

Statement from evaluation of the master program in Software Engineering and Management at Göteborgs Universitet

1. Summary

1.1 Strengths

- The high level of faculties' academic and pedagogic records.
- The engagement and willingness to cooperate amongst the teachers.
- The topic and focus of the education program are both highly relevant for the expanding job market in the IT-related sector, locally as well as internationally.

1.2 Development areas

The content of the program:

- The required prerequisites of the students are very general, which makes it necessary to start at a low level. Unnecessary time is spent on rehearsal of concepts taught in the bachelor courses. This hampers the utilization of the full potential of highly merited teachers and makes strong students understimulated.
- The program lacks a program identity amongst the students. A better formulation and communication of program goals and philosophy of progression is needed.
- Progress in management subjects is under-documented in the course plans.

Management of the program:

- Make use of CDIO-matrices to relate individual courses to the learning goals. Experience shows that compiling all courses into a matrix for the entire study program is a good way to ensure good coverage and to identify development areas.
- It takes a long time to establish course plans and the result is often very general. This is partly due to that the systems for GU and Chalmers differ. Too general course plans make it difficult for students and teachers to plan the courses. It also makes courses less transparent for evaluation and improvement.

1.3 Next step

The evaluation committee recommends the faculty to initiate a discussion about the level of ambition of the program. The program has the potential to become a world-class program if the teachers can use their excellent research experience and expose the students to advanced problems and methods to find solutions to complex problems. The development in such a direction will cost time and money up-front, so the faculty has to decide the level suitable for GU. Thereafter, work with setting up goals and writing appropriate course plans can continue.

2 Evaluation criteria

In the directives to the evaluators, GU requested a statement of 8 predefined questions that we have translated into English and answered in the following subsections

2.1 The actual study results corresponds to the learning outcomes and the higher education ordinance exam objectives

There is a coherent story in the Program description document. However, the syllabi tell a somewhat different story. The general problem for the program seems to be balancing the flexibility of who to admit and the flexibility to let students make specialisation apart from the master's thesis. There is flexibility in the prerequisites with only a general degree required and no specific pre-knowledge within software engineering. The main reason might be to attract a broad group of students to the program. The open admittance criteria, however, creates problems since several courses in the first year, as a consequence, must cover topics usually included in 1st level SE courses. Students with a background from the program's 1st-cycle sibling, N1SOF, point out that several parts of these courses repeat topics from that program. The consequence may be that the breadth and depth criteria in the main topic of study are difficult to satisfy for **all** students. The program allows for additional specialization with elective courses. Profiles may add to the problem, in particular for students with a non-SE degree.

Below we briefly reflect on the program setup, its prerequisites, learning outcomes, and how the course syllabuses reflect these. We use the Higher Education Ordinance states in Annex-2 for structure.

HEO-A2	N2SOF - Masters	
Knowledge and understanding	Comments	
<ul style="list-style-type: none"> demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialized knowledge in certain areas of the field as well as insight into current research and development work, and 	<p>The main field of study is “Software Engineering”. The program level admittance criteria are general. Broad BSc degree in CS/IT as the baseline and programming, OOD, algorithms and data structures, and project experience as more specific criteria.</p> <p>The demonstrate knowledge and understanding are “broadly” but the “certain areas” is more unclear.</p> <p>The insight into current research is also unclear in many courses.</p> <p>Several courses seem to be “first courses” in certain areas, with a basic programming knowledge as the only prerequisite.</p>	
<ul style="list-style-type: none"> demonstrate specialized methodological knowledge in the main field of study. 	<p>This is met by the Empirical software engineering course.</p>	
Competence and skills		
<ul style="list-style-type: none"> demonstrate the ability to critically and systematically integrate knowledge and analyze, assess and deal with complex phenomena, issues and situations even with limited information 	<p>This can be met in the project courses. It depends to a large degree on the actual problem and evolution project.</p> <p>The thesis course also assesses these skills and competencies.</p>	
<ul style="list-style-type: none"> demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within 	<p>This can be met in the project courses. It depends to a large degree on the actual problem and evolution project.</p> <p>The thesis course also assesses these skills and competencies.</p>	

<p>predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work</p>		
<ul style="list-style-type: none"> • demonstrate the ability in speech and writing both nationally and internationally to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and 	<p>Several courses, besides the thesis course, include report writing and oral presentations. The discussion criteria are more unclear. It may be met in these courses, it is however not clear from the documentation.</p>	
<ul style="list-style-type: none"> • demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity 	<p>The connection to research is primarily managed in the Empirical SE course and the thesis. The fuzzy connection to research in a majority of the program's courses connection makes it somewhat unclear whether this criterion is met.</p> <p>The balance between individual and group assessment in projects should be made clearer to guarantee the individual's competencies and skills. This might work well in practice, but is not well attained in the course plans.</p>	
<p><i>Judgment and approach</i></p>		
<ul style="list-style-type: none"> • <i>demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work</i> 	<p>Primarily in the empirical and software quality course. Not explicit in the program level learning outcomes.</p>	
<ul style="list-style-type: none"> • <i>demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and</i> 	<p>Unclear. Not explicit in the program level learning outcomes.</p>	

<ul style="list-style-type: none"> • <i>demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.</i> 	<p>Satisfied. The thesis course and the industrial project contain an element where information gathering and structuring are important parts.</p>	
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2.2 Teaching puts students' learning in the center

GU has a programme of four courses of five credits concerning pedagogical and educational skills. Section 2.4 provides the overall assessment of the skills of the teachers engaged in the program. The criteria used for the assessment are unified from GU's pedagogical idea program, from the Swedish Student Union proposal, and from the reports of the national conferences on pedagogy in HE:

- *Criterion 1, University's learning environment:* the physical and virtual space, in the way to promote interaction between teachers and students and between students; teachers' skills and development to visualize, document and disseminate their experiences of teaching, including different forms of feedback, from students, colleagues, management, etc.; supportive organisational structures for teachers and students.
- *Criterion 2, Student's responsibility:* students are expected to take significant responsibility for their own learning process and they are expected to acquire, seek and create knowledge with others.
- *Criterion 3, Students' expectations in HE:* to be able to motivate students to take responsibility; to be able to use the students' views - evaluation and feedback; to be able to meet students' different needs - through varied teaching methods.

Findings:

- The physical space is satisfying. Some limitations refer to the lack of access to some all-purpose and meeting-type rooms for the GU students compared to Chalmers students, and to non-working power outlets in some of the classroom.
- The virtual space is not satisfying because of "too many systems"; the students are complaining about not having single points of communication (the preferred is an online portal). On the program level, there are several communication points (systems) including both GU and Chalmers; at the course level, the communication points are not unified across the courses. As a consequence, students are afraid and stressed to miss important information, as well as their student-teacher interaction is too low.
- Teachers' pedagogical skills are satisfying, especially professors. The Ph.D. students, according to the program students, are not satisfactory in pedagogical skills. A recommendation is to ensure that Ph.D. students and other teaching assistants ("researchers") take necessary pedagogic education/course(s).

- Students' responsibilities are managed through a representatives group; the students of the program would like the responsibilities to be broadened to the individual student level.
- Students' expectations are to be more engaged during teaching sessions, in different ways, as well as to have better-functioning contacts with the course teachers for Q&A.

2.3 The content and form of teaching and the form stands on a scientific and/or artistic basis and proven experience

The program engages 21 teachers, with a very good inclusion of the associate professors and full professors, some highly renowned in the research community; in addition, some Ph.D. students are assisting in the courses. All the teachers are actively conducting research in areas that correspond well to their teaching subjects in the program, that is, an observation based on their CV's and research impact metrics available online. See also section 2.4.

Findings:

- The course literature is well-corresponding to the topics of the courses; on some of the courses (related to software development), the literature sources are quite new, while on some the literature is older (related to the management topic), and a logical explanation as well as supported by the teachers is that this is due to different dynamics of theory changes in the two topics.
- For some of the courses, the literature is extensive, which is fine on the master level, as long the students are informed about what they have to read, in which order, and why - a reading instruction for the literature should be provided; one example is to make clear which parts of the literature are relevant for the final exam.
- There exists a connection from the course syllabus to research, but it is not explicitly provided to the students; that could be improved by more systematically emphasizing which literature and exemplifying which course parts that relate to actual research.
- The given theories on the "project-heavy" courses, according to the students of the program, are too limited.
- Some of the software tools used on the courses, such as on the MDD course (DIT596) are too complex, according to the students.
- The students report that they are spending between 10 and 25 hours per week on the program. That leaves space to increase the load to correspond to the points that the students earn at the end.
- The articles entitled in the course literature are not followed with clear guidelines on how to use them, therefore the students simply read them, or do not read them at all. Only a few provide the basis for assignments.
- The teachers are competent, according to the students.

2.4 Teachers have timely and adequate subject, pedagogical, and educational skills; the number of teachers is in proportion to the scope of training and content

The list of teachers comprises 21 teachers whereof 18 also submitted a short CV. One teacher is not on the department list, works for another department and is involved in one course. In terms of research areas, the group of teachers involved in the program include eight individuals with expertise in:

- Requirements engineering
- Software architecture
- Software design
- Software processes
- Software testing
- Software quality
- Additional relevant domains, such as software security, web-based systems, and model-driven engineering

Findings:

- The research areas amongst the teachers correspond very well to the technical courses.
- No teacher conducts research in management, but many teachers have research connected to managing software projects. This is a weakness that might be addressed with more formalized cooperation with management researchers.
- When reviewing the courses' PMs, course evaluations, and other documents, ten teachers seem not to be involved in any courses neither in the old or the new program. The documentation of courses in year two in both the old and new program is insufficient, which means that it's likely that more teachers are involved in the courses.

As regards pedagogical and educational skills GU has a programme of four courses of five credits each.

Findings for all 18 teachers:

- The median number of credits is 18, which is very satisfying. No teacher lacks pedagogical training.
- In total, the group of teachers 47 pedagogical publications, which is also very satisfying.

2.5 The training is relevant to the needs of the students and society

Based on discussions with staff and students we think the program offers training to students that satisfy both their needs and the society's need. The program is offered at Campus Lindholmen in Gothenburg, one of the fastest expanding job markets in northern Europe for IT-related jobs, which create lots of opportunities for students during their studies and after graduation. The training has a connection to industry in thesis projects, guest lectures, and problems in project courses that students conduct with a connection to companies. It is clear that the students are attractive on the job market, which indicates that the program is relevant for society and also students, assuming their primary concern is to secure a job after the education. Some students, however, express a concern that they expected the program to be more challenging.

2.6 The students have influence in the planning, implementation, and monitoring of the training

The students of GU, similarly to other Swedish universities, have a number of common rights and obligations stipulated by laws and regulations at the state level (such as Högskolelagen and Högskoleförordningen), while some other are local regulations. On GU, the main documented rules are as following:

- The university must give the students who participate in or have completed a course, the opportunity to present their experiences and views on the course through a course evaluation organized by the university. The University compiles the course evaluations and students about the results and any decisions that are due to the course evaluations.
- The head of department or equivalent is responsible for ensuring that students who participate in or have completed a course are given the opportunity to anonymously present experiences and views on the course.

Findings:

- The course evaluation, individually and anonymously performed by the students, is the main means used for influencing the planning and implementation of the courses included in the program.
- There is no “excellent” grading in the program evaluation; the director would like, therefore, to create a focus group to understand what the students are missing on the program.
- The courses have an individual evaluation (questionnaire) answers. For the course DAT261 (Model-Based Testing), there is a meeting protocol but no summary of questionnaire answers. DIT596 (Model Driven Engineering) and DAT220 (Advanced Software Architecture) are missing evaluation meeting protocols.

- The course evaluations (surveys) are used as the starting point for the two annual evaluation meetings: one lead by the program's coordinator (director), and the other without him/her. The program teachers and students representatives attend the meetings. The conclusions of the meetings are used as the benchmarks for the next years' meetings.
- There is, in addition, an informal follow-up between the program's director and individual teachers. There is a formal process for courses with the evaluations below 3.
- The final reviews/proposed changes are not presented to next-year students, i.e. some teachers inform about them, and some not. This should be ensured for each and every course.

A suggestion for the future would be that the student union organizes the course evaluations for a set of related study programs. It's probably better if course representatives are elected by their fellow students and meet a few times per year to share their impressions and develop the feedback to GU together. This way the students can follow-up on the input they give and the students will be more motivated to contribute to the long-term development of the program.

2.7 An appropriate study and learning environment is available for all students

The physical learning environment seems adequate; it's not brought up as a problem during interviews. The students in software related programmes have access to the entire first level of the Patricia building and Kuggen where there are both individual study places and rooms for group work.

Some rooms lack electricity outlets.

There are different IT-platforms for GU and Chalmers which complicates the access of information and communication for the students. According to the students, this leads to negative consequences as regards communication and information

IT resources in general, such as network, computer labs are not brought up as a problem during interviews.

About 25-30% of the students are women, which is slightly better than other IT related study programs. There are activities to attract more women. One of the interviewees thinks that GU has "less of a macho culture" compared to Chalmers.

None of the students that participated in the interviews are aware of any problems with discrimination and equal opportunities. If problems would occur they rely on receiving help from the student union or the student office.

Foreign students can meet problems if they are admitted in the same application round as the Swedish students, with notification in July. Typically they start late due to the long processing time of their visa applications. A delayed start of one week can be acceptable, but no longer. There are proposals for blocking foreign students from the second application period to avoid these problems.

For students with permanent disabilities there is a central organisation at GU that handles pedagogical support to give all students equal opportunities to complete the studies.

2.8 There is a continuous follow-up and development of the study program

The process for changing courses was implemented a year ago and prescribes that teachers initiate the change which is reviewed by a course plan group for later approval by the vice dean. The program coordinators need to make sure that changes do not affect other programs negatively. It is not always that this communication works as intended. A suggestion is that the course plan group would call teachers and administrators for a regular check-up.

The program coordinators are aware of the responsibility for strategic development, but since the program was changed recently they currently take more of an observing role. This can be OK for a short period only. He is also coordinating a Chalmers program; Chalmers has more meetings with program managers where also strategic development is discussed. Having some kind of group for IT-educations at GU is an idea suggested by an interviewee.

A formal description of the program coordinator role and having a deputy program coordinator is recommended.

The faculty and the department develop a three-year operational plan each year including actions raised from improvement suggestions found by evaluating the present way of working.

At GU level there is a quality policy. There are basically three processes for quality assurance:

1. Local, continuous development and follow up. This is specially focussed on the compliance with national rules and the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). This work is done at faculty as well as at the department level.
2. External evaluations, such as the one reported here are performed in six-year intervals if the study programme is not evaluated by the six-year cycle by UKÄ. These evaluations are initiated by the faculty education board.

3. The rector of GU makes an annual follow-up of the quality work by the faculties and the quality policy itself. Workshops for education development, sharing of experience among the different faculties, and benchmarking are offered to all faculties.

These procedures are ambitious and are in line with other successful universities. The faculty-initiated external evaluations in item 2 are very ambitious.

About the evaluation

The evaluation group had the following members:

Kristian Sandahl, professor, Linköpings universitet. Chairman.

Jelena Zdravkovic, professor, Stockholms universitet

Jesper Andersson, docent, Linnéuniversitetet

Viktor Elliot, universitetslektor, Göteborgs universitet

Kim Van Loo, student representative, Göteborgs universitet

The group have received an initial set of documentation about both the old and the new programs and made an on-site visit with interviews with management, teachers, students, and support personnel 2018-11-15.

Additional documentation have been requested and delivered without any problems.