mentoring that they view is important. This is highly commendable. In addition, the Director of SwedNESS is also the primary supervisor of one student at UU. Apart from the PI, locally the staff team seems very engaged with SwedNESS, and are keen to see the benefits being realised sustainably.

2.2 KTH

The four PhD projects at KTH cover engineering, functional materials and basic physics. In general, the quality of the student presentations was extremely high, with most students deeply engaged in the SwedNESS network and taking advantage of the additional training opportunities. However, not all of the supervisors seem fully aware of the importance of the training being provided and have not necessarily applied the appropriate level of prioritisation, leading to opportunities being missed. This has led to a very wide variation in the success levels for beamtime applications between the students. Most of the students have developed into independent and in some cases highly productive researchers. It is to be hoped that the extended stays will help to rectify this disparity, but some level of intervention may also be required to support students and supervisors involved.

Both the local PI and DoS are heavily engaged in SwedNESS, with a sense of responsibility going beyond their roles as primary supervisors for two of the projects. Their presentation provided a strong insight into how they were using SwedNESS to contribute towards the establishment of new academic and industrial collaborations exploiting neutron techniques. The students also clearly benefit from having the overall Director of studies for SwedNESS located at KTH.

2.3 Chalmers

There are three PhDs based at Chalmers, with projects covering engineering and functional materials. In general, the committee was impressed by the quality of the students' work, and it was clear that all three are well on track with their studies, with an impressive level of independent research. Appropriate external stay projects and hosts have been identified, and the students have appreciated the main part of the course content provided by SwedNESS. The students have been successful in their beamtime applications, and a number of publications have already been published or are close to submission. The students have also had opportunities to present their work at conferences, widening their research networks.

The PI is the primary supervisor for one of these projects, but the local Director of Studies has no direct supervisory responsibilities. It was not entirely clear what the local DoS role was within the Chalmers node of SwedNESS after the preparation and delivery of the specialized Spectroscopy course. The presentation given by the PI and DoS demonstrated that they are invested in SwedNESS and revealed that Chalmers has contributed its own money to Swedish neutron sciences (MSEK 50). The committee would encourage local management at Chalmers to develop stronger industrial connections, and to ensure that the students are fully aware of the strategic importance of their research.

2.4 Lund University

The three PhD-students based at Lund University (LU) are working on projects primarily in life sciences, but with strong engineering aspects in one case. The three students expressed their appreciation of the social networking opportunities and courses provided by SwedNESS, and two out of the three have either already completed or are currently engaged in their external stays, while the third is planned. They have been successful in applying for beamtime at a range of facilities but should be encouraged to start working on publications and presenting their work at international conferences. In certain cases, the students would benefit from being given clearer guidance on the goals of their research, and their strategic relevance.

The PI is named as a supervisor for one student but does not appear to be heavily involved either in this project or the others. The local DoS is a secondary supervisor for one of the other projects. It is not clear what the local management views as their responsibilities towards SwedNESS, apart from the development and delivery of the specialised imaging course. The committee felt that more could be done to support the integration of both the students and their supervisors into the SwedNESS network. No presentation was made in terms of how SwedNESS fitted into existing research programmes at Lund, or how the work in SwedNESS could be put onto a more sustainable footing. The overall impression is that little advantage is being taken regarding the opportunities offered by the university's proximity to ESS.

2.5 Linköping University

The three PhD-students at Linköping University (LiU) are working on diverse projects covering engineering, life sciences and functional materials. The students are all impressively independent and developing their own research directions. It is to be particularly commended that their research has strong strategic implications for the successful running and exploitation of ESS in the future; and the students appear to recognise this. Two extended stays have already been completed, and the others are planned. The students appear to be on track with their studies, and several publications and patents are in development or already published. In certain cases, it would perhaps be helpful to encourage stronger links between students and supervisors across the entire network to help avoid feelings of isolation.

One supervisor is also the local PI, and while that project is running very well, it is not clear that the PI perceives any role for themselves within the everyday running of SwedNESS. The local DoS seemed rather remote from the SwedNESS project and has little engagement with the students. It is perhaps a little regrettable that, in a network of experts such as this, there wasn't the depth of support to be able to avoid significant delays in running a course when a personal situation developed. There are also concerns that the local management doesn't appear to foresee any means of making the course materials developed sustainable without continued financial support from SSF.

2.6 Stockholm University

The three PhD projects based at Stockholm University (SU) cover life sciences, functional materials and basic physics. The three students highly appreciate the SwedNESS courses they had attended, and the social network these have fostered. They have been successful in applying for beamtime and have already produced a number of publications. Extended stays are planned for all three at appropriate host organisations. While all three students appear to be well self-motivated and independent, in certain areas they may benefit from more direct supervision and direction. The

students should also be encouraged to enhance and advertise the strategic relevance of their research where appropriate. In areas where supervisors have less neutron experience, it would be beneficial if stronger collaborative links could be formed with the relevant neutron experts across the SwedNESS network.

The PI does not have any clear involvement with SwedNESS and is not acting in a supervisory capacity for any of the students. The DoS is the primary supervisor for one of the students, but clearly feels a sense of responsibility to all three and is keen to provide them with support. The specialised diffraction course developed at SU has been well received, and the committee is very happy to see that the DoS recognises the value of creating something sustainable and that it has been integrated into the university course catalogue.

3 Actors and roles in SwedNESS

3.1 PhDs

The committee is impressed with the general high standard and independence of the PhD-students in SwedNESS. In few cases, there are though clear need for more interaction with the supervisor(s), either because the student needs help to focus his or her project or because the student needs more close supervision. The PhDs did not mention the possibility to get help from the university-reference groups in the case of lack of supervision

The SwedNESS PhD-students have a decent network and get support from others in the SwedNESS network. However, some students have their network from elsewhere. The SwedNESS courses are generally good and provides good common knowledge and basis for networking.

The extended stays abroad are very important and highly appreciated by the students. These external stays have been to neutron sources all over the world, such as in USA, Japan, Australia, Germany, Switzerland etc., which gives very important experiences and interaction with specialists.

The projects represent a good spread in disciplines and techniques.

3.2 SwedNESS board

The SwedNESS board seems to take its role very seriously. The board cares about SwedNESS and is aware of potential risks and bottlenecks. The board is an important security and backup for the management.

3.3 SwedNESS Management

The committee was impressed by the dedication of the management, both the director and the overall DoS. The level of engagement and activity from the management seems excellent, and awareness of individual students is high. The management is constructively moving SwedNESS and Swedish neutron science forward.

3.4 Supervisors

The supervisors show highly varying level of engagement in the SwedNESS projects. SwedNESS should make clear what kind of expectations they have on the supervisors. The supervisors should

appreciate the fully funded PhD-students and be active in more parts of the projects, including visits to neutron facilities. The supervisors should also attend SwedNESS activities, such as annual meetings. There is no sign of a supervisor network, as was outlined in the application.

3.5 Local Directors of study (DoS)

The committee observed very different degree of perceived responsibility amongst the local DoSs. Their specific role in the program should be clarified by the management. The initial role of the DoSs, setting up courses has generally been very good, but the necessity to follow up on both running and new courses seems somewhat lacking, even though some DoSs have taken this duty seriously and for example secured implementation of courses into the general university course program. Some courses are demanded by the students but will effectively be given too late to be relevant. Improved communication about relevant courses, summer schools and conferences worldwide could benefit the students and reduce the pressure to develop new courses in all disciplines.

There is a lack in consensus in the role of the local DoS concerning following the progress of individual PhD-students and their project. The DoS should have a coordinating responsibility for the PhDs in their respective universities. DoS should take more responsibility in “mid-term review” to probe the status of the students and follow their progress.

The DoSs could initiate a dialog with the universities in order to have a meaningful study plan for PhDs which avoid being overloaded by mandatory credits from respectively SwedNESS and Departments.

It is obviously awkward for the DoS to intervene with supervisors, but perhaps their role could be made easier if SwedNESS management made it very clear that all primary supervisors are expected to attend more than one beamtime with their PhD student.

3.6 Principal investigators (PIs)

The PI-role should be re-visited. The committee’s impression is that the PIs formulated the application, but since then their involvement has been rather weak.

The PI could use their strategic position in their respective universities and intercede more with universities about the SwedNESS-program, for instance about the student credit development. The PI-group could act as a reference group to the operative management but should not be linked directly to the board.

4 SwedNESS project

4.1 Fulfillment of call scope, including added value

The program is well on its way to fulfill the scope of the call. 20 well educated PhDs is a significant increase for the community and will certainly affect the neutron scattering competence map in Sweden for the future. The high reflectivity mirror project, the deuteration development project and the sample environment projects are all examples of relevance and importance for future Swedish neutron scattering science.

Overall, course development and hands-on training has been very successful, appreciated by the students, and sets an example for how this should be done for future graduate schools. The work needs to be completed by revising the course catalogue, developing unfinished courses as well as revising courses based on feed-back from the attendees. In some cases, scouting for existing courses abroad may be more effective than developing Swedish alternatives.

Through SwedNESS a common curriculum has been developed, but when it comes to fostering real inter-university collaboration, more can be accomplished.

4.2 Fulfillment of the project plan

The project is approximately one year late, which perhaps could be expected considering the complexity and size. Clearly, the quality of the PhDs is high which is much more important than the specific timing. Course development has been good, and this curriculum development should continue. However, scouting for new neutron users could have been more active and it is unclear whose role this is. Annual meetings seem to be working very well and is beneficial for the whole Swedish neutron community. A clear goal was to create a supporting supervisor network, which has not happened. Indeed, the supervisor, crucial for the success of most PhD projects, appears to have been occasionally forgotten in the build-up of SwedNESS. PI competence, as described in the application, has not really been utilized, and industry/society collaboration has not been established as promised, at least not as viewed from the students' perspective. Interdisciplinary collaboration could be strengthened. However, an excellent, diverse group of enthusiastic PhD-students has been formed.

4.3 Scientific performance

All four named research areas of SwedNESS; Life-Science & Technologies, Engineering materials & Processes, Novel Functional Materials, and Basic Physics & Chemistry are areas of strength in Sweden, highly relevant and with potential to be world leading.

Several strong projects are found within Engineering with high relevance both academically and industrially, perhaps most notably the work on high reflectivity mirrors. Also, within Functional materials SwedNESS is working on the relevant state of the art areas, and with potentially high industrial interest. There is a nice spread of sub-areas, e.g. batteries (cathode, anode and electrolytes), thermoelectrics, clathrates, and magnetic materials.

There are some projects within Life Science, also an area of Swedish strength, with an opportunity for future expansion. Within basic physics and chemistry there are several good basic materials science projects but not so much basic physics. The interdisciplinary aspect of the projects is limited, which might also limit the opportunity to interact between nodes.

4.4 Relevance for society

Several very relevant projects are running, with obvious opportunity to interact closely with Swedish industry and society. Although companies were often named in the student presentations, in most cases the actual interaction was limited or missing. SwedNESS should consider holding workshops about relevance and utilization of research results to improve the industrial/societal connection to SwedNESS and promote participation in the neutron scattering community.

5 Conclusion and recommendations

5.1 Conclusion

SwedNESS is a unique and excellent effort for Sweden and Swedish neutron sciences. The projects and the PhD-students are generally of very high quality and will contribute to future Swedish sciences. The framework of SwedNESS including good funding for courses and extended, international visits is highly appreciated, and it is strongly recommended to be continued.

5.2 Recommendation to SwedNESS

5.2.1 Next stage of SwedNESS

The next call for PhD-proposals should be transparent. It is recommended that the management use an external, international assessment committee for the selection of projects. Selection should be based primarily on excellence, but geographic distribution and topical diversity should as well be taken into account. However, there should be no requirement for projects to be equally distributed across the nodes.

The management of SwedNESS should develop a system for evaluating the quality of supervision.

The final decision on projects should be made by the board based on international panel assessment and the supervision review.

SwedNESS should aim for 20 PhD-students in the next stage by moving superfluous funds from stage 1 to stage 2. More considerable co-funding from universities should also be sought for.

5.2.2 Roles

Both the local DoSs and the PIs can play important roles for the success of the SwedNESS project. The management should make their expectations regarding the responsibility of respectively the PIs and the DoSs clear. However, the overall SwedNESS structure is somewhat complex. The management may consider a simplification in the next phase of the project.

5.2.3 Curriculum

Local DoSs and/or PIs should initiate discussions with their respective universities on mandatory courses.

5.2.4 Future

Local DoSs and/or PIs should initiate discussion with universities on future postdoc positions, which the SwedNESS students can apply for in competition with other international young researchers.

5.3 Recommendation to SSF

5.3.1 Continuation

It is strongly recommended that SSF funds the next stage of SwedNESS, which optimally should start before the end of the present program, to ensure overlap between the present and new cohorts of PhD-students.

5.3.2 Future

It is recommended that SSF considers a future postdoc program, which the SwedNESS students can apply for in competition with international young researchers.

6. Appendices.

1	**Terms of Reference for the mid-term evaluation**
2	**SwedNESS**
2.1	Call text GSn 2015-10-15
2.2	Application 2016-03-16
2.3	Final Evaluation from the application review panel 2016-05-16
2.4	Revised research plan 2016-06-09
2.5	Annual reports (2016, 2017, 2018)
2.6	Mid-term report 2019-09-31
2.7	Survey responses 2019-09-31
3	**Personnel and projects of SwedNESS**
3.1	Board of SwedNESS: see Appendix 2.4, research plan, page 2.
3.2	Management of SwedNESS: see Appendix 2.4, research plan, page 2
3.3	PI-group of SwedNESS: see Appendix 2.4, research plan, page 3.
3.4	Local Directors of study (DoS)
3.5	PhD-students
3.6	PhD-projects: see Appendix 2.4, research plan, page 5 – 15
4	**Time plan and committee for the evaluation**
4.1	Detailed time plan
4.2	Evaluation committee
4.3	Survey questions