



General syllabus for third-cycle studies in the third-cycle subject area Software Engineering

Decided by: The deans jointly.

Effective from: 2024-01-01

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Note: This is a translation of the established Swedish-language version of the General Syllabus in the subject. In the event of discrepancies, the Swedish-language version takes precedence.

1 Description of the third-cycle subject at BTH

The research subject area deals with techniques, methods and processes for the development of complex software systems with special emphasis on industrial large-scale software development.

The subject includes the application of a systematic, disciplined and quantifiable approach to the development, operation and maintenance of software systems.

The scientific research will result in principles that are applicable to large-scale software development that leads to products, systems and services with the right functionality and quality, delivered on time and at the estimated cost.

The subject includes sub-areas such as management, requirements engineering, software architecture, verification and validation, evolution, process improvement, software quality, business aspects, modelling, and metrics and models for software development. Empirical methods are central to the subject area for studying relationships between different phenomena and quantities.

2 Structure of the programme

Doctoral studies that end with a licentiate degree comprise two years of net study time (120 credits) and consist of a course component of at least 40 credits and a licentiate thesis of at least 60 credits.

Doctoral studies that end with a doctoral degree comprise four years of net study time (240 credits) and consist of a course component of at least 60 credits and a thesis of at least 150 credits.

Doctoral students who have been admitted to a doctoral degree are given the opportunity to obtain a licentiate degree (as above) after a part of at least 120 credits has been completed of the education that is to conclude with a doctoral degree.

An individual study plan is drawn up for each doctoral student¹. The individual study plan describes the individual structure of the education. The individual study plan is revised and followed up annually in accordance with the routines established at BTH. The study plan should convincingly demonstrate how the objectives of the doctoral student's doctoral education can be achieved within the available time.

¹ In BTH's general syllabus, the word "doctoral student" is used synonymously with the Higher Education Ordinance "doctoral student" (according to Chapter 1, Section 4 of the Higher Education Ordinance (1993:100)). The choice of words is made to avoid confusion with doctoral studentships and that as a doctoral student, you can be admitted to a licentiate degree and not just a doctoral degree.

In accordance with the Higher Education Ordinance, at least two supervisors are appointed, one of whom is appointed as principal supervisor. According to the Higher Education Ordinance, an examiner must also be appointed for each doctoral student for assessment and grading of doctoral education. The appointment of supervisors and examiners must be made in accordance with BTH's guidelines. The supervisor, who is not the main supervisor of the two, must have a PhD. In addition, additional supervisors may be attached to the doctoral student, for example from the business sector, if it is of benefit to the doctoral student's studies. For these additional supervisors, there is no requirement to have a PhD.

2.1 Purpose of the education

BTH conducts doctoral education to contribute to solutions to society's complex challenges and meet the demands of a changing labour market.

Specifically, the doctoral education aims to develop the doctoral student's knowledge in the subject area and ability to conduct independent research, development, teaching and investigative work based on a scientific basis in different areas of society. In addition, the purpose of the doctoral degree is to give the doctoral student the ability to critically and independently plan, initiate and lead such work.

2.2 Objectives of the programme

According to the System of Qualifications in the Higher Education Ordinance (1993:100) as set out in the appendix.

2.3 Implementation of the education

The doctoral student conducts research and writes and defends a scientific work (licentiate thesis/doctoral thesis). To support this, the programme may include lectures, seminars, literature studies, project assignments, group supervision and individual supervision. Courses for each individual doctoral student are determined individually in consultation with the supervisors and the examiner and are included in the individual study plan.

The supervision in the programme aims to assist the doctoral student in the choice of research area, scientific method, and the organisation and planning of the scientific work and associated studies. The supervisors shall assist with subject expertise and ensure that the work maintains an international level of quality. The supervision also aims to introduce the doctoral student to the scientific community and its requirements for ethics, integrity, and critical thinking.

The doctoral student will participate in national and international contexts and present his/her own research.

During the study period, the doctoral student will take part in the scientific activity conducted within the research environment at the department/faculty by attending seminars and guest lectures, and normally give one seminar per year on his/her thesis work.

The doctoral student will carry out an oral popular science presentation of his/her research before the licentiate degree and the public defence of the doctoral thesis and write a popular science summary to be included in the licentiate thesis and doctoral thesis, respectively.

Doctoral students, employed by the university as doctoral students, are recommended to devote some time (no more than 20 percent of full time) to teaching undergraduate education. Such initiatives are funded by undergraduate education and must be described in the individual study plan.

The programme must be designed so that the doctoral student achieves the applicable qualitative targets. How each individual doctoral student's knowledge needs are to be ensured in order to fulfil the qualitative targets is stated in each individual study plan.

3 Eligibility and selection

3.1 General entry requirements

According to Chapter 7. Section 39 of the Higher Education Ordinance (1993:100).

3.2 Specific entry requirements

To be eligible for admission to third-cycle studies, the applicant must have been awarded a second-cycle degree in a technical or mathematical-natural sciences field or have acquired knowledge in some other way to be able to benefit from third-cycle studies in the subject.

3.3 Selection

According to Chapter 7. 41 § in the Higher Education Ordinance (1993:100) and current admission regulations at BTH. Selection shall be made with regard to the applicants' ability to benefit from the programme. The basis for selection among eligible applicants is the degree of ability to benefit from the doctoral education, as well as the availability of supervision and other resources with regard to the planned focus of the licentiate thesis/doctoral thesis.

The assessment criteria applied in the selection process for doctoral studies are:

- Familiarity with the theory and applications of the subject,
- Relevant work experience, if applicable,
- Ability to express oneself in speech and writing,
- Familiarity with English,

- Creativity, initiative, independence and ability to cooperate.

The basis for assessing the applicant's fulfilment of the assessment criteria is the results of completed university courses, the quality of the independent project and any publications, references, interviews and a personal letter from the applicant describing the applicant's expectations and intentions for the programme. In some cases, the applicant may be required to undergo special work samples.

Admission to doctoral studies takes place continuously.

4 Tests included in the education

The programme consists of courses and scientific work. Examinations that are part of doctoral studies are assessed with the grade pass/fail. The grade of the course and the licentiate thesis is determined by a specially appointed examiner. The grade of the doctoral thesis is decided by a specially appointed examining committee.

For any credit transfer, please refer to the current credit transfer procedure and guidelines for credit transfer.

4.1 Courses

To support the research work, and for the fulfilment of the qualitative targets in general, the doctoral student takes a number of courses. Courses completed at BTH as well as other higher education institutions can be included.

For doctoral courses given at BTH, there must be a written course description that states, among other things, the name of the course in Swedish and English, the course objectives, content and credits. The individual study plan must regulate which courses may be included in the programme and how many credits each course is to be counted as (when participating in a course that is originally intended for first- or second-cycle level, please refer to the guidelines for credit transfer of courses in third-cycle education).

Courses or modules, with specified minimum scope, in the following areas are compulsory:

- Research Methodology, 6 credits
- Information Retrieval for Researchers, 3 credits
- Scientific Writing and Review, 3 credits
- Ethics in Research, 2 credits

The choice of courses shall be characterized by flexibility with regard to the doctoral student's prior knowledge and the focus of the research work and shall be determined in consultation between the doctoral student, supervisor and examiner. The form of examination is determined by the examiner in consultation with the supervisor. Goal fulfilment is assessed by the examiner.

All compulsory courses or components must be completed before the doctoral thesis is orally defended at a public defence. Other courses and modules should be chosen so that the doctoral student has both breadth and depth within the research area. The courses should also benefit the doctoral student's skills and abilities, his or her studies or scientific work.

4.2 Scientific work

Scientific work in the form of a licentiate thesis/doctoral thesis shall be designed as a coherent, scientific work (monograph) or as a summary and associated scientific papers (compilation), which the doctoral student(s) have authored alone or jointly with another person. The scientific work is written in English or Swedish.

The licentiate thesis must be defended orally at a public licentiate seminar. For further information, please refer to the "Rules for licentiate seminars" established by the university.

The doctoral thesis must be defended orally at a public defence. Prior to this, the thesis must have been quality assured as described in "Appendix – Quality Assurance Model for Doctoral Theses in Software Engineering". For further information, please refer to the "Rules for public defences" established by the university.

5 Degree

5.1 Qualitative targets

Objectives according to the System of Qualifications in the Higher Education Ordinance (1993:100), "Appendix - System of Qualifications (Higher Education Ordinance (1993:100))".

In addition to the objectives of the System of Qualifications in the Higher Education Ordinance, the doctoral student must demonstrate knowledge of gender equality issues in research.

5.2 Title of qualification

The title of the doctoral degree at BTH consists of a general degree with the addition of a prefix.

A doctoral student who is pursuing a licentiate degree in the subject and who has a technical qualification is² normally awarded the title of Degree of Licentiate. In other cases, the title of the degree is Degree of Licentiate.

² In this context, technical education refers to a Master of Science in Engineering, a Degree of Master of Science or equivalent in a technical or mathematical-natural sciences field.

A doctoral student who is pursuing a doctoral degree in the subject and who has a technical qualification is normally awarded the title of Doctor of Philosophy. In other cases, the title of the degree is Doctor of Philosophy.

The prefix must be clarified in the individual study plan.

6 Entry into force and transitional provisions

This general syllabus enters into force on 1 January 2024.

As a general rule, doctoral students admitted before this date complete their studies according to an older study plan. If a doctoral student so wishes and it is deemed appropriate, the examiner concerned may approve the transition to a new general syllabus. The doctoral student must then notify the relevant dean of the transition and attach a copy of an individual study plan updated according to the new general syllabus.

Appendix 1: Thesis Quality Assurance Model in Software Engineering (TQM)

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1. Introduction

The TQM model has been developed in response to the BTH Deans' request to implement *mandatory formal quality assurance measures* for each field of research education and to support the Dean's decisions regarding the approval of defense dates.

The TQM does not replace existing quality assurance measures but extends them to ensure good research education, production of competent researchers and good Ph.D. theses. The TQM is used for all compilation theses in Software Engineering, i.e. theses that comprise a set of papers and a "kappa" that introduces the thesis work and binds these papers together. At the core of the TQM is a "scoring system" for the papers included in a compilation thesis. Thesis overall coherence is not directly covered by the TQM. It is quality assured by existing procedures by the Ph.D. student and his/her supervision team.

The TQM does not apply to theses presented as monographs. Monographs are handled as special cases and mandate a pre-review of the thesis that replaces the TQM model presented here. The pre-review of monographs is carried out by two independent evaluators appointed by the collegium of researchers within SERL¹.

The establishment of the TQM does not affect the right of any Ph.D. student to request a defense without the support of the supervision team or the dean.

2. Thesis Quality Assurance Model (TQM)

Overview: The TQM contains a quality points system, a list of recommended publication venues, and a process for its application.

Purpose: The purpose of the TQM is fivefold.

1. To allow the research collegium in Software Engineering to discuss and homogenize their views and establish the quality that is expected in relation to the thesis itself by continuously monitoring and discussing requirements on quality.
2. To allow supervisors and Ph.D. students to proactively discuss and plan the research work. Thus, every year the TQM can be used to check the progress on the planned thesis (publications). This way, the TQM can be used continuously as an aide to the Ph.D. student and supervision team, complementing the goal attainment checklist² and other quality assurance processes.
3. To make the expectations of quality of the thesis work explicit for all Ph.D. students, as they have access to the TQM from the start of their studies.
4. To exploit the already established quality assurance processes and avoid introduction of delays associated with pre-defenses or external expert evaluations. The TQM takes advantage of other quality assurance processes and utilizes the fact that Software Engineering Ph.D. students publish their theses contributions in peer-reviewed journals, conferences, and workshops already.
5. To establish a minimum quality for a thesis in Software Engineering and support the Dean's decisions regarding an application for a defense date (*"anhållan om disputation"*).

¹ Software Engineering Research Lab

²<https://bthse.sharepoint.com/sites/SerlSweden/teams/Delade%20dokument/General/PhD%20goals%20attainment%20checklist%201.1.pdf>

Applicability: The potential use of the TQM is manifold. This appendix describes the model itself and the process of using it for quality assurance of Ph.D. theses as a support for the suggestion for defense. Further guidelines and checklists may be established to exemplify other uses of the TQM, for example, to establish the procedures for reviewing Ph.D. student progress in the yearly ISP meetings. These additional guidelines and checklists are out of the scope of this document.

Terminology: For the purpose of the TQM, the term thesis “*quality*” denotes only the ranking/quality of the venues of the papers included in the thesis being evaluated using the TQM. There are, of course, other aspects to quality, however, these are not the focus of the TQM but a part of other quality assurance measures/activities. Finally, the model is a score point model granting “*TQM points*” for Ph.D. student contribution as detailed below. These are not ECTS points, rather points used by the model to gauge the quality of thesis contribution.

Roles: For clarity the roles relevant to the TQM and this document are listed below:

1. Ph.D. student = the student in question owning the thesis under review.
2. Supervision team = Main supervisor, supervisor(s), examiner (minimum 2 people). A formal part of the supervision team is also the “senior reviewer” which is a person participating mainly in the yearly ISP follow up meetings and is a person outside of the department.
3. Dean = the person with the delegated responsibility for research education for software engineering. If this role changes (e.g., organizational change) the equivalent role will replace the “dean” role in the TQM.
4. SERL seniors = all permanent employees within SERL/DIPT with a Ph.D. degree in software engineering or equivalent.
5. Independent evaluators = SERL seniors, or external seniors if requested/needed, nominated to review the thesis under question, if required. Evaluators need to have the ability/formal right to be examiners themselves.

The Model: The TQM model acknowledges thesis contributions/papers based on the quality of the targeted publication venues, publication status and authorship status. In the following, we describe the model itself with examples, then the processes and procedures of its use. The TQM focuses only on the thesis kappa and included papers as described in Section 1.

2.1 TQM

Publication venues: A publication at a peer-reviewed venue is associated with a number of TQM points (e.g., a full paper at a level-A conference gives 30p, a short paper at a level-B conference gives 10p etc., see Table 1), which are later adjusted with weights (see Table 2). In addition to peer-reviewed venues, the kappa (formulation of the thesis with introduction and all items associated) also gives TQM points. The number of points for the kappa is decided by the examiner in relation to the size and complexity of the contribution within the kappa itself. The intent is that all thesis publications are categorized and summarized, and the kappa ties the work together. However, to what extent the thesis is coherent is outside the scope of the TQM and is the responsibility of the supervision team to assure.

Table 1: TQM points for publication venue types and publication venue levels (A or B).

VENUE	Full paper		Short paper	
	A	B	A	B
Journal	45	35	25	20
Magazine	40	30	20	15
Conference	30	20	15	10
Workshop	10		5	
Licentiate kappa	5–10			
Dissertation kappa	10–20			

Table 2: TQM model weights in relation to the status of publication and order of authorship.

PUBLICATION STATUS	WEIGHT
Published/ accepted/ in press /in revision	x 1.0
Submitted	x 0.5
AUTHORSHIP ORDER	
First author	x 1.0
Second author	x 0.5
Other author	x 0.3

Minimal number of TQM points:

- For a **DISSERTATION/Ph.D. degree/Thesis the requirement is 180 TQM points.**³
- If used for a LICENTIATE Degree/Defense/Thesis, the requirement is 90 TQM points. Please observe that Licentiate theses (incl. kappa) are not formally handled by the TQM but included here as a bonus for supervision teams that would like to use the TQM continuously during the Ph.D. studies.

Journals, magazines and conferences:

- The categorization into levels (A or B) is maintained separately in *the venue list of peer-reviewed journals, magazines and conferences, published openly on the SERL wiki @ DIPT/SERL⁴ and the subject for regular updates by the collegium*. Only publications in the journals, magazines and conferences on this list will give TQM points. Regular updates to the venue list are critical as the level and quality of venues change, new venues emerge and evolve over time. The venue list is updated through collegial discussions where all researchers and Ph.D. students participate. New venues are to be suggested on the need basis at any time.

Workshops:

- Workshops are not listed and categorized. Any peer-reviewed workshop that the examiner assesses as of sufficient quality can give TQM points.

Next, the TQM takes the amount of contribution as well as progression of peer-review into account in the form of score weights (see Table 2). The aspects of level and type of venue, progress in peer-review publication process and authorship status are all perspectives relevant for judging the contribution of the student in a thesis according to the traditions of research and thesis work in empirical software engineering and at DIPT/SERL.

Publication status: If a paper is published, accepted, in press or in revision, then the score for the publication venue type remains the same (i.e., x1). If a paper is “only” submitted, it is weighed less (x0.5). The objective is to premiere peer-reviewed papers over “in progress” work, as well as to assure that publication is encouraged as a part of the quality assurance continuously during the Ph.D. studies⁵.

Authorship order: Next in Table 2 we see the Ph.D. student’s authorship contribution weight per paper. Traditionally and state-of-practice for Ph.D. theses in software engineering at BTH is that a Ph.D. student who is leading a research publications is the first author. Authorship order denotes the level of contribution. The TQM points listed in Table 1 for a paper are adjusted with the weights x1, x0.5 and x0.3, respectively, depending on the authorship order. We want to encourage collaboration between Ph.D. students and thus reward papers in collaboration, but also make sure that the main body of work (papers) of a thesis are led by the PhD student owning the thesis in question.

Table 3: Example patterns for Licentiate and Doctoral theses. In the publication code “[C/J/W]-[A|B]-[f/s], [a/s]”, the first letter represents the venue type, the second – its level, the third – whether it is a full or short paper, and the last its publication status. E.g., “C-A-f, a” represents an accepted full paper at a level-A conference. All items in the examples assume the PhD student is first author (see Table 2).

LICENTIATE THESIS EXAMPLES	TQM TOTAL
L1: C-A-f, a + C-A-s, a + C-B-f, a + C-A-f, s + kappa	90 (incl. 10p kappa)
L2: J-A-f, a + J-B-f, a + kappa	90 (incl. 10p kappa)

³ If the course points are 60 credits. The sum of TQM points and course credits should be 240.. The TQM points have to be scaled in relation to course/thesis division as allowed by the ASP (General Study Plan).

⁴ <https://bthse.sharepoint.com/sites/SerlSweden.teams/Delade dokument/General/SERL TQM/SERL Publication Ranking List.pdf>

⁵ Papers that are considered in the category “Accepted / in press” are: i. papers already accepted, ii. papers already accepted but awaiting final publication, iii. papers that are in 2nd review round or even further in the process. Papers in the category “Submitted” all papers that are i. to be submitted, ii. have been submitted but not gotten any feedback, iii. been rejected.

DOCTORAL THESIS EXAMPLES	
D1: 3 * J-B-f, a + 2 * C-A-f, a + kappa	180 (incl. 15p kappa)
D2: J-B-f, a + J-A-f, s + 2 * C-B-f, a + C-A-f, s + W-f, a + kappa	167.5 (incl. 15p kappa)
D3: J-A-f, a + J-B-f, s + 2 * C-A-f, a + C-B-f, a + C-B-f, s + W-f, a + kappa	182.5 (incl. 20p kappa)
D4: J-A-f, a + J-B-f, a + J-A-f, s + C-A-f, a + C-B-f, a, C-A-f, s + kappa	182.5 (incl. 15p kappa)
D5: 3 * C-A-f, a + J-B-f, a + 2 * J-A-f, s + kappa	185 (incl. 15p kappa)

Examples and patterns: A level-A journal gives 45p (see Table 1) if the Ph.D. student is the first author and the paper is accepted or in press. If the Ph.D. student is the 3rd author in the same journal AND it is only submitted the TQM points for that paper would be: $45 \times 0.3 \times 0.5 = 6.75p$.

Table 3 illustrates some example patterns of theses at DIPT. Note that the assumption in these examples is that the Ph.D. student is the first author of all papers. In this way, the Doctoral thesis in pattern D1 has three accepted full papers in level-B journals and two accepted full papers in level-A conferences. Please observe that quantity does not always “beat” quality, as evidenced in pattern D1, which reaches 180 TQM with 5 publications, whereas D2 falls short despite 6 publications. The reason is that papers in level-A venues have the status “submitted”. Each Ph.D. student and supervision team are recommended to create their own publication strategies early in the ISP and regularly follow the calculations over time. This motivates high-end venues, peer-reviewed venues, and the Ph.D. student being the first author.

Progression from Licentiate to Ph.D.: Papers can be “reused” between the Licentiate and Ph.D. theses. If papers are reused (from the Licentiate thesis to the Ph.D. thesis) the points are counted again. That is, the requirements of 180p for the Ph.D. thesis are the total number of points in relation to the publications included in the final Ph.D. thesis independent of whether some papers were previously used as a part of the Licentiate thesis.

3. TQM Use Process and Procedures

The TQM should be used as a tool for proactive quality assurance of theses, the planning of the research education and decision support. However, the focus of this appendix is to describe the TQM as a quality gate model to support the dean’s decision for proceeding with a Ph.D. defense. Below we detail this process, which is as important as the details of the model itself. Figure 1 describes how TQM is used toward the end of the research education for the purpose of quality assurance issued by the Dean.

Thesis evaluation using TQM: When a defense process is initiated (A), the supervision team and Ph.D. student meet for a formal checkup to calculate the TQM score of the thesis (B). Please note that these calculations should be done continuously, however, for the thesis defense the TQM score is finalized formally as part of the defense request act, prior to the defense request being sent to the dean.

- If the *TQM score is equal to or above* the defined threshold, the defense request is sent to the dean together with a summary of the TQM evaluation⁶ (C); no further activities regarding TQM are necessary.
- If the *TQM score is below* the defined threshold, a motivation (written by the supervision team/Ph.D. student) is required that explains why the TQM score does not reflect the actual quality of the thesis (D).

Resolving deviations: It is important to note that a TQM score that is below the threshold may have several explanations and does not necessarily indicate a low thesis quality. For example;

- the thesis might have fewer publications than average, but some of them might be seminal and/or very “heavy” (which is not captured by the TQM),
- the subject area might be much harder to publish in, and thus getting publications accepted is harder and takes longer time.

⁶ The TQM point score for each included paper, including the kappa, as well as a sum of the score.

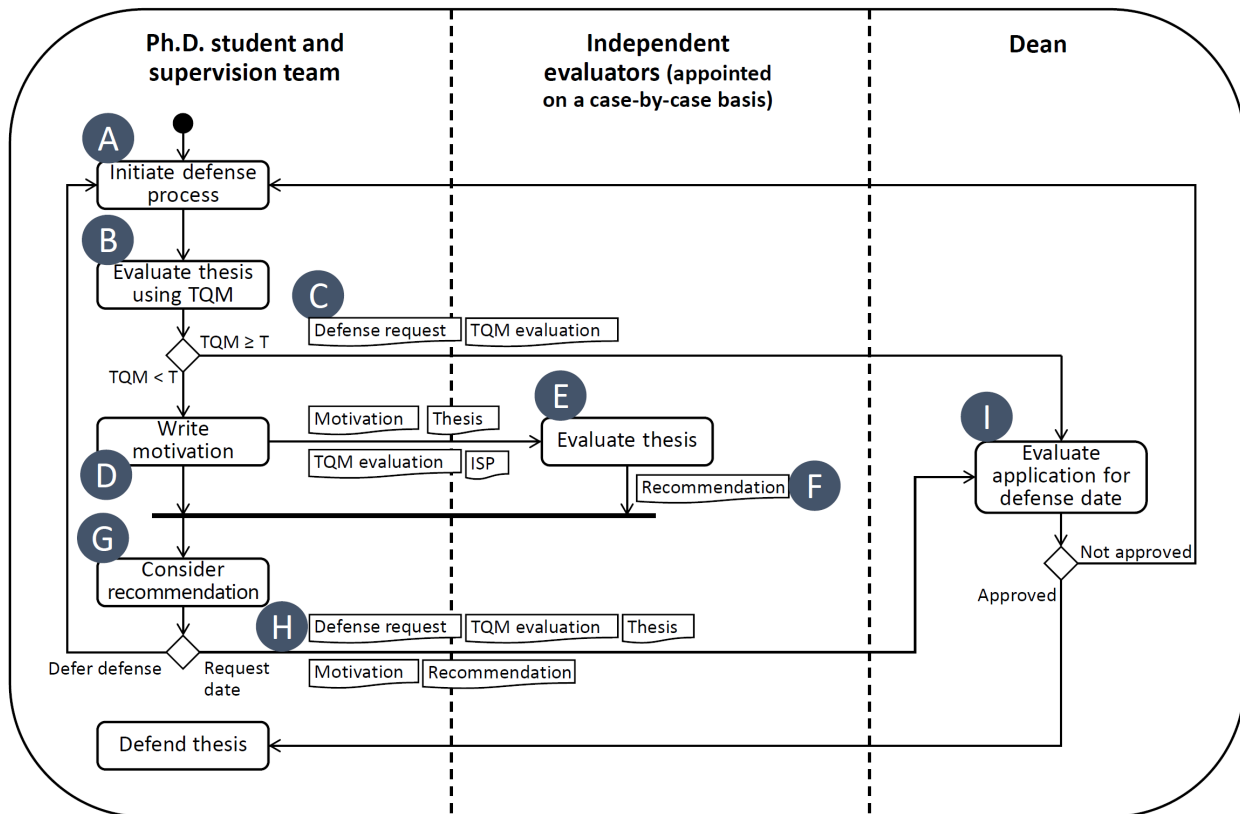


Figure 1: TQM process overview when applying for defense date.

TQM should therefore only be used for decision support; human experts need to review the results and make a final recommendation in cases where the score is lower than the threshold. Such a review is done routinely where the TQM score is below the threshold. The review is normally done by two SERL-internal independent evaluators⁷, who are nominated in the collegial meeting (as detailed below).

Independent evaluation: The independent evaluators assess the thesis, the TQM score, the motivation and the ISP (E) and provide a recommendation, which is sent back to the Ph.D. student and the supervision team (F). The result of this evaluation can be a recommendation to proceed with the defense, or a recommendation for improving the thesis contribution. Based on the recommendation of the independent evaluators, the Ph.D. student and the supervision team hold a joint meeting with the evaluators and discuss the evaluation and options for how to proceed. The supervision team together with the Ph.D. student make the final decision on the further steps (G):

- If they decide to defer the defense no further action is required. A new defense process can be initiated at a later stage (A).
- If they decide to request a defense date, the defense request is sent to the dean together with the following documents (H): *TQM evaluation*, the *thesis*, the *motivation* and the written *recommendation* from the two independent evaluators.

Taken together, this means that the dean’s evaluation of a defense request (I) is either based on just the defense request and the TQM evaluation (if the TQM score is equal to or above the threshold) (C) or on a set of five documents: defense request, TQM evaluation, thesis, motivation and recommendation (H).

In a vast majority of cases, we expect that the recommendation by the independent evaluators will support the motivation by the Ph.D. student and the supervision team. In any case, the final decision about the approval of a defense request lies with the dean. If the dean does not approve a defense request, a new defense process can be initiated at a later stage.

⁷ See details on reviewers/evaluators and procedures.

Nomination of internal independent expert evaluators: The concept of *internal independent evaluators* as used in this document refers to seniors that have the right to be examiners for Ph.D. students at BTH and are themselves working in the area of Software Engineering. If the evaluation of the quality of a thesis is partly predicated on expertise in an area outside of the competence of SERL then a third reviewer can be added to the evaluation of a specific thesis (decision by the SERL senior collegium). The process for selecting the reviewers/evaluators is done by the seniors collectively during the joint senior meetings. The supervision team is responsible for putting “reviewer assignment and schedule” for a thesis on the monthly meeting agenda in good time before an application for a defense date is planned to be sent.

The principles of selection are as follows:

- A. **Independence:** A reviewer cannot be part of the supervision team and should not be a co-author of any paper with the Ph.D. student in question within the last five years. Complete independence is not the goal for the TQM, rather collegial review and quality assurance. To avoid potential bias see point C.
- B. **Volunteerism:** A qualified and independent reviewer can say no to be a reviewer. A senior declining a review assignment can share the reasons but is not requested to.
- C. **Bias:** Any SERL senior can during the meeting where reviewers are selected voice their opinions and even reserve themselves in relation to known or unknown bias. For example, a member of the supervision team can reserve him-/herself against selecting a specific senior as a reviewer. A reservation cannot be overruled by any other senior, however, the reservation must be explained.

If no senior within SERL can be selected due to a lack of independence and/or bias, two external reviewers need to be found and asked to act as evaluators as per TQM procedures. These external reviewers are selected by SERL seniors jointly with the supervision team to ensure independence and to avoid bias. If the SERL seniors cannot reach a no-reservation decision in relation to external reviewers the dean will be called in to mediate the discussion at a follow-up meeting, and the dean will decide on external reviewers with subject area competence input from SERL seniors.

4. Change Management Process

Any model needs to be refined, improved and even replaced as the need arises or as a better alternative comes along. The formal procedure for changes to TQM (and thus indirectly to an appendix to the ASP) are as follows:

- Any SERL senior or Ph.D. student in software engineering can at any time propose a change/improvement/replacement of TQM.
- The proposal is sent to the area responsible for the research education in software engineering, together with a motivation.
- The area responsible informs the SERL seniors and the Ph.D. students in software engineering about the proposal.
- The area responsible and the elected Ph.D. student representative for the research education in software engineering ensures that the proposal is jointly discussed by the group.
- The proposal is then discussed at a joint meeting of the SERL seniors.
- If a majority of SERL seniors agree to the proposal an update request for TQM is sent to the dean together with a motivation for said change/improvement/replacement.
- The dean decides within his/her mandate for research education, on the proposal.

Appendix - System of Qualifications (Higher Education Ordinance (1993:100))

Licentiate degree

Extent

A licentiate degree is awarded

either after the doctoral student has completed a course of study of at least 120 credits in a subject for third-cycle studies,

or after the doctoral student has completed a part of at least 120 credits of a course of study that is to conclude with a doctoral degree, if the higher education institution decides that such a licentiate degree can be awarded at the higher education institution.

Target

Knowledge and understanding

For a licentiate degree, the doctoral student must

- demonstrate knowledge and understanding in the field of research, including current specialist knowledge in a limited part of this area as well as specialised knowledge of scientific methodology in general and the methods of the specific research area in particular.

Competence and skills

For a licentiate degree, the doctoral student must

- demonstrate the ability to identify and formulate issues critically, autonomously and creatively and with scientific accuracy, and to plan and, using appropriate methods, carry out a limited research project and other advanced tasks within predetermined time frames and thereby contribute to the formation of knowledge and to evaluate this work,

- demonstrate the ability to present and discuss, orally and in writing, research and research results in both national and international contexts in dialogue with the scientific community and society in general, and

- demonstrate the skills required to participate independently in research and development work and to work independently in some other qualified capacity.

Judgement and approach

For a licentiate degree, the doctoral student must

- demonstrate the ability to make assessments of research ethics in their own research,
- demonstrate insight into the possibilities and limitations of science, its role in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify his or her need for further knowledge and to take responsibility for his or her knowledge development.

Scientific paper

For a licentiate degree, the doctoral student must have had a scientific thesis of at least 60 credits approved.

Other

For a licentiate degree with a certain specialisation, the specified requirements that each higher education institution itself determines within the framework of the requirements in this qualification descriptor shall also apply.

Phd

Extent

A doctoral degree is awarded after the doctoral student has completed a course of study of 240 credits in a subject for third-cycle studies.

Target

Knowledge and understanding

For a doctoral degree, the doctoral student shall:

- demonstrate broad knowledge and a systematic understanding of the research area as well as in-depth and up-to-date specialist knowledge in a defined part of the research area, and
- demonstrate familiarity with scientific methodology in general and with the methods of the specific research area in particular.

Competence and skills

For a doctoral degree, the doctoral student shall:

- demonstrate the ability to conduct scientific analysis and synthesis as well as to independently critically examine and assess new and complex phenomena, issues and situations,

- demonstrate the ability to identify and formulate issues critically, independently, creatively and with scientific accuracy, and to plan and, using appropriate methods, conduct research and other advanced tasks within predetermined time frames, and to review and evaluate such work,
- demonstrate by means of a thesis the ability to make a significant contribution to the formation of knowledge through their own research,
- demonstrate the ability to present and discuss research and research results in both national and international contexts, orally and in writing, in dialogue with the scientific community and society in general,
- demonstrate the ability to identify the need for further knowledge, and
- demonstrate the ability to contribute to the development of society and support the learning of others, both in research and education as well as in other qualified professional contexts.

Judgement and approach

For a doctoral degree, the doctoral student shall:

- demonstrate intellectual independence and scientific probity as well as the ability to make assessments of research ethics, and
- demonstrate in-depth insight into the possibilities and limitations of science, its role in society and the responsibility of the individual for how it is used.

Scientific dissertation (doctoral thesis)

For a doctoral degree, the doctoral student must have received a passing grade for a scientific thesis (doctoral thesis) of at least 120 credits.

Other

For a doctoral degree with a certain specialisation, the specified requirements that each higher education institution itself determines within the framework of the requirements in this qualification descriptor shall also apply.