

General syllabus for third-cycle education in the third-cycle subject area Software Engineering (*Programvaruteknik*)

1 Description of the third-cycle subject area at BTH

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

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

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

The subject area includes areas such as management, requirements management, software architecture, verification and validation, evolution, process improvement, software quality, business aspects, modelling and measurements and models for software development. Empirical methods are central in the subject area for the study of relationships between different phenomena and magnitudes.

2 Structure of the course/programme

Third-cycle courses and study programmes which finish with a Degree of Licentiate comprise an actual period of study of two years (120 higher education credits) and consist of a course component of minimum 40 higher education credits and a licentiate thesis of minimum 60 higher education credits.

Third-cycle courses and study programmes which finish with a Degree of Doctor comprise an actual period of study of four years (240 higher education credits) and consist of a course component of minimum 60 higher education credits and a dissertation of minimum 150 higher education credits.

A third-cycle student who is admitted to the Degree of Doctor is given the possibility to take a Degree of Licentiate (according to the above) after having completed minimum 120 higher education credits of the programme that is to be finished with a Degree of Doctor.



For each third-cycle student an individual study plan is set up. The individual study plan describes the individual set-up of the studies. The individual study plan is revised and followed up yearly in accordance with the routines that are established at BTH. The study plan is to show in a convincing way how the goals for the third-cycle student's studies can be attained within the available time period.

In accordance with the Higher Education Ordinance at least two supervisors are appointed for each third-cycle student of whom one is appointed principal supervisor. For examination and grading in the third-cycle education, the Higher Education Ordinance also requires that an examiner is appointed for each third-cycle student. The supervisors and the examiner will be appointed according to BTH's guidelines. A supervisor, who is not the principal supervisor of the two, must have a doctoral degree. In addition, further supervisors may be affiliated to the third-cycle student, e.g., from industry, if this is for the benefit of the third-cycle student's studies. For these additional supervisors there is no demand on having a doctoral degree.

2.1 Purpose of the education

BTH conducts third-cycle education in order to contribute with solutions to the complex challenges in society and to meet the demands of a changeable labour market.

Specifically, the third-cycle courses and study programmes aim at developing the third-cycle student's knowledge in the subject area and her/his capacity to independently carry on research-, development-, teaching- and investigatory work based on a scientific foundation in different areas of society. The purpose of the Degree of Doctor is, in addition, to give the third-cycle student the capacity to critically and independently plan, initiate, and lead such work.

2.2 Goals for the education

According to the System of Qualifications in the Higher Education Ordinance (1993:100) according to enclosure.

2.3 Realization of the education

The third-cycle student carries on research and writes a scientific work (licentiate thesis/doctoral dissertation). In support of this, the education may include lectures, seminars, literature studies, project assignments, group supervision and individual supervision. Courses for each third-cycle student are established individually in consultation with the supervisors and the examiner and are entered into the individual study plan.

The supervision of the education aims at assisting the third-cycle student regarding choice of research domain, scientific method and organization and planning of the scientific work and pertaining studies. The supervisors are to assist with subject competence and see to that the work holds an international quality level. Furthermore, the supervision aims at introducing the third-cycle student to the scientific community and its demands on, e.g., ethics, honesty and critical thinking.



The third-cycle student is to participate in national and international contexts and present her/his own research.

During the education period, the third-cycle student is to take part of the scientific activities which are conducted in the scientific environment at the department/faculty by attending seminars and guest lectures, and, in the normal case, give one seminar per year about her/his thesis work.

The third-cycle student is to carry out a popular science-based presentation of her/his research before the Degree of Licentiate and public defence of the doctoral dissertation and write a popular science-based summary.

A third-cycle student, employed by the higher education institution as a doctoral student, is recommended to dedicate certain time (not more than 20 per cent of full working hours) to teaching in first- and second-cycle courses and programmes. Such work is financed by the first- and second-cycle courses and programmes and is to be accounted for in the individual study plan.

The education should be organized so that the third-cycle student attains the stipulated qualitative targets. How the knowledge needs of each individual third-cycle student are to be fulfilled in order to attain the qualitative targets is stated in respective individual study plan.

3 Entry requirements and selection

3.1 General entry requirements

According to 7 Chap. 39 § in the Higher Education Ordinance (1993:100).

3.2 Specific entry requirements

Qualified to be admitted to doctoral education is a graduate at second-cycle level in the technical or mathematical-natural sciences field or otherwise acquired knowledge in order to be able to benefit from doctoral education in the subject.

3.2 Selection

According to 7 Chap. 41 § in the Higher Education Ordinance (1993:100) and the current admission regulations at BTH. Selection is to be made in consideration of the applicants' capacity to profit by the education. The foundation for selection among the qualified applicants is the degree of capacity to profit by the third-cycle education, and the access to supervision and other resources in view of the planned specialization of the licentiate thesis/doctoral dissertation.

Examples of bases of assessment applied at the selection for third-cycle education are constituted by:



- Familiarity with the theory and applications of the subject,
- Relevant work experience where appropriate.
- Ability to express oneself in speech and writing,
- Familiarity with English,
- Creativity, initiative, independence, and ability of cooperation.

To assess how the applicant fulfils the bases of assessment, the following are used: results from higher education courses, quality of the independent work and possible publications, references, interviews, possible personal knowledge, and a personal letter from the applicant which describes the applicant's expectations on and intentions with the education. In certain cases, the applicant may undergo specific work tests.

Admission to third-cycle education is done on a continuous basis.

4 Examinations that form part of the education

The education consists of courses and a scientific work. Examinations that form part of the third-cycle education are assessed with the grades pass/failed. A grade on a course and a licentiate thesis, respectively, is determined by a specially appointed examiner. A grade on a doctoral dissertation is determined by a specially appointed grading committee.

For a possible credit transfer, see the current order for credit transfers and the guidelines for credit transfers.

4.1 Courses

In support of the research work and for the fulfilment of the qualitative targets generally, the third-cycle student takes a number of courses. Courses completed at BTH as well as courses from other higher education institutions can be included.

For third-cycle courses given at BTH there is to be a written course description which, among other things, states the title of the course in Swedish and English, the course objectives, content and credits. The individual study plan is to regulate which courses can form part of the studies and how many higher education credits each course should award (for participation in a course originally intended for first- or second-cycle, see the guidelines for credit transfer of courses in third-cycle education).

Components of the education in the areas below are compulsory. How these are examined, through a course or other component, is regulated in each separate individual study plan.

- Research methodology, 6 higher education credits
- Information search for researchers, 3 higher education credits
- Scientific writing and scientific review, 3 higher education credits
- Ethics in research, 2 higher education credits



The choice of courses is to be characterized by flexibility with regard to the third-cycle student's prior knowledge and the specialization of the research work and is to be determined in consultation between the third-cycle student, supervisors and examiner. The examination format is determined by the examiner in consultation with the supervisors. Goal attainment is tested by the examiner.

All compulsory courses or components are to be completed before the doctoral dissertation is publicly defended at the public defence of the doctoral dissertation. Other courses and components are to be chosen so that the third-cycle student obtains both breadth and depth in the research domain. The courses are also to benefit the third-cycle student's competence and skills, her/his studies or scientific work.

4.2 Scientific work

Scientific work in the form of a licentiate thesis/doctoral dissertation is to be designed as an integrated, connected scientific work (monograph) or as a summary – introductory part – together with pertaining scientific academic papers (compilation), which the third-cycle student has written alone or together with another person or persons. The scientific work is written in English or Swedish.

The licentiate thesis is to be presented orally at a public licentiate seminar. For further information, please see "Regulations for licentiate seminars" established by BTH.

The doctoral dissertation is to be defended orally at a public defence of doctoral dissertation. The dissertation must have been quality assured beforehand as described in "Enclosure 1 – Quality assurance model for doctoral thesis in Software Engineering". For further information, please see "Regulations for the public defence of a doctoral dissertation" established by BTH.

5 Degree

5.1 Qualitative targets

Goals according to the System of qualifications in the Higher Education Ordinance (1993:100) according to "Enclosure 2 – System of qualifications (Higher Education Ordinance 1993:100)".

5.2 Title of qualification

The degree title of third-cycle studies in Swedish at BTH consists of a general degree with the addition of a prefix. The prefix is normally teknologie.

Third-cycle student taking a Degree of Licentiate in Software Engineering normally receives the Swedish degree title teknologie licentiatexamen (Eng. Degree of Licentiate of Technology).



Third-cycle student taking a Degree of Doctor in Software Engineering normally receives the Swedish degree title teknologie doktorsexamen (Eng. Degree of Doctor of Philosophy).

Exceptions to the prefix Technology in the Swedish degree: For individuals who do not have a second-cycle technical education¹ a degree of Philosophy will be awarded. The prefix should be clarified in the individual study plan. For a degree of Philosophy the Swedish degree title is: Filosofie licentiatexamen (Eng. Degree of Licentiate of Philosophy).

Filosofie doktorsexamen (Eng. Degree of Doctor of Philosophy).

6 Effective date and interim regulations

This general syllabus becomes effective on June 1, 2021.

Third-cycle students admitted before June 1, 2021, will complete, as a general rule, their studies according to the older general syllabus. If a third-cycle student so requests and it is deemed suitable, the relevant examiner may accept a transfer to the new general syllabus. The third-cycle student will then report the transfer to the relevant Dean and attach a copy of an updated individual study plan updated according to the new general syllabus.

¹ A technical education refers to a Master's degree in Engineering, Master's degree in Science or equivalent in a technical or mathematical-scientific field.



Enclosure 1 – Quality assurance model for doctoral thesis in Software Engineering

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.

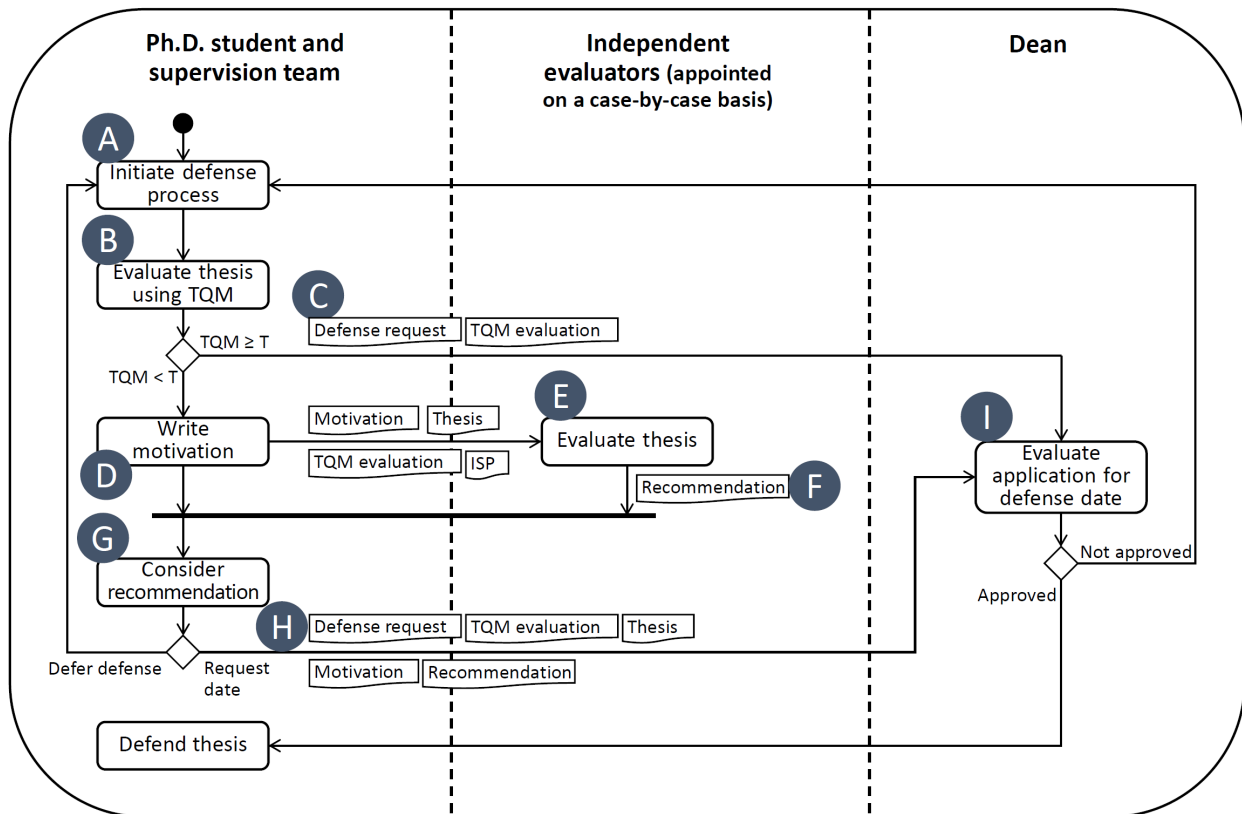


Figure 1: TQM process overview when applying for defense date.

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.



Enclosure 2 – System of qualifications (Higher Education Ordinance 1993:100)

Degree of Licentiate [Licentiatexamen]

Scope

A Degree of Licentiate is awarded

either after a third-cycle student has completed a study programme of at least 120 credits in a subject in which third-cycle teaching is offered,

or after a third-cycle student has completed one part comprising at least 120 credits of a study programme intended to conclude with the award of a PhD, if a higher education institution decides that a Degree of Licentiate of this kind may be awarded at the institution.

Outcomes

Knowledge and understanding

For a Degree of Licentiate the third-cycle student shall demonstrate knowledge and understanding in the field of research including current specialist knowledge in a limited area of this field as well as specialised knowledge of research methodology in general and the methods of the specific field of research in particular.

Competence and skills

For a Degree of Licentiate the third-cycle student shall

- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake a limited piece of research and other qualified tasks within predetermined time frames in order to contribute to the formation of knowledge as well as to evaluate this work
- demonstrate the ability in both national and international contexts to present and discuss research and research findings in speech and writing and in dialogue with the academic community and society in general, and
- demonstrate the skills required to participate autonomously in research and development work and to work autonomously in some other qualified capacity.

Judgement and approach

For a Degree of Licentiate the third-cycle student shall



- demonstrate the ability to make assessments of ethical aspects of his or her own research
- 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
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

Thesis

For a Degree of Licentiate the third-cycle student shall have been awarded a pass grade for a research thesis of at least 60 credits.

Miscellaneous

Specific requirements determined by each higher education institution itself within the parameters of the requirements laid down in this qualification descriptor shall also apply for a Degree of Licentiate with a defined specialisation.

Degree of Doctor

Scope

A Degree of Doctor is awarded after the third-cycle student has completed a study programme of 240 credits in a subject in which third-cycle teaching is offered.

Outcomes

Knowledge and understanding

For the Degree of Doctor the third-cycle student shall

- demonstrate broad knowledge and systematic understanding of the research field as well as advanced and up-to-date specialised knowledge in a limited area of this field, and
- demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.

Competence and skills

For the Degree of Doctor the third-cycle student shall

- demonstrate the capacity for scholarly analysis and synthesis as well as to review and assess new and complex phenomena, issues and situations autonomously and critically
- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake



research and other qualified tasks within predetermined time frames and to review and evaluate such work

- demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research
- demonstrate the ability in both national and international contexts to present and discuss research and research findings authoritatively in speech and writing and in dialogue with the academic community and society in general
- demonstrate the ability to identify the need for further knowledge and
- demonstrate the capacity to contribute to social development and support the learning of others both through research and education and in some other qualified professional capacity.

Judgement and approach

For the Degree of Doctor the third-cycle student shall

- demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of research ethics, and
- demonstrate specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used.

Research thesis (doctoral thesis)

For the Degree of Doctor the third-cycle student shall have been awarded a pass grade for a research thesis (doctoral thesis) of at least 120 credits.

Miscellaneous

Specific requirements determined by each higher education institution itself within the parameters of the requirements laid down in this qualification descriptor shall also apply for a Degree of Doctor with a defined specialisation.