# 1.0 Personal information

**1.1 Name**
*Eva Blomqvist*

**1.2 Date of birth**
*19770816*

**1.3 Home address and telephone number**
*Jönköping, Sweden*

*+4613282772*

**1.4 Work address and telephone number**
*Linköpings universitet*
*581 83 LINKÖPING*

*+4613282772*

**1.4.1 E-mail address**
*eva.blomqvist@liu.se*

**1.5 Present employment with the exact denomination and date of employment. Regarding application for promotion; enclose the Associate Professor/Senior Lecturer/Lecturer/Research Fellow/Assistant Lecturer hiring decision**
*2016-04-01 - present*
*Universitetslektor i datalogi (Assistant Professor in Computer Science), IDA-HCS, Linköping University*

*2015-09-01 - present*
*Temporary project employment at SICS East Swedish ICT AB to work on the research project E-care@home (contract expires 2017-12-31), part time 50%*

### 1.6 Previous employment. Leaves of absence including type (e.g. parental leave)

*2015-09-01 - 2016-12-31*
*Leave of absence (50%) from LIU employment (Forskarassistent) in order to work at SICS East Swedish ICT.*

*2011-07-05 - 2016-03-31*
*Forskarassistent (Assistant Professor), IDA-HCS, Linköping University*

*2015-04-16 - 2015-06-27*
*Parental leave (25%)*

*2015-01-19 - 2015-04-16*
*Parental leave (50%)*

*2014-01-21 - 2014-08-31*
*Parental leave (Full time)*

*2010-09-15 - 2011-07-04*
*Acting assistant professor in Computer Science (Tillförordnad lektor i datalogi), School of Engineering, Jönköping University, Jönköping (SE), (Full time)*

*2011-02-16 – 2013-02-16*
*Contratto d'opera nell'ambito del progetto Europeo 'INTERACTIVE KNOWLEDGE STACK FOR SMALL TO MEDIUM CMS/KMS PROVIDERS' (approximate English translation: work contract within the European project 'INTERACTIVE KNOWLEDGE STACK FOR SMALL TO MEDIUM CMS/KMS PROVIDERS'), STLab, ISTC-CNR, Rome (IT), (Part time)*

*2009-01-16 - 2011-01-16*
*Assegno di ricerca, sul tema: "Ingegneria della conoscenza, con speciale attenzione alla progettazione di ontologie e alla reingegnerizzazione semantica di dati eterogenei sul Web" (approximate English translation: Research fellowship, postdoc, on subject: 'Knowledge engineering, with specific focus on design of ontologies and semantic reengineering of heterogeneous data on the Web') at STLab ISTC-CNR, Rome (IT), starting date: 2009-01-16 (initially a one-year assignment, prolonged January 2010 until 2011-12-31), contract terminated on request: 2011-01-16. (Full time)*

*2003-08-18 - 2009-01-19*
*PhD student employment (Doktorand), School of Engineering, Jönköping University, (Full time)*

### 1.7 Temporary residence as visiting research fellow/lecturer/postdoctoral research fellow etc.

*Postdoc at STLab ISTC-CNR, Rome (IT), 2009-01-16 - 2010-09-14*

## 2.0 Diplomas

### 2.1 University Diploma including year of degree. Enclose grades

*Ph.D., Linköping University, Computer Science, Completed 2009-05-28*

*Master of Science in Computer Science and Engineering, Linköping University (Civ.ing. D), Completed 2003-08-20*

## 3.0 Scientific merits

**3.1 Short description of own research profile (maximum 2 pages)** **Suppl. no.** *1*

**3.2 Short description of planned research (maximum 2 pages)** **Suppl. no.** *2*

## 3.3 List of publications

### 3.3.1 Scientific publications in scientific journals. (Mark the publications that are included in the doctoral thesis)

*Zhang Z., Gentile A. L., Blomqvist E., Augenstein I., Ciravegna F.: An Unsupervised Data-driven Method to Discover Equivalent Relations in Large Linked Datasets. Semantic Web 8(2), pp.197-223, IOS press, 2017.*
*(Comments about journal: One of two top journals in the Semantic Web field, impact factor 1.786.)*

*Blomqvist E., and Thollander P.: An Integrated Dataset of Energy Efficiency Measures Published as Linked Open Data. Energy Efficiency 8(6), Springer, 2015.*
*No of citations: 8*
*(Comments about journal: A major forum on energy efficiency research, both from a technical and economic perspective, impact factor 1.183.)*

*Timpka T., Spreco A., Dahlström Ö., Eriksson O., Gursky E., Ekberg J., Blomqvist E., Strömgren M., Karlsson D., Eriksson H., Nyce J., Hinkula J., and Holm E.: Performance of eHealth Data Sources in Local Influenza Surveillance: A 5-Year Open Cohort Study. Journal of Medical Internet Research, 16(4):e116, 2014.*
*No of citations: 5*
*(Comments about the journal: a leading journal for internet-related research in the health and healthcare domains, impact factor: 4.532.)*

*Blomqvist E.: The Use of Semantic Web Technologies for Decision Support - A Survey. Semantic Web 5(3): 177-201, IOS Press, 2014.*
*No of citations: 48*
*(Comments about journal: One of two top journals in the Semantic Web field, impact factor 1.786.)*

*Included in PhD thesis:*
*Blomqvist E., and Öhgren A.: Constructing an enterprise ontology for an automotive supplier. Engineering applications of artificial intelligence, Vol. 21, Issue 3, pp.386-397, Elsevier, 2008.*
*No of citations: 40*
*(Comments about journal: Impact factor 2.368. Invited extended version of a conference paper.)*

*No of citations above in google scholar as of end of 2016.*

### 3.3.2 Other publications

**Suppl. no.** *3*

*See suppl. 3*

### 3.3.3 List of a maximum of 10 scientific pieces of work that are considered to be most meritorious for the appointment. The list shall contain information on publisher and year of publication.

*Zhang Z., Gentile A. L., Blomqvist E., Augenstein I., Ciravegna F.: An Unsupervised Data-driven Method to Discover Equivalent Relations in Large Linked Datasets.*

*Semantic Web 8(2), pp.197-223, IOS press, 2017.*
*(Applicant's contrib.: a crucial part of the main idea behind the work, as well as parts of the initial software implementation. Later software versions, and evaluation mainly by Zhang. Contributed to writing subsections of the paper.)*

*Blomqvist E., Hammar K., and Presutti V.: Engineering Ontologies with Patterns – The eXtreme Design Methodology. Chapter 2 of: Ontology Engineering with Ontology Design Patterns - Foundations and Applications. IOS Press Studies on the Semantic Web, Vol. 25, 2016.*
*(Applicant's contrib.: main developer of the XD methodology since 2010, most of the experiences reported are from the applicant, as well as variants of the methodology suggested. All writing done by the applicant.)*

*Blomqvist E., and Thollander P.: An Integrated Dataset of Energy Efficiency Measures Published as Linked Open Data. Energy Efficiency 8(6), Springer, 2015.*
*(Applicant's contrib.: project leader and main technical contributor to the project reported, main software development done by the applicant. Most writing done by the applicant.)*

*Keskisärkkä, R., and Blomqvist, E.: Supporting Real-Time Monitoring in Criminal Investigations. In: The Semantic Web: ESWC 2015 Satellite Events Portorož, Slovenia, May 31 – June 4, 2015, Revised Selected Papers, LNCS Vol. 9341, Springer, 2015.*
*(Applicant's contribution: co-development of the main idea with the PhD student, who then performed the main software development. Paper writing mainly done by the student, some contributions from the applicant.)*

*Blomqvist E.: The Use of Semantic Web Technologies for Decision Support - A Survey. Semantic Web 5(3): 177-201, IOS Press, 2014.*

*Blomqvist, E., Seil Sepour, A., and Presutti, V.: Ontology Testing - Methodology and Tool. In: Knowledge Engineering and Knowledge Management - 18th International Conference, EKAW 2012, Galway City, Ireland, October 8-12, 2012. Proceedings. LNCS, Vol. 7603, pp. 216-226, Springer, 2012.*
*(Applicant's contrib.: initial idea and concepts developed by the applicant. Master student Seil Sepour performed implementation. All writing done by the applicant.)*

*Presutti V., Blomqvist E., Daga E., and Gangemi A.: Pattern-based Ontology Design. In: Ontology Engineering in a Networked World (Chap. 3), Springer, 2012.*
*(Applicant's contrib.: contributor to the development of the methodology, initial ideas by Presutti. Most writing done by the applicant.)*

*Blomqvist E., Presutti V., Daga E. and Gangemi A.: Experimenting with eXtreme Design. Knowledge Engineering and Management by the Masses – Proceedings of the 17th International Conference, EKAW 2010, Lisbon, Portugal, October 11-15, 2010. LNAI Vol. 6317, Springer, 2010.*
*(Applicant's contrib.: design, development, and execution of the experiments, as well as analysis done mainly by the applicant. Feedback by Presutti, software developed by Daga. Most writing done by the applicant.)*

*Blomqvist E., Gangemi A. and Presutti V.: Experiments on pattern-based ontology design. Proceedings of the 5th International Conference on Knowledge Capture (K-CAP 2009), September 1-4, 2009, Redondo Beach, California, USA. pp. 41-48, ACM, 2009.*
*(Applicant's contrib.: design, development, and execution of the experiments, as well as analysis done mainly by the applicant. Feedback by Presutti & Gangemi. Most writing done by the applicant.)*

*Presutti V., Daga E., Gangemi A., and Blomqvist E.: eXtreme Design with Content Ontology Design Patterns. Proceedings of the Workshop on Ontology Patterns (WOP*

*2009), collocated with the 8th International Semantic Web Conference (ISWC-2009), Washington D.C., USA, 25 October, 2009. CEUR workshop proceedings, Vol-516, 2009.*
*(Applicant's contribution: part of the team developing the methodology from initial idea by Presutti. Some contributions to the text.)*

## Scientific merits continued

### 3.4 Grants. Larger grants that have been received as main applicant or as fellow applicant. (State main applicant and other fellow applicants).

*Co-applicant (project coordinator: Lantmäteriet, other partners: Naturvårdsverket, MSB, SGU, Novogit AB, FpX AB) "Länkade Geodata - att öppna upp guldgruvan av offentliga geodata för innovation" - Total grant: 494KSEK, project duration 8 months, 2014-2015.*

*Project leader and main applicant (LiU the only applicant), grant from Energimyndigheten for project entitled "DEFRAM - 2"– Grant of 484KSEK, duration 14 months, 2014-2015.*

*Project coordinator and applicant, CENIIT grant (LiU) for project entitled "Semantic Technologies for Decision Support - A Pattern-based Approach" – Grant of 475KSEK per year, maximum duration 6 years, 2012-2017.*

*Project leader and main applicant (LiU the only applicant), grant from Energimyndigheten for project entitled "DEFRAM - Databas för Effektivare FRAMtagning av energikartläggningar"– Grant of 320KSEK, duration 5 months, 2012-2013.*

*Project leader and main applicant (fellow applicants: SCB, Malmö högskola, Metasolutions AB), Vinnova grant (no. 2012-01667) for project entitled "Länkade öppna data i Sverige – portal och nationell statistik"– Total grant of 399KSEK, duration 6 months, 2012.*

*Co-applicant of VINNOVA grant for project entitled "Attraktiv region genom ett hållbart, effektivt och tryggt samhälle" (Attractive region through a sustainable, effective, and safe society), main applicant: Saab AB, other applicants included Länsstyrelsen Östergötland, Linköpings kommun, Energikontoret Östergötland, Cleantech Östergötland, FOI, and several others – Total grant of 750KSEK, duration 5 months, 2011-2012.*

### 3.4.2 Grants from the EU, foundations and other grants

*VALCRI - Co-applicant (coordinator: Middlesex University, UK, 17 partners in total), grant from the European Commission FP7- SEC 2012, IP, European Commission Grant Agreement N° FP7-IP-608142, grant duration 44 months, starting from May 2014.*

### 3.5 Active participation in national and international conferences during the past five years. Name the kind of activity, e.g. plenum lectures, invited lectures, chairmanship, session organising etc.

*ESWC 2017 General chair*
*EKAW 2016 Scientific program chair*
*ESWC 2016 Scientific program chair*
*ISWC 2015 Presenter of demo, co-chair of WOP workshop and non-presenting author of peer-reviewed publication at WOP*
*EKAW 2014 Workshop and tutorials co-chair, session chair*
*ISWC 2014 Attendee*
*ISWC 2013 Posters&demos co-chair, non-presenting author of peer-reviewed publication, and presenting author of peer-reviewed publication at WOP workshop.*
*ESWC 2013 Non-presenting co-author of SMILE workshop paper*
*ISWC 2012 Session chair, co-chair of WOP workshop, proceedings chair*
*EKAW 2012 Presenting author of peer-reviewed publication*

*Notes on the conferences:*
** ISWC - International Semantic Web conference. The top conference in the Semantic Web field, A-ranked, yearly conference.*
** ESWC - Extended Semantic Web conference (former: European Semantic Web Conference). The second top conference in the Semantic Web field, A-ranked, yearly conference.*
** EKAW - International Conference on Knowledge Engineering and Knowledge Management. Biannual conference.*

### 3.5.3 Editorial/advisory board scientific journals

*Member of the editorial board of the Journal of Web Semantics, Elsevier (since 2016). Journal of Web Semantics is one of two top journals specifically targeted at the Semantic Web field.*

### 3.5.4 Referee assignments for journals. Name the journals and average number of assignments per year

*Semantic Web Journal, IOS Press, approx. 2-3 reviews per year*
*Journal of Applied Ontology, IOS Press, approx. 2 reviews per year*
*Engineering Applications of Artificial Intelligence, less than once a year*
*Software: Practice and Experience, less than once a year*
*Transactions on Data and Knowledge Engineering, less than once a year*

### 3.6 Other scientific merits

*PC member of numerous conferences, including the yearly ESWC (PC member 2009, 2010, 2011, 2012, 2013, 2014, 2015 - 2016 as Program Chair, and 2017 as General Chair) and ISWC (PC member 2009, 2010, 2011, 2012, 2013, 2014, 2015, and 2016), as well as the biannual EKAW conferences, since 2010, and numerous smaller conferences, workshops, PhD symposia etc.*

## 4.0 Pedagogical merits

**4.1 Description of own pedagogical work on the levels bachelor/master/doctor.**
**If the work has been extensive please limit the documentation to the most recent five years. Name:**

- **University/ /higher education institution**
- **Scope and level of teaching**
- **Different forms and methods of teaching/examination**
- **Experience of IT-supported teaching**
- **International teaching experience/teaching in English**
- **Course coordinator/examiner**
- **Supervision of essays/doctoral theses**
  - **Name the main and associate supervisor, the name of the student, the title of the work, level, credits and year of degree**

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*Co-supervisor of two PhD students, Karl Hammar and Robin Keskisärkkä, since 2011 and 2013 respectively. Main supervisor in both cases is Henrik Eriksson, IDA (LiU). Karl defended his Licentiate thesis in September 2013 (thesis title: "Towards an Ontology Design Pattern Quality Model") and is estimated to defend his doctoral thesis in 2017, Robin is estimated to present his Licentiate in 2017.*

*For course-related activities, and master- and bachelor thesis supervision, see suppl. 4 and 5.*

**4.2 Pedagogical leadership**

- **Leader assignments (e.g. director of studies etc.)**
- **Development/design of courses/programmes**
- **Evaluation assignments/steering committees/committee work linked to educational matters**

*2016-2017: Part of the work group (subgroup of PPG-IT) that evaluates the IT-program and proposes program changes with a 10-year horizon.*

*2014-present: Responsible for 3rd semester ("terminsansvarig") at the IT program (Civinlingenjör IT). Assignment includes to keep courses of the semester aligned, support course responsible teachers in preparing and updating scenarios for PBL group work, and supervise and coordinate PBL group supervisors, as well as participate in the overall program planning (through the group PPG-IT).*

*2012-2013: Design of two instances of Bachelor course "725G61 Programmering, grundkurs" at Linköping University*

*2012: Design of PhD course "Semantic Technologies in Practice" at Linköping University*

*2011: Design of Master course "Information Retrieval" at Jönköping University*

*2010: Design of Master course "Information Logistics" at Jönköping University*

*2004: Member of a project group for developing guidelines and standards for examination and supervision of theses and project work (Handledning och examination av examens- och projektarbete) at School of Engineering, Jönköping University.*

**4.3 Pedagogical education and competence development**

- **Teaching and learning in higher education (enclose copy of course certificate)**
- **Other pedagogical/didactic education on academic level**
- **Other education of relevance to the appointment**

*2014: Problem Based Learning and small group tutorial, Didacticum, Linköping University (2 credits)*

*2012: Research supervision, Step 3a – CUL, Linköping University (4 credits), including faculty specific part*

*2011: Teaching in Higher Education, Step 2 (DUO) – CUL, Linköping University (6 credits)*

*2005: Teaching in Higher Education, Step 1 (LUK) – CUL, Linköping University (4 credits – old credit system)*

**4.5 Production of study material for teaching**

- **Production of books, compendia, laboratory guides, films etc.**
- **Production of IT-based material**

*2012: Preparation of course material, including lab exercises and instructions for course "Programmering, grundkurs"*

*2012: Preparation of self-study part of PhD course "Semantic Technologies in Practice", including textual instructions and information, exercises, and video tutorials*

*2009-2011: Preparation of course material, exercises and questionnaires for the PhD courses in ontology engineering held both in Bologna and Jönköping*

**4.7 Evaluation of teaching skills**

- **Pedagogical awards and honours**
- **Quality follow-up**
- **Course evaluation**
- **Assignments (e.g. pedagogical career steps)**

*All courses I have taught were evaluated according to applicable practices at that university at the time. For instance, at Jönköping University the official course evaluations were conducted by the student union, and a summary was give to the examiner either in writing or orally. The courses I have taught at LiU have been evaluated through the KURT system, using the standard questionnaire and scoring. In addition to such course evaluations, in all PhD course and several master courses I have conducted regular surveys during the course sessions, both to capture the satisfaction of the students, but in addition to evaluate the level of understanding and the effectiveness of the teaching methods and tools applied. For all courses that have been evaluated several years in a row, with comparable course evaluation methods, I have always received an improved result, i.e. improved student satisfaction as the course has been changed and improved throughout the years.*

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*Nevertheless, in my opinion, course evaluations that simply result in a "score" for the course, in terms of student satisfaction, are not very informative, nor useful for improving a course. Instead the interesting information comes from more detailed questions and interactions with the students. Therefore I have rarely been satisfied with "standard" questionnaires for course evaluations. To exemplify, in the Information Retrieval master's course taught at Jönköping University in 2011, I used a modified version of the Shortened Experiences of Teaching and Learning Questionnaire (SETLQ) to assess the students' experience with the course. That particular course was also part of my DUO course project, i.e., as my object of study during my pedagogical education. The final report written in the DUO course, to reflect over the Information Retrieval course implementation and assessment is included in suppl. 6 as an example of how I have used course evaluations in the past.*

**4.10 Own reflections regarding own pedagogical activities in short Use the factual basis stated above, and supplements if any, in a short reflection in a pedagogical context. The reflection shall contain a description of the applicant's perception of knowledge and basic pedagogical view, with concrete examples of how these have been practiced in the own pedagogical work, as well as examples of how the applicant's knowledge and the students' knowledge acquirement has developed.**

**Suppl. no.** *7*

## 5.0 Other skills

## 6.0 Administrative merits and academic leadership

## 6.1 Administrative assignments

### 6.1.1 Leading of work and staff

*Co-supervisor of two PhD students since 2013, c.f. point 4.1.*

*Project leader and principal investigator of the following research projects (c.f. point 3.4 for details on the grants):*
** Länkade öppna data i Sverige – portal och nationell statistik (2012, funded by Vinnova)*
** DEFRAM and DEFRAM-2 (2012-2015, funded by Energimyndigheten)*
** Semantic Technologies for Decision Support - A Pattern-based Approach (2012-2017, funded by CENIIT at LIU)*

*Leader of the Data Management and Ontologies (DMO) working group within the VALCRI FP-7 project (c.f. point 3.4.2 for grant details).*

### 6.1.2 Leadership training (enclose copy of course certificate)

*Leadership, Linköping University*

*Leadership course in training for non commissioned officers/sub-officers of the Swedish Navy, Örlogsskolorna Karlskrona*

### 6.1.3 Member of academic boards/committees

*Elected member of the board of the Department of Computer and Information Science, Linköping University, 2012-present.*

*Member of the research education board (Forskarutbildningsutskottet), School of Engineering, Jönköping University 2007-2009*

*PhD student representative in research board (Forskningsrådet), School of Engineering, Jönköping University 2003-2006*

### 6.1.4 Other administrative assignments

*Chair of PhD student association at School of Engineering, Jönköping University, three election periods.*

*Representative of Jönköping University in the board for PhD studies at SFS (SFS Doktorandkommitté) during one year.*

### 6.2.4 Other assignments of relevance to the appointment

*Chair of the international Association for Ontology Design and Patterns (ODPA) since its founding in 2016, and member of the steering committee of the Workshop on Ontology Patterns (WOP) since its first edition in 2009.*

*Secretary of the board of the Swedish AI Society since 2010.*

*General chair of the ESWC 2017 conference, program chair of two conferences (ESWC 2016 and EKAW 2016), as well as numerous other chair assignments in the past 6 years (including several proceedings chair assignments, poster & demos chair of ESWC 2014, ISWC 2013, and EKAW 2008 etc.), c.f. also point 3.5.*

## 7.0 Merits from third stream activities and information about research and development work

### 7.1 External contacts and external work

*Participation in three W3C community groups, performing pre-standardisation efforts together with industry. Groups are "RDF stream processing" (https://www.w3.org/community/rsp/), "Emergency Information" (https://www.w3.org/community/emergency/), and "Decisions and Decision Making" (https://www.w3.org/community/decisionml/). Additionally, previous participation in one W3C Incubator (predecessor to the Decisions and Decision Making community group).*

*Publication of open data using linked data technologies, resulting from several research projects. This includes data from SCB, the Swedish Energy Agency, and the US Department of Energy. I addition to data publication, this has also led to spreading of information about the linked data technologies, e.g. through seminars and tutorials, at several Swedish authorities, such as SCB, Lantmäteriet, SGU, Naturvårdsverket, MSB, SVA, FOI and others.*

*Participation in the research project VALCRI, EU-funded FP7-Sec IP, concerning the use of semantic technologies and visual analytics to support police analysts in their daily work. Project includes software and ontology development in close collaboration with both software companies and end-user organisations, such as the West Midlands Police department (UK), and several police departments in Antwerp (BE), as well as providing training on our technologies to those parties.*

*Participating in the research project IKS, EU-funded FP7 IP, concerning the transfer of semantic technologies into the software and business of small and medium-sized CMS provider companies.*

*Participated in the research project NeOn, EU-funded FP6 IP, and thereby developed ontology patterns for UN-FAO (Food and Agriculture Organization of the United Nations).*

*Participated in the research project MediaILOG, which partly aimed to study problems and IT solutions at a local media company, Jönköpings Posten. Within the project I conducted interviews at Jönköpings Posten and analyzed their work processes.*

*Participated in the research project SEMCO, where Autoliv Electronics was a partner. The collaboration resulted in an enterprise ontology describing their requirements engineering process and an evaluation of this ontology together with employees at Autoliv.*

#### 7.1.1 Collaboration with commerce and industry

*Participation in several research projects with industry partners, both from Sweden and other European countries. Examples include participation in the EU-funded FP7 project IKS, with an early adopters program (http://www.iks-project.eu/projects/early-adopter-programme) involving 41 companies from around Europe, taking part in training and development activities concerning semantic content management, led by project participants. More recent projects include several linked data projects in Sweden, where several SME:s have been involved, e.g. Metasolutions AB and Novogit AB. Additionally, a recent EU-funded FP7-Sec project (VALCRI) includes concrete collaboration on software and ontology development with several software companies, e.g. Space Application Services (Belgium), Object Security (UK), and AE Solutions (UK).*

#### 7.1.2 Other merits within the third stream mission

*2011: 2-day course in ontology engineering given at FOI*

*Several conference tutorials on ontology design and patterns, including at ESWC 2010 and K-CAP 2009.*

## Current research profile

My main research area is focused on Semantic Web technologies, in particular methods for creating and applying ontologies within Decision Support Systems (DSS). To truly benefit from the Semantic Web, or ontology-based applications in general, ontologies must be easy to construct or reuse, and easy to apply in a software system. One of the core concepts in my research has been the notion of an Ontology Design Pattern (ODP), which analogous to software design patterns intend to support increased quality in the resulting artefacts due to reuse of best practice solutions. I took an active part in the emergence of the general notion of ODPs, and published one of the first papers discussing ODPs, at ICEIS 2005, two months prior to the better-known paper by Gangemi, which was published at ISWC 2005, and which is usually referenced as the origin of the term. While during my PhD I focused mainly on semi-automatic ontology construction, so-called ontology learning, I have during my postdoc and my subsequent years at LiU moved more towards pattern-based methods and methodologies for manual ontology engineering and reuse, as well as towards methods and technologies for applying ontologies in various DSS tasks.

As a post-doc at STLab, ISTC-CNR (IT), I performed a set of experiments on manual use of ODPs, determining the effects of pattern usage on the process and resulting ontologies, but also detailing the need for methodological and tool support. Together with my colleagues from STLab we developed a methodology for pattern-based ontology design called eXtreme Design (XD) which I applied in my case studies and experiments. It is an agile and incremental methodology, using ODPs both as guidelines and reusable components. In my work I particularly studied how to support the user in finding and selecting appropriate ontology design patterns, based on the current set of requirements, and the nature of the improvements that could be identified in the resulting ontologies. In addition to this, I participated in two EU-funded research projects, NeOn[1] and IKS[2]. In NeOn my main focus was on developing and testing the XD methodology. In IKS I was working on ontological requirements of semantic Content Management Systems, participated in the ambient intelligence use-case of the project, where a number of ontologies were engineered using a variant of XD and a catalogue of ODPs, as well as further developed XD itself.

During my first few years at LiU, as "forskarassistent" I was partly financed by the Security Link national research network, therefore focus was on DSS applications within the Security field. In 2012 I acquired my first internal grant, from CENIIT. This grant gave me the opportunity to perform a thorough survey of the DSS field and how Semantic Web technologies had so far been applied there, resulting in a survey article in the Semantic Web Journal. Five focus areas for future research were identified, based on both their importance from an industrial needs perspective, but also from a "white spots" analysis of the research field. These areas consist of *information integration*, *contextual information filtering*, *semantic complex event processing*, *ontology evolution*, and *decision sharing*. A detailed analysis of the areas can be found in the article (see publication list in CV). These five areas have been the frame of my research since then, both setting the agenda for my own personal research as well as of the PhD students that I supervise and of the additional acquired grants since then. My personal research focus has been mainly on (i) information integration, by applying ODP-based ontologies, as well as (ii) the ontology engineering methods and ODPs to support creating ontologies for such applications.

[1] http://www.neon-project.org
[2] http://www.iks-project.eu/

The CENIIT grant has from 2013 and onwards been used to partly finance a PhD student (co-supervised by me), who has been focusing on contextual information filtering and semantic complex event processing, using and extending RDF stream processing methods. The CENIIT grant was recently renewed for its sixth and final period (2017). Additionally, in the context of a recent EU-funded project (VALCRI[3]) another PhD student (not supervised by me) has been engaged, focusing on the ontology evolution topic. Finally, a third PhD student (externally funded by Jönköping University, co-supervised by me) is currently focusing on methodology and tool support for ODP usage. Together, myself and these three PhD students complement each other well, and our research constitute a more or less complete coverage of the five areas of open problems identified it the survey article.

Since 2012 I have acquired grants both from Vinnova (2 grants) and Energimyndigheten (2 grants), focusing mainly on the concept of Linked Data, which can be seen as a technology for performing data integration (c.f. focus areas mentioned above). Linked Data involves a set of methods, guidelines, and technologies that allows us to publish and link data elements on the Web. Linked Data technologies can also support information integration internally in an organisation, hence it is highly relevant also for organisation-internal DSS. In the first Vinnova-funded project we explored the potential of publishing the metadata classification structure of Statistics Sweden (SCB) as Linked Data, and made a pilot by publishing a small set of this classification structure as open data. This has enabled online information integration in several later research projects, e.g. our own energy-related data in the DEFRAM-project reuses the SCB data in an online fashion. The second Vinnova-funded project was led by Lantmäteriet, and aimed at exploring the benefits of Linked Data for geographical data more specifically, and how Linked Data principles can work together with the INSPIRE standardisation initiative for integration of geographical data across organisations, e.g. for DSS in emergency management. Further, together with researchers in the energy efficiency domain, and funded by Energimyndigheten, I have led two projects for publishing energy audit data as Linked Data. Here the challenge was not the publishing of data itself, but the integration of Swedish energy audits with similar data from the US Department of Energy, in order to provide a better DSS for energy auditors as well as the audited organisations themselves. Linked Data technologies again proved invaluable in this integration process, and a particularly interesting challenge was the use of ontologies as a vocabulary for integration and reclassification of the data into a joint taxonomy.

VALCRI is an EU funded FP7-Sec IP, which started in May 2014. I participated in the acquisition of this grant as the main contributor from the LiU team, and today all the above mentioned PhD students are also engaged in this project. The project focuses on supporting criminal intelligence analysis, by novel data extraction and analysis methods combined with innovative visual analytics and interaction approaches. The focus of LiU is on information integration, filtering and analysis through ontologies and Semantic Web technologies as well as semantic complex event processing over real time data streams (again c.f. focus areas mentioned previously). As in the previously mentioned projects we are applying ontologies as vocabularies and models for data integration and analysis, e.g., in this case integration of various police data sources, and study how these ontologies can be created, e.g. by means of XD and ODPs, and maintained, i.e., through ontology evolution.

In summary, personally my main research focus is on applied and highly industry-relevant research in the area of the Semantic Web, in particular ontology-based applications and ontology engineering, specifically for improving DSS.

[3] http://www.valcri.org/

## Future research

My main research focus will continue to be on applied and highly industry-relevant research in the area of the Semantic Web, in particular ontologies and ontology engineering based on ontology design patterns (ODPs), for improving Decision Support Systems (DSS). Within this field there are a number of challenges that need to be addressed, and where I intend to make a contribution.

One challenge, where we are currently making a contribution, is that of managing rapidly changing information. Despite being designed for Web data, Semantic Web technologies have surprisingly enough mostly focused on static datasets. However, this is changing and during the past few years the area of RDF stream processing has developed, as well as other areas that focus on change management and ontology evolution, for instance. Our work in this area will proceed and we will continue to work towards supporting reasoning and semantic complex event processing upon rapidly changing information, as well as ontology evolution. This direction is mainly carried out in practice by supervising the PhD students that are currently focusing on precisely these problems, and for one of them I intend to become the main supervisor as soon as the docentship applied for here is approved.

Another such challenge involves the uncertain nature and varying quality of real-world data. It is rarely the case that we know for certain that something is true or not, even if it is asserted in our knowledge base. There are a number of theoretical directions for handling uncertainty in logical languages, and several of these have also found their way into the Semantic Web community, e.g., in the form of extensions to the standard languages (e.g., OWL extensions) for modelling uncertainty. However, very few of these are used in practice, and there is a complete lack of tool- and methodology support for engineering such ontologies. However, I believe that in order for ontologies to be truly widespread, there must be good practical options for modelling and using uncertainty in ontologies, if needed. For this reason, I have been working on several project proposals outlining research in this direction. These proposals contain research on methods and ODPs for supporting the management of uncertainty using primarily the OWL standard itself and existing logical extensions. This challenge is also something that has emerged in our current EU-funded project, VALCRI, where data is often unreliable, e.g. statements from witnesses, victims or the accused suspects. Although today we can certainly model this situation using for instance the W3C PROV model, to record where the data comes from and under what circumstances it was collected, there is currently no way to actually reason over this "uncertainty" in the knowledge base, since we are in this project using standard OWL and tooling without support for any of its extensions.

In addition to the notion of uncertainty, also the methods for managing and using ontologies need some improvement. In my PhD thesis I explored the field of ontology learning, which applies various extraction and machine learning techniques to semi-automatically generate ontologies. However, at that time (early ´00:s) the learning mechanisms were not well-developed, and also the ODPs that we used were in the very early idea phase at that time. Now, as machine learning, and in particular in combination with improved NLP technologies for learning from textual input, has considerably improved, I think it is time to revisit this area. Using the ODPs that are available today, in combination with modern machine learning technologies (as successfully researched by several other researchers at IDA) I envision being able to develop new methods and tools for semi-automatic specialisation of ODPs, as a complement to the ontology evolution methods that we are

currently investigating. This is an area in which I would personally be interested to pursue research, rather than merely having PhD students work on the topic.

Finally, research work on information integration using Linked Data principles, and ontology engineering based on ODPs, will continue. For instance, our current research has only briefly covered some of the steps in the eXtreme Design (XD) methodology for ontology engineering, where more research is needed to extend the methodology with detailed guidelines and tool support. Two such steps are the testing and verification step, as well as the integration step. Ontology testing is today performed completely manually, either by simply checking for faults in the logical structure, disregarding the requirements completely, or by manually checking for compliance with requirements. Only for requirement-independent testing, e.g. debugging, checking for consistency and coherence, there are automated tools. However, being able to semi-automatically generate test data and test cases from requirements is something we started investigating already several years ago, but so far did not find time to develop a sufficient solution for. Similarly, the module integration step of our XD methodology is a crucial step, which is currently lacking detailed guidelines. Since XD is an agile methodology applying a divide and conquer strategy, important design decisions for the overall ontology are pushed towards the end of the design process, which in some case may require complete refactoring of the ontology in the integration phase. At the moment this is left entirely up to the expertise of the integration team, and performed using standard ontology engineering environments, without specific support for this task. Here I could benefit from previous research done at IDA, concerning ontology alignment and integration tools, i.e. by Patrick Lambrix group, however these methods and tools need to be extended to take the specifics of the XD methodology into account, and to allow for more extensive refactoring of the involved ontology modules than what is usually expected in an ontology alignment scenario.

In summary, there is still a lot of work to do within the five focus areas that were mentioned as my current frame of research (c.f. supplement 5), and in particular I intend to complete the detailing of the guidelines and tools needed for the XD methodology. However, during the past few years a couple of additional challenges have emerged, as mentioned above; managing and exploiting uncertainty in the data using ontologies based on OWL extensions, as well as exploiting the recent developments in the machine learning field to support both ontology engineering and evolution. This also illustrates one final point in my research focus, namely the connection to industry and my intention to work on real and industry-relevant problems, rather than anything that my be interesting from a researcher point of view.

## Other Publications

Number of citations, listed in Google Scholar (as of 2016 - citation count above 20 in bold), is provided after each article (when available). Comments on a selection of the recent most prominent conferences, including acceptance rates are included at the end of section 1. Work that was performed in the context of my PhD is marked with a *.

**Note:** journal articles are NOT included in the list below, instead they are listed directly in the CV under heading 3.3.1.

| | **1. Peer-reviewed conference contributions (included in proceedings)** | **Year** |
|---|---|---|
| 23. | Keskisärkkä, R., and Blomqvist, E.: Supporting Real-Time Monitoring in Criminal Investigations. In: *The Semantic Web: ESWC 2015 Satellite Events Portorož, Slovenia, May 31 – June 4, 2015, Revised Selected Papers*, LNCS Vol. 9341, Springer, 2015. | 2015 |
| 22. | Zhang, Z., Gentile, A. L., Blomqvist, E., Augenstein, I., and Ciravegna, F.: Statistical Knowledge Patterns: Identifying Synonymous Relations in Large Linked Datasets. In: *The Semantic Web - ISWC 2013 - Proceedings of the 12th International Semantic Web Conference, 21-25 October 2013, Sydney, Australia*. LNCS Vol. 8218, Springer, 2013.<br>No of citations: 15 | 2013 |
| 21. | Zhang, Z., Gentile, A. L., Augenstein, I., Blomqvist, E., and Ciravegna, F.: Mining Equivalent Relations from Linked Data. In: *Proceedings of the annual meeting of the Association for Computational Linguistics (ACL) 2013 (short papers),* 2013.<br>No of citations: 9 | 2013 |
| 20. | Musetti, A., Nuzzolese, A. G., Draicchio, F., Presutti, V., Blomqvist, E., Gangemi, A., and Ciancarini, P.: Aemoo: Exploratory search based on knowledge patterns over the semantic web. *Semantic Web challenge*, 2012.<br>**No of citations: 23** | 2012 |
| 19. | Blomqvist, E., Seil Sepour, A., and Presutti, V.: Ontology Testing - Methodology and Tool. In: *Knowledge Engineering and Knowledge Management - 18th International Conference, EKAW 2012, Galway City, Ireland, October 8-12, 2012. Proceedings.* LNCS, Vol. 7603, pp. 216-226, Springer, 2012.<br>No of citations: 1 | 2012 |
| 18. | Blomqvist, E., McGarry, D., and Waters, J.: Towards a Semantic Decision-making Format. In: *Proceedings of TAMSEC2011*, Linköping University, 2011. | 2011 |
| 17. | Khan, M. T. and Blomqvist, E.: Ontology Design Pattern Detection - Initial Method and Usage Scenarios. In: *Proceedings of the Fourth International Conference on Advances in Semantic Processing (SEMAPRO 2010).* XPS, ThinkMind Digital Library, 2010.<br>No of citations: 11 | 2010 |
| 16. | Blomqvist, E., Presutti, V., Daga, E. and Gangemi, A.: Experimenting with eXtreme Design. In: *Knowledge Engineering and Management by the Masses – Proceedings of the 17th International Conference, EKAW 2010, Lisbon, Portugal, October 11-15, 2010*. Lecture Notes in Artificial Intelligence, Vol. 6317, Springer, 2010.<br>**No of citations: 35** | 2010 |

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|---|---|---|
| 15. * | Blomqvist E.: OntoCase-Automatic Ontology Enrichment Based on Ontology Design Patterns. In: *The Semantic Web - ISWC 2009, 8th International Semantic Web Conference, ISWC 2009, Chantilly, VA, USA, October 25-29, 2009. Proceedings.* pp. 65-80, LNCS, Springer, 2009.<br>**No of citations: 33** | 2009 |
| 14. | Blomqvist E., Gangemi A. and Presutti V.: Experiments on pattern-based ontology design. In: *Proceedings of the 5th International Conference on Knowledge Capture (K-CAP 2009), September 1-4, 2009, Redondo Beach, California, USA.* pp. 41-48, ACM, 2009.<br>**No of citations: 65** | 2009 |
| 13. * | Ricklefs, M. and Blomqvist, E.: Ontology-based relevance assessment - An evaluation of different semantic similarity measures. In: *Proc. of OTM 2008: ODBASE - The 7th International Conference on Ontologies, DataBases, and Applications of Semantic*s, Monterrey, Mexico, Nov.10-14, Springer, 2008.<br>No of citations: 9 | 2008 |
| 12. * | Blomqvist, E.: Case-based Reasoning for Ontology Engineering. In: *Proceedings of The 10th Scandinavian Conference on Artificial Intelligence (SCAI 2008)*, Stockholm, May 26-28, IOS Press, 2008.<br>No of citations: 2 | 2008 |
| 11. * | Blomqvist E.: Pattern Ranking for Semi-automatic Ontology Construction. In: *Proceedings of SAC'08: Track on Semantic Web and Applications (SWA)*, Fortaleza, Ceará, Brazil, March 16-20, ACM, 2008.<br>**No of citations: 31** | 2008 |
| 10. * | Blomqvist, E., Öhgren, A. and Sandkuhl, K.: Comparing and Evaluating Ontology Construction in an Enterprise Context. In: *Lecture Notes in Business Information Processing - Enterprise Information*, Volume 3, pp.221-240, Springer, 2008.<br>No of citations: 1 | 2008 |
| 9. * | Blomqvist, E.: OntoCase - A Pattern-based Ontology Construction Approach. In: *Proc. of OTM 2007: ODBASE - The 6th International Conference on Ontologies, DataBases, and Applications of Semantics*, Vilamoura, Algarve, Portugal, November 25-30, Springer, 2007.<br>**No of citations: 28** | 2007 |
| 8. * | Billig, A., Blomqvist, E. and Lin, F.: Semantic Matching based on Enterprise Ontologies. In: *Proceedings of OTM 2007: ODBASE - The 6th International Conference on Ontologies, DataBases, and Applications of Semantics*, Vilamoura, Algarve, Portugal, November 25-30, Springer, 2007.<br>No of citations: 14 | 2007 |
| 7. * | Albertsen, T. and Blomqvist, E.: Describing Ontology Applications. In: *Proceedings of the 4th European Semantic Web Conference (ESWC07)*, Innsbruck, Austria, June 3-7, Springer, 2007.<br>No of citations: 11 | 2007 |
| 6. * | Blomqvist, E., Öhgren, A. and Sandkuhl, K.: Ontology Construction in an Enterprise context: Comparing and Evaluating two Approaches. In: *Proceedings of 8th International Conference on Enterprise Information Systems*, Paphos, Cyprus, May 2006.<br>No of citations: 16 | 2006 |
| 5. * | Blomqvist, E. and Öhgren, A.: Constructing an Enterprise Ontology for an Automotive Supplier. In: *Proceedings of 12th IFAC Symposium on Information Control Problems in Manufacturing*, Saint-Etienne, France, May 2006.<br>No of citations: 3 | 2006 |

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|---|---|---|
| 4. * | Thörn, C., Eriksson, Ö., Blomqvist, E. and Sandkuhl, K.: Potentials and Limits of Graph-Algorithms for Discovering Ontology Patterns. In: *Proc. of the Int.l Conference on Intelligent Agents, Web Technology and Internet Commerce - IAWTIC'2005*, Wien, Austria, Nov. 2005.<br>No of citations: 1 | 2005 |
| 3. * | Blomqvist, E.: Fully Automatic Construction of Enterprise Ontologies Using Design Patterns: Initial Method and First Experiences. In: *Proc. of OTM 2005: ODBASE the 4th Int.l Conf. on Ontologies, Databases, and Applications of Semantics*, Agia Napa, Cyprus, Oct-Nov, Springer, 2005.<br>**No of citations: 29** | 2005 |
| 2. * | Blomqvist, E., Levashova, T., Öhgren, A., Sandkuhl, K., Smirnov, A. and Tarassov, V.: Configuration of Dynamic SME Supply Chains Based on Ontologies. In: *Proc. of the 2nd Intl Conference on Industrial Applications of Holonic and Multi-Agent Systems*. Copenhagen, Denmark, Aug.2005.<br>No of citations: 19 | 2005 |
| 1. * | Blomqvist, E. and Sandkuhl, K.: Patterns in Ontology Engineering – Classification of Ontology Patterns. In: *ICEIS 2005, Proceedings of the Seventh International Conference on Enterprise Information Systems, Miami, USA, May 25-28,* (ISBN 972-8865-19-8), 2005.<br>**No of citations: 71** | 2005 |

**Comments about a selection of the most recent and most prominent conferences above:**

- ISWC - International Semantic Web conference. The top conference in the Semantic Web field, A-ranked[1], yearly conference. Acceptance rate between 17-22%. Semantic Web challenge is a separate track of this conference.
- ESWC - Extended Semantic Web conference (former: European Semantic Web Conference). The second top conference in the Semantic Web field, A-ranked[1], yearly conference. Acceptance rate around 25%. Satellite events include a poster & demo session.
- EKAW - International Conference on Knowledge Engineering and Knowledge Management. Biannual conference. Acceptance rate around 30%.
- K-CAP - International conference on Knowledge Capture. A-ranked[1], biannual conference. Acceptance rate around 28%.
- ACL - Association of Computational Linguistics. A+ ranked conference[1].

**1. Peer-reviewed workshop contributions** **Year**

| | | |
|---|---|---|
| 14. | Dragisic, Z., Lambrix, P., and Blomqvist, E.: Integrating Ontology Debugging into the eXtreme Design Methodology. In: *Proceedings of the 6th Workshop on Ontology and Semantic Web Patterns (WOP 2015) co-located with the 14th International Semantic Web Conference (ISWC 2015) Bethlehem, Pensylvania, USA, October 11, 2015*, CEUR-WS Vol. 1461, 2015. No of citations: 2 | 2015 |
| 13. | Keskisärkkä, R., and Blomqvist, E.: Sharing and Reusing Continuous Queries – Expression of Interest. In: *Online Proceedings of the RDF Stream Processing Workshop at ESWC2015*, 2015. | 2015 |

[1] According to the CORE ranking, see http://www.core.edu.au/

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| 12. | Keskisärkkä, R., and Blomqvist, E.: Towards the Use of RDF Stream Processing Engines for Event Enrichment from Social Media Streams. In: *Online proceedings of the Workshop on Semantics and Analytics for Emergency Response (SAFE2015) collocated with the The 12th International Conference on Information Systems for Crisis Response and Management (ISCRAM2015),* 2015. | 2015 |
| 11. | Blomqvist, E., Zhang, Z., Gentile, A. L., Augenstein, I., and Ciravegna, F.: Statistical Knowledge Patterns for Characterizing Linked Data. In: *Proceedings of the Workshop on Ontology and Semantic Web Patterns (4th edition) - WOP2013*, CEUR workshop proceedings, 2013.<br>No of citations: 5 | 2013 |
| 10. | Rinne, M., Blomqvist, E., Keskisärkkä, R., and Nuutila, E.: Event Processing in RDF. In: *Proceedings of the Workshop on Ontology and Semantic Web Patterns (4th edition) - WOP2013*, CEUR workshop proceedings, 2013.<br>No of citations: 7 | 2013 |
| 9. | Rinne, M., Blomqvist, E.: The Event Processing ODP. In: *Proceedings of the Workshop on Ontology and Semantic Web Patterns (4th edition) - Pattern track - WOP2013*, CEUR workshop proceedings, 2013.<br>No of citations: 1 | 2013 |
| 8. | Keskisärkkä, R. and Blomqvist E.: Event Object Boundaries in RDF Streams: A Position Paper. In: *Proceedings of the 2nd International Workshop on Ordering and Reasoning - Co-located with the 12th International Semantic Web Conference (ISWC 2013) - Sydney, Australia, October 22nd, 2013*. CEUR workshop proceedings, Vol. 1059, 2013. No of citations: 2 | 2013 |
| 7. | Keskisärkkä, R. and Blomqvist, E.: Semantic Complex Event Processing for Social Media Monitoring - A Survey. In: *Proceedings of SMILE 2013, co-located with ESWC 2013*, 2013.<br>No of citations: 7 | 2013 |
| 6. | Blomqvist, E., Ceruti, M., Waters, J., and McGarry, D.: A Decision-making Format for the Semantic Web. In: *Proceedings of the Workshop on Ontology Patterns (WOP 2010), collocated with the 9th International Semantic Web Conference (ISWC 2010), Shanghai, China, November 7-11, 2010*. CEUR workshop proceedings, 2010.<br>No of citations: 1 | 2010 |
| 5. * | Blomqvist E.: Ontology Patterns - Typology and Experiences from Design Pattern Development. In: *Proceedings of SAIS 2010*, Uppsala, May 20-21, (Online proceedings, Linköping University Electronic Press) 2010.<br>No of citations: 6 | 2010 |
| 4. | Presutti V., Daga E., Gangemi A., and Blomqvist E.: eXtreme Design with Content Ontology Design Patterns. In: *Proceedings of the Workshop on Ontology Patterns (WOP 2009), collocated with the 8th International Semantic Web Conference (ISWC-2009), Washington D.C., USA, 25 October, 2009*. CEUR workshop proceedings, Vol-516, 2009.<br>**No of citations: 55** | 2009 |
| 3. * | Blomqvist, E.: Semi-automatic Ontology Engineering using Patterns. In: *Proc. of ISWC07 Doctoral Consortium*, Busan, Korea, Nov. 11-15, Springer, 2007.<br>No of citations: 10 | 2007 |
| 2. * | Blomqvist, E.: Pattern-based Ontology Construction. In: *Proc. of the Knowledge Web PhD Symposium 2007*, Innsbruck, Austria, June 2007.<br>No of citations: 1 | 2007 |

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|---|---|---|
| 1. * | Blomqvist, E., Levashova, T., Öhgren, A., Sandkuhl, K. and Smirnov, A.: Formation of Enterprise Networks for Collaborative Engineering. In: *Post-conference proceedings of 3. International Workshop on Collaborative Engineering*, Sopron, Hungary, April 2005.<br>No of citations: 6 | 2005 |

**3. Monographs** **Year**

| | | |
|---|---|---|
| 2. * | Blomqvist, E.: *Semi-automatic Ontology Construction based on Patterns*. (Doctoral dissertation). Linköping: Linköping University Electronic Press.<br>**No of citations: 37** | 2009 |
| 1. | Blomqvist, E.: *Security in Sensor Networks*. Master's Thesis and Technical Report 135 of the Control Engineering Laboratory, Helsinki University of Technology, 2003. | 2003 |

**4. Books and Book Chapters** **Year**

| | | |
|---|---|---|
| 3. | Blomqvist E., Hammar K., and Presutti V.: Engineering Ontologies with Patterns – The eXtreme Design Methodology. In: *Ontology Engineering with Ontology Design Pattern – Foundations and Applications*, IOS Press, 2016. | 2016 |
| 2. | Presutti V., Blomqvist E., Daga E., and Gangemi A.: Pattern-based Ontology Design. In: *Ontology Engineering in a Networked World* (Chap. 3), Springer 2012.<br>**No of citations: 31** | 2012 |
| 1. | Gangemi A., Presutti V., and Blomqvist E.: The Computational Ontology Perspective: Design Patterns for Web Ontologies. In: *Approaches to Legal Ontologies*, Law, Governance and Technology Series, Vol. 1 (Chapter 12), Springer, 2011.<br>No of citations: 1 | 2011 |

**5. Edited volumes**
**(for details on the most prominent conferences see comments after section 1 above)** **Year**

| | | |
|---|---|---|
| 14. | Blomqvist E., Ciancarini P., Poggi F., and Vitali F. (Editors): *Knowledge Engineering and Knowledge Management 20th International Conference, EKAW 2016, Bologna, Italy, November 19-23, 2016, Proceedings*. Springer LNCS Vol. 10024, 2016. | 2016 |
| 13. | Sack, H. and Blomqvist, E. and d'Aquin, M. and Ghidini, C. and Ponzetto, S. P. and Lange, C. (Editors): *The Semantic Web. Latest Advances and New Domains: 13th International Conference, ESWC 2016, Heraklion, Crete, Greece, May 29--June 2, 2016, Proceedings*. Springer LNCS Vol. 9678, 2016. | 2016 |
| 12. | Blomqvist, E., Hitzler, P., Krisnadhi, A., Narock, T., and Solanki, M. (Editors): *Proceedings of the 6th Workshop on Ontology and Semantic Web Patterns (WOP 2015) co-located with the 14th International Semantic Web Conference (ISWC 2015) Bethlehem, Pensylvania, USA, October 11, 2015*. CEUR-WS Vol. 1461, 2015. | 2015 |

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|---|---|---|
| 11. | Lambrix, P., Hyvönen, E., Blomqvist, E., Presutti, V., Qi, G., Sattler, U., Ding, Y., Ghidini, C. (Editors): *Knowledge Engineering and Knowledge Management EKAW 2014 Satellite Events, VISUAL, EKM1, and ARCOE-Logic, Linköping, Sweden, November 24-28, 2014. Revised Selected Papers.* Springer LNCS Vol. 8982, 2015. | 2015 |
| 10. | Presutti, V., Blomqvist, E., Troncy, R., Sack, H., Papadakis, I., and Tordai, A. (Editors): *The Semantic Web: ESWC 2014 Satellite Events - ESWC 2014 Satellite Events, Anissaras, Crete, Greece, May 25-29, 2014, Revised Selected Papers*. Lecture Notes in Computer Science 8798, Springer, 2014. | 2014 |
| 9. | Blomqvist, E., and Groza, T. (Editors): *Proceedings of the Posters & Demos Track of the International Semantic Web Conference 2013*, CEUR workshop proceedings, 2013. | 2013 |
| 8. | Pellegrini, T., Sack, H., Blomqvist, E., Di Noia, T., Sabou, M. et al. (Editors): *Proceedings of I-SEMANTICS 2013, 4th-6th September 2013, Messe Graz, Austria*. ACM ICP, 2013. | 2013 |
| 7. | Blomqvist, E., Brewster, C., Lanfranchi, V., and Mazumdar, S. (Editors): *Proceedings of Social Media and Linked Data for Emergency Response (SMILE) Co-located with the 10th Extended Semantic Web Conference – May 26-30, 2013 at Montpellier, France*, CEUR workshop proceedings, 2013. | 2013 |
| 6. | Cudré-Mauroux, P., Heflin, J., Sirin, E., Tudorache, T., Euzenat, J., Hauswirth, M., Xavier Parreira, J., Hendler, J., Schreiber, G., Bernstein, A., and Blomqvist E. (Editors): *The Semantic Web – ISWC2012 – 11th International Semantic Web Conference, Boston (MA), USA, November 11-15 2012*, Vol. 7649-7650, Springer LNCS, 2012. | 2012 |
| 5. | Blomqvist, E., Gangemi, A., Hammar, K., and Suaréz-Figueroa, M. C. (Editors): *Proceedings of the 3rd International Workshop on Ontology Patterns – WOP 2012 – Workshop at the 11th International Semantic Web Conference, Boston (MA), USA, November 12, 2012.* CEUR workshop proceedings (forthcoming), 2012. | 2012 |
| 4. | Aroyo, L., Welty C., Alani H., Taylor J., Bernstein A., Kagal L., Noy N., and Blomqvist E. (Editors): *The Semantic Web – ISWC2011 – 10th International Semantic Web Conference, Bonn, Germany, October 2011*, Vol. 7031-7032, Springer LNCS, 2011. | 2011 |
| 3. | Blomqvist E., Chaudhri V. K., Corcho O., Presutti V., and Sandkuhl K. (Eds): *Proc. of the 2nd International Workshop on Ontology Patterns - WOP2010 - Workshop at the 9th International Semantic Web Conference - ISWC 2010 Workshops Volume VIII - Shanghai, China, November 8, 2010.* CEUR workshop proceedings, Vol 671, 2010. | 2010 |
| 2. | Blomqvist E., Sandkuhl K., Scharffe F. and Svatek V. (Editors): *Proceedings of the Workshop on Ontology Patterns (WOP 2009), collocated with the 8th International Semantic Web Conference (ISWC-2009), Washington D.C., USA, 25 October, 2009.* CEUR workshop proceedings, Vol 516, 2009. | 2009 |
| 1. | Blomqvist E. (Editor): *EKAW 2008 - 16th International Conference on Knowledge Engineering and Knowledge Management - Knowledge Patterns. Poster and Demo Proceedings.* (Online proceedings), 2008. | 2008 |

| | **6. Other publications** | **Year** |
|---|---|---|
| 1. | Blomqvist E., Hitzler P., Janowicz K., Krisnadhi A., Narock T., and Solanki M.: Considerations regarding Ontology Design Patterns. (Editorial) *Semantic Web* 7(1), 1-7, 2016.<br>No of citations: 7 | 2016 |

## Teaching – Courses and thesis supervision

Below my teaching experience is presented, **except for PhD student supervision, which is mentioned directly in the CV (c.f. point 4.1).** First summarised in a table for the last 5.5 years, i.e. since I started working at LiU, which complements supplement 9 that includes a similar table for my teaching activities at Jönköping University up until spring 2011. From 2003-2011 I spent a total of 2591hours on teaching activities related to my employment at Jönköping University (see suppl. 9), and since 2011 I have spent a total of 833 hours of teaching activities at Linköping University (or as a guest teacher), which in total sums up to 3424 hours. Missing from these two tables, and the total sum of hours, are only the teaching activities that I participated in just prior to, and during, my postdoc (at CNR, Italy - 2009-2010), however, these are still included in the detailed account below the table in this document. The motivation for omitting these from the count of hours is that the uncertainty of the amount of hours spent is too high, considering that no teaching planning was made at all during my postdoc.

| Time | University, program and course title | Level | No of students /theses | Credits | Number of hours[1] | Teacher role and responsibility | Forms of teaching |
|---|---|---|---|---|---|---|---|
| Ht16 | Linköping University, IT program year 2, PBL group supervision | Bachelor | 6 | 4 | 64 | Supervision of one PBL group | PBL group work |
| Ht16 | Linköping University, TDDD99 Professionalism for Engineers | Bachelor | 17 | 1 (in Ht16) | 60 | Mentor of two dialogue groups | Dialogue seminars + grading of assignments |
| Ht15 | Linköping University, IT program year 2, PBL group supervision | Bachelor | 7 | 4 | 64 | Supervision of one PBL group | PBL group work |
| Ht15 | Linköping University, TDDD65 Introduction to Academic Studies | Master | 5 | 6 (in larger course) | 14 | Supervision of individual assignments | Written assignments |
| 2015 | Linköping University, TDDD99 Professionalism for Engineers | Bachelor | 18 | 2 | 120 | Mentor of two dialogue groups | Dialogue seminars + grading of assignments |
| Ht14 | Linköping University, IT program year 2, PBL group supervision | Bachelor | 6 | 4 | 64 | Supervision of one PBL group | PBL group work |
| Ht14 | Linköping University, TDDD65 Introduction to Academic Studies | Master | 2 | 6 (in larger course) | 8 | Supervision of individual assignments | Written assignments |
| 2014 | Linköping University, Masters theses | Master | 2 | 20 | 25 | Supervisor | - |

[1] Hour count is based on my own notes and the course schedule, since work plans for teaching at the division are not regularly distributed to the employees, nor broken down into hours.

| Time | University, program and course title | Level | No of students /theses | Credits | Number of hours[1] | Teacher role and responsibility | Forms of teaching |
|---|---|---|---|---|---|---|---|
| Ht13-Vt14 | Linköping University, Systemvetare (year 1), 725G61 Programmering, grundkurs | Bachelor | 70 | 6 | ~150 | Course design, examiner, lecturer, lab supervisor | Lectures, lessons, programming labs, project work |
| Ht13 | Linköping University, TDDD65 Introduction to Academic Studies | Master | 3 | 6 (in larger course) | 10 | Supervision of individual assignments | Written assignments |
| Vt13 | Centrum för Informationslogistik, Ljungby,Informationslogistiska tillämpningar | Bachelor | 30 | - | 3 | Guest lecture | Guest lecture |
| Ht12-Vt13 | Linköping University, Systemvetare (year 1), 725G61 Programmering, grundkurs | Bachelor | 70 | 6 | ~120 | Course design, examiner, lecturer, lab supervisor | Lectures, lessons, programming labs, project work |
| Ht12 | Linköping University, TDDD65 Introduction to Academic Studies | Master | 2 | 6 (in larger course) | 8 | Supervision of individual assignments | Written assignments |
| Ht12 | Linköping University, PhD course, Semantic Technologies in Practice | PhD | 11 | 10 | 50 | Examiner, course design | Self-study online module + lectures and labs + project assignment |
| 2012 | Linköping University, Masters theses | Master | 1 | 20 | 15 | Examiner | - |
| 2012 | Linköping University, Bachelor theses | Bachelor | 1 | 10.5 | 15 | Examiner and supervisor | - |
| Ht11 | Jönköping University, Research Methodology | Master | - | - | 3 | Guest lecturer | Guest lecture |
| Vt11 | University of Bologna, Computational Ontologies | PhD | 12 | - | 40 | Course design, lecturer, supervision of exercises | Mix of lectures and hands-on exercises |
| | **Sum of hours (in the past 5.5 years):** | | | | **833h** | | |

In addition to this summary (table above + supplement 9) I provide a more detailed account of the activities below. The list is divided into PhD courses, via master level courses to basic courses on bachelor level and below. In the text each set of courses is presented in chronological order, starting from the most recent. For PhD courses and master level courses, all teaching is included in this detailed account (2003-2016), while on bachelor and basic level only the last 6 years are included (2011-2016). For thesis supervision, only supervision from the last 6 years is included.

# PhD courses

## PhD courses in 2012

| | |
|---|---|
| **Course title:** | Semantic Technologies in Practice |
| **University:** | Linköping University |
| **Time period:** | 2012-HT |
| **Level:** | PhD course |
| **Scope:** | Part I - self-study (corresponding to about 5 lectures) and 4 homework exercises, on the basics of the Semantic Web.<br>Part II - 10h lectures + 15h supervised exercises, introducing various aspects of Semantic Web technologies.<br>Part III - individual (practical) course project. |
| **Forms and methods:** | Part I was an online self-study module, designed by me, where students handed in solutions to the exercises online to get feedback. Part II was a mix of traditional lectures, combined with hands-on with exercise sessions. Exercises were done mostly in groups of two students, but the final exercise was a "ontology engineering project simulation" involving the whole group working on the same project in a realistic manner. Part III was an individual project, selected and carried out by each student. |
| **Language:** | English |
| **IT-support:** | Exercises performed in the ontology engineering environment TopBraid Composer. LiU course webpages for presenting course material and supporting the online self-study part. PowerPoint for lectures. Various state-of-the-art Semantic Web tooling used for the exercises. |
| **Course responsibility:** | Yes |

## PhD courses in 2011

| | |
|---|---|
| **Course title:** | Computational Ontologies |
| **University:** | University of Bologna |
| **Time period:** | 2011-05-02 – 2011-05-12 (mix between half days and full days) |
| **Level:** | PhD course |
| **Scope:** | Course containing 5 full days of lectures and exercises/mini-projects, spread out over the course period. My participation concerned giving lectures, as well as planning and supervising the practical ontology engineering parts, supervision of the collaborative project, and development of questionnaires and exercises before the course. |
| **Forms and methods:** | Traditional lectures mixed with exercises. A few hours per day were spent on exercises (mini-projects) performed by the participants in groups of 2-3 students. Each exercise session was |

| | |
|---|---|
| | concluded by a questionnaire where the students evaluated the content, planning, tools and methods, as well as their own effort and contribution. The last day the students performed a collaborative project where the small groups collaboratively developed a larger ontology in semi-realistic setting (e.g. with a simulated customer etc.). |
| **Language:** | English |
| **IT-support:** | Exercises performed in the ontology engineering environment TopBraid Composer. Wiki for presenting course material. PowerPoint for lectures. |
| **Course responsibility:** | No – but responsible for independently planning exercises, final project, and development of questionnaires. |

| | |
|---|---|
| **Course title:** | Research Methods in Product Realization |
| **University:** | Pro Viking forskarskola, Jönköping University |
| **Time period:** | 2011-03-15 (2 hours) |
| **Level:** | PhD course |
| **Scope:** | Guest lecture entitled "Research Methodology in Information Engineering" |
| **Forms and methods:** | Lecture. |
| **Language:** | English |
| **IT-support:** | PowerPoint for lecture slides. |
| **Course responsibility:** | No – but responsible for independently planning this particular lecture. |

### PhD courses in 2010

| | |
|---|---|
| **Course title:** | Computational Ontologies |
| **University:** | University of Bologna |
| **Time period:** | 2010-02-02 – 2010-02-10 (mix between half days and full days) |
| **Level:** | PhD course |
| **Scope:** | Course containing 7 full days of lectures and exercises/mini-projects. My participation concerned supervision of the practical parts (approximately 3 hours during 5 of the days), one lecture of 2 hours, supervision of the final collaborative project, and development of questionnaires and exercises before the course. |
| **Forms and methods:** | Traditional lectures mixed with exercises. 3 hours per day was spent on exercises (mini-projects) performed by the participants in groups of 2-3 students. Each exercise session was concluded by a questionnaire where the students evaluated the content, planning, tools and methods, as well as their own effort and contribution. The last day the students performed a collaborative project where the small groups collaboratively developed a |

| | |
|---|---|
| | larger ontology in semi-realistic setting (e.g. with a simulated customer etc.). |
| **Language:** | English |
| **IT-support:** | Exercises performed in the ontology engineering environment TopBraid Composer. Wiki for presenting course material. PowerPoint for lectures. |
| **Course responsibility:** | No – but responsible for independently planning exercises, final project, and development of questionnaires. |

### PhD courses in 2009

| | |
|---|---|
| **Course title:** | Enterprise Knowledge Management |
| **University:** | Jönköping University/Linköping University |
| **Time period:** | 2009-11-16 – 2009-11-17 (this part of the course) |
| **Level:** | PhD course |
| **Scope:** | One part of a course, consisting of two full days. I alone performed the planning of this part, but shared the actual teaching with Aldo Gangemi. Day one I supervised a 3 hours exercise, and day two I had a two hour lecture and then supervised a 3 hour exercise. |
| **Forms and methods:** | Traditional lectures only one hour per day, the rest of the time was spent on interactive lectures (where the teacher shows something in a tool and the students try to repeat it on their own computer) and exercises (mini-projects) performed in groups of 2-3 students. Every exercise session was concluded through a questionnaire here the students evaluated the content, planning, tools and methods, as well as their own effort and contribution. |
| **Language:** | English |
| **IT-support:** | Interactive lectures and exercises performed using the ontology engineering environment TopBraid Composer. Wiki for presenting course material. PowerPoint for lectures. |
| **Course responsibility:** | No – but responsible for independently planning the particular session. |

### PhD courses in 2008

| | |
|---|---|
| **Course title:** | NeOn 2008 Tutorial on Computational Ontologies |
| **University:** | University of Bologna |
| **Time period:** | 2008-09-15 – 2008-09-18 (6 hours/day) |
| **Level:** | PhD course |
| **Scope:** | Course containing 6 full days of lectures and exercises/mini-projects. My participation concerned supervision of the practical parts (approximately 3 hours per day) and development of |

| | |
|---|---|
| | questionnaires and exercises before the course. |
| **Forms and methods:** | Traditional lectures mixed with exercises. 3 hours per day was spent on exercises (mini-projects) performed by the participants in groups of 2-3 students. Each exercise session was concluded by a questionnaire where the students evaluated the content, planning, tools and methods, as well as their own effort and contribution. |
| **Language:** | English |
| **IT-support:** | Exercises performed in the ontology engineering environment TopBraid Composer. Wiki for presenting course material. PowerPoint for lectures. |
| **Course responsibility:** | No – but responsible for independently planning exercises and development of questionnaires. |

## Master level teaching

### Master courses and supervision in 2015

| | |
|---|---|
| **Course title:** | TDDD65 Introduction to the Theory of Computation - Introduction to Advanced Academic Studies |
| **University:** | Linköping University |
| **Time period:** | 2015-HT |
| **Level:** | Master students |
| **Scope:** | Supervising 5 students in their individual writing assignments, and grading their assignments. Assignments consist of writing an article summary of a given article and then a critical review of two articles. |
| **Forms and methods:** | Seminars + individual written feedback. |
| **Language:** | English |
| **IT-support:** | Using Urkund for plagiarism control, and Webreg for grading. |
| **Course responsibility:** | No |

### Master courses and supervision in 2014

| | |
|---|---|
| **Course title:** | TDDD65 Introduction to the Theory of Computation - Introduction to Advanced Academic Studies |
| **University:** | Linköping University |
| **Time period:** | 2014-HT |
| **Level:** | Master students |
| **Scope:** | Supervising 2 students in their individual writing assignments, and grading their assignments. Assignments consist of writing |

| | |
|---|---|
| | an article summary of a given article and then a critical review of two articles. |
| **Forms and methods:** | Seminars + individual written feedback. |
| **Language:** | English |
| **IT-support:** | Using Urkund for plagiarism control, and Webreg for grading. |
| **Course responsibility:** | No |

| | |
|---|---|
| **Course title:** | Master thesis supervision |
| **University:** | Linköping University |
| **Time period:** | Examined 2014 |
| **Level:** | Master thesis, 20 p |
| **Scope:** | Supervisor of Deepak Uppukunnathe, thesis with title "Semantic Formats for Emergency Management" Examiner: Henrik Eriksson. |
| **Forms and methods:** | Supervision of implementation and research work, as well as written report and oral presentation + opposition. |
| **Language:** | English |
| **IT-support:** | Word |
| **Course responsibility:** | Supervisor of this particular thesis |

| | |
|---|---|
| **Course title:** | Master thesis supervision |
| **University:** | Linköping University |
| **Time period:** | Examined 2014 |
| **Level:** | Master thesis, 20 p |
| **Scope:** | Supervisor of Ylva Hecktor, thesis with title "Porting XDtools from NeOn Toolkit to Protégé" Examiner: Henrik Eriksson. |
| **Forms and methods:** | Supervision of implementation and research work, as well as written report and oral presentation + opposition. |
| **Language:** | English |
| **IT-support:** | Word |
| **Course responsibility:** | Supervisor of this particular thesis |

## Master courses and supervision in 2013

| | |
|---|---|
| **Course title:** | TDDD65 Introduction to the Theory of Computation - Introduction to Advanced Academic Studies |
| **University:** | Linköping University |
| **Time period:** | 2013-HT |

| | |
|---|---|
| **Level:** | Master students |
| **Scope:** | Supervising 3 students in their individual writing assignments, and grading their assignments. Assignments consist of writing an article summary of two given articles and then a critical review of two more articles. |
| **Forms and methods:** | Seminars + individual written feedback. |
| **Language:** | English |
| **IT-support:** | Using Urkund for plagiarism control, and Webreg for grading. |
| **Course responsibility:** | No |

### Master courses and supervision in 2012

| | |
|---|---|
| **Course title:** | TDDD65 Introduction to the Theory of Computation - Introduction to Advanced Academic Studies |
| **University:** | Linköping University |
| **Time period:** | 2012-HT |
| **Level:** | Master students |
| **Scope:** | Supervising 2 students in their individual writing assignments, and grading their assignments. Assignments consist of writing an article summary of two given articles and then a critical review of two more articles. |
| **Forms and methods:** | Seminars + individual written feedback. |
| **Language:** | English |
| **IT-support:** | Using Urkund for plagiarism control, and Webreg for grading. |
| **Course responsibility:** | No |

| | |
|---|---|
| **Course title:** | Master thesis supervision |
| **University:** | Linköping University |
| **Time period:** | Examined 2012 |
| **Level:** | Master thesis, 20 p |
| **Scope:** | Examiner of Dodla, Krishna Chaitanya, thesis with title "Does environment affect the user experience?" Supervisor: Johan Åberg. |
| **Forms and methods:** | Examination through written report and oral presentation + opposition. |
| **Language:** | English |
| **IT-support:** | Word |
| **Course responsibility:** | Examiner of this particular thesis |

## Master courses and supervision in 2011

| | |
|---|---|
| **Course title:** | Research Methodology |
| **University:** | Jönköping University |
| **Time period:** | 2011-10-07 (2 hours) |
| **Level:** | Master course |
| **Scope:** | Guest lecture entitled "Research Methodology in Information Engineering" |
| **Forms and methods:** | Lecture. |
| **Language:** | English |
| **IT-support:** | PowerPoint for lecture slides. |
| **Course responsibility:** | No – but independently responsible for this particular lecture. |

| | |
|---|---|
| **Course title:** | Information Retrieval (7.5hp) |
| **University:** | Jönköping University |
| **Time period:** | 2011-01-17 – 2011-03-22 |
| **Level:** | Master course |
| **Scope:** | Independently designing, planning and carrying out the complete course. Teaching together with one assistant (PhD student - supervising the programming part of the projects). The course is given at the master program in Information Engineering and Management. The course introduces the basics in Information Retrieval (IR), but has its focus on recent developments and how ontologies can be used within IR (to link to the course in Knowledge Management and Knowledge Representation the students took prior to this course). |
| **Forms and methods:** | Only four introductory lectures for basic content, the rest of the theory is covered in seminars prepared and held by student groups. Practical part is covered through student projects, where they develop a complete search engine based on ontologies. Written exam, divided into parts addressing the different learning objectives and graded according performance on the different parts (mapped to different abilities, e.g. to simply "remember" something or to be able to also "analyze" or "evaluate" some topic). Continuous course evaluation through questionnaires and muddy cards. |
| **Language:** | English |
| **IT-support:** | Eclipse Java development environment for projects. LMS: PingPong. PowerPoint for lectures. |
| **Course responsibility:** | Yes, complete course responsibility and examiner. |

## Master courses and supervision in 2010

| | |
|---|---|
| **Course title:** | Knowledge Management and Knowledge Representation (7.5hp) |
| **University:** | Jönköping University |
| **Time period:** | 2010-10-25 – 2010-12-12 |
| **Level:** | Master course |
| **Scope:** | My part of the course covered two lectures on knowledge representation and the semantic web, one lab on basic ontology engineering, as well as exam questions on these topics. |
| **Forms and methods:** | Lectures introducing knowledge representation and practical ontology engineering. One lab, consisting of two parts; studying existing ontologies, and developing ontologies. Lab was carried out in a supervised session of 3 hours in a computer room, and finalized independently by the students. Written exam with a mix of theoretical and practical problems. |
| **Language:** | English |
| **IT-support:** | Tool for ontology engineering: TopBraid Composer, Pellet reasoner. Web browser for exploring the semantic web. LMS: PingPong. PowerPoint for lectures. |
| **Course responsibility:** | No – but independent design of the knowledge representation part of the course. |

| | |
|---|---|
| **Course title:** | Information Logistics (7.5hp) |
| **University:** | Jönköping University |
| **Time period:** | 2010-10-25 – 2010-12-12 |
| **Level:** | Master course |
| **Scope:** | Independently designing, planning and carrying out the complete course. Teaching together with one assistant (PhD student - supervising 3 out of 5 assignment projects). The course is the final course of the master program in Information Engineering and Management, targeting semantic technologies for information logistical applications. Focus on current research. |
| **Forms and methods:** | Lectures introducing advanced ontology engineering, and giving an overview of the research topics in information logistics. Labs exercising advanced ontology engineering. Project assignments carried out as a theoretical study and analysis of state-of-the-art approaches in a sub-field of information logistics, reported orally and in a written report. Written exam. |
| **Language:** | English |
| **IT-support:** | Tool for ontology engineering: TopBraid Composer, Pellet reasoner. Web browser for exploring the semantic web. LMS: PingPong. PowerPoint for lectures. |

| | |
|---|---|
| **Course responsibility:** | Yes, complete course responsibility and examiner. |

| | |
|---|---|
| **Course title:** | Software Engineering |
| **University:** | Università degli studi di Roma – La Sapienza |
| **Time period:** | 2010-03-10 – 2010-03-18 (guest lecturer, 2 days consisting of 3+2 hours) |
| **Level:** | Master course |
| **Scope:** | Guest lecture in Software Cost Estimation and Function Points, as well as exercising Function Points. Development of two exam questions with correction template. |
| **Forms and methods:** | Lecture, 3 hours, and exercise solved together with students, 2 hours. Written exam. |
| **Language:** | English |
| **IT-support:** | Wiki for presenting course material, and PowerPoint. |
| **Course responsibility:** | No |

### Master courses and supervision in 2009

| | |
|---|---|
| **Course title:** | Ontologies and Semantic Web |
| **University:** | Universidad Politécnica de Madrid |
| **Time period:** | 2009-12-09 (guest lecture) |
| **Level:** | Master curse for program: Research Master in Artificial Intelligence |
| **Scope:** | Part of the course concerning Ontology Design Patterns. Two hours lecture and a practical homework-task. Planning of the lecture and exercise. |
| **Forms and methods:** | Traditional lecture also containing demonstrations (tools and methods). Articles read beforehand by the students, practical task explained during lecture and handed in by the students one week later together with a questionnaire. |
| **Language:** | English |
| **IT-support:** | Tool for ontology engineering: NeOn toolkit. PowerPoint for lecture. |
| **Course responsibility:** | No – but responsible for planning this session. |

| | |
|---|---|
| **Course title:** | Information Logistics |
| **University:** | Jönköping University |
| **Time period:** | 2009-11-18 – 2009-11-25 (5 full days) |
| **Level:** | Master course |

| | |
|---|---|
| **Scope:** | The exercise part of the course consisted of 5 exercise sessions, each 3 hours in a computer room with the teacher available for questions, and 2 hours of lectures or interactive lectures before each of the 5 exercises. Planning and development of the exercises and lectures, correction of reports and supervision, development of exam questions for this particular part and correction of these. |
| **Forms and methods:** | Lectures mixed with interactive lectures where the students follow and mimic what the teacher does on their own computer. Exercise session when the students independently solve modelling problems in groups of two students. Exercises are concluded by a questionnaire to evaluate content, planning, methods and tools, and their own performance. |
| **Language:** | English |
| **IT-support:** | Tool for ontology engineering: TopBraid Composer, Pellet reasoner. Web browser for exploring the semantic web. LMS: PingPong. PowerPoint for lectures. |
| **Course responsibility:** | No – but responsible for planning and development of the exercises and corresponding lectures. |

| | |
|---|---|
| **Course title:** | Software Engineering |
| **University:** | Università degli studi di Roma – La Sapienza |
| **Time period:** | 2009-04-17 – 2009-04-21 (guest lecturer, 2 days consisting of 3+2 hours) |
| **Level:** | Master course |
| **Scope:** | Guest lecture in Software Cost Estimation and Function Points, as well as exercising Function Points. Development of two exam questions with correction template. |
| **Forms and methods:** | Lecture, 3 hours, and exercise solved together with students, 2 hours. Written exam. |
| **Language:** | English |
| **IT-support:** | Wiki for presenting course material, and PowerPoint. |
| **Course responsibility:** | No |

### Master courses and supervision in 2008

| | |
|---|---|
| **Course title:** | Information Logistics |
| **University:** | Jönköping University |
| **Time period:** | 2008-10-20 – 2008-12-14 (5 sessions + project supervision once a week) |
| **Level:** | Master course |
| **Scope:** | The exercise part of the course consisted of 4 exercise sessions, each 3 hours in a computer room with the teacher available for |

| | |
|---|---|
| | questions, and 2+2 hours of lectures (before the first exercise and between the second and third). Planning and development of the exercises and lectures, correction of reports and supervision, development of exam questions for this particular part and correction of these. In addition, supervision of two project groups (theoretical studies in Ontology Learning and Ontology Matching) resulting in a project report and a presentation in front of the other students. |
| **Forms and methods:** | Traditional lectures to introduce the theory to be exercised. Exercise session when the students independently solve modelling problems in groups of two students. Exercises are concluded by a questionnaire to evaluate content, planning, methods and tools, and their own performance. Project groups are supervised in weekly meetings with pre-determined topic and deadlines for partial results. The results are presented in a written report and an oral presentation. |
| **Language:** | English |
| **IT-support:** | Ontology engineering tool: TopBraid Composer. LMS: PingPong. PowerPoint for lectures. |
| **Course responsibility:** | No – but responsible for planning and development of the exercises and corresponding lectures, as well as for proposing and describing two of the project assignments |

| | |
|---|---|
| **Course title:** | Information and Knowledge Management |
| **University:** | Jönköping University |
| **Time period:** | 2008-01 – 2008-04 (6 sessions + correction of reports) |
| **Level:** | Master course |
| **Scope:** | Supervision of 6 exercises (in ER-modelling, ontologies and rules, document modelling and XML), each of 4 hours, and in addition correction of written reports. |
| **Forms and methods:** | The students conduct practical exercises at the computer, or on paper, in groups of two students, while the teacher is available for questions. The students hand in a report that it corrected by the teacher and are possible asked for corrections. |
| **Language:** | English |
| **IT-support:** | Parts of the exercises were preformed with computer support, such as MS Visio, Protégé, and validation tools for DTD and XML. LMS: PingPong. |
| **Course responsibility:** | No |

## Master courses and supervision in 2006

| | |
|---|---|
| **Course title:** | Software quality and project management |
| **University:** | Jönköping University |
| **Time period:** | 2006-11-15 – 2006-12-20 (4 meetings + presentation) |
| **Level:** | Master course |
| **Scope:** | Part of a course, I was only involved in project supervision and in the exam. Supervision of 3 project groups, 4 supervision meetings, and an oral presentation before the other students of the course. Correction of written reports. Participation at oral exams (outside the time period above) as a "secretary". |
| **Forms and methods:** | The students performed projects in groups of 2-3 students, through finding, reading and analyzing research articles and books within a given area. The result is a report and a presentation. The final exam of the course is an individual oral exam. Each exam there is a "secretary" who notes down the student's answers and helps the examiner to grade the student. |
| **Language:** | English |
| **IT-support:** | LMS: PingPong, and Urkund for plagiarism check. |
| **Course responsibility:** | No – participated in extending the list of projects |

| | |
|---|---|
| **Course title:** | (introduction for new master students) |
| **University:** | Jönköping University |
| **Time period:** | 2006-08-24 (2hrs) |
| **Level:** | Master programs |
| **Scope:** | A lecture to inform about rules and principles of Swedish universities, report writing, and study techniques (to prevent problems with cultural differences, plagiarism etc.) |
| **Forms and methods:** | Lecture and time for discussion |
| **Language:** | English |
| **IT-support:** | LMS: PingPong (for links to material). |
| **Course responsibility:** | Developed and conducted the lecture independently, as an assignment from the program responsible at the university. |

| | |
|---|---|
| **Course title:** | Software quality and project management |
| **University:** | Jönköping University |
| **Time period:** | 2006-04-18 – 2006-06-16 (4 meetings + presentation) |
| **Level:** | Master course |
| **Scope:** | Part of a course, I was only involved in project supervision and in the exam. Supervision of 2 project groups, 4 supervision meetings, and an oral presentation before the other students of |

| | |
|---|---|
| | the course. Correction of written reports. Participation at oral exams (outside the time period above) as a "secretary". |
| **Forms and methods:** | The students performed projects in groups of 2-3 students, through finding, reading and analyzing research articles and books within a given area. The result is a report and a presentation. The final exam of the course is an individual oral exam. Each exam there is a "secretary" who notes down the student's answers and helps the examiner to grade the student. |
| **Language:** | English |
| **IT-support:** | LMS: PingPong, and Urkund for plagiarism check. |
| **Course responsibility:** | No |

### Master courses and supervision in 2005

| | |
|---|---|
| **Course title:** | Software quality and project management |
| **University:** | Jönköping University |
| **Time period:** | 2005-04-19 – 2005-05-19 (5 meetings + presentation) |
| **Level:** | Master course |
| **Scope:** | Part of a course, I was only involved in project supervision and in the exam. Supervision of 2 project groups, 5 supervision meetings, and an oral presentation before the other students of the course. Correction of written reports. Participation at oral exams (outside the time period above) as a "secretary". |
| **Forms and methods:** | The students performed projects in groups of 2-3 students, through finding, reading and analyzing research articles and books within a given area. The result is a report and a presentation. The final exam of the course is an individual oral exam. Each exam there is a "secretary" who notes down the student's answers and helps the examiner to grade the student. |
| **Language:** | English |
| **IT-support:** | LMS: PingPong, and Urkund for plagiarism check. |
| **Course responsibility:** | No |

### Master courses and supervision in 2004

| | |
|---|---|
| **Course title:** | Software quality and project management |
| **University:** | Jönköping University |
| **Time period:** | 2004-03-30 – 2004-05-11 (6 meetings + presentation) |
| **Level:** | Master course |
| **Scope:** | Part of a course, I was only involved in project supervision and in the exam. Supervision of 2 project groups, 6 supervision |

| | |
|---|---|
| | meetings, and an oral presentation before the other students of the course. Correction of written reports. Participation at oral exams (outside the time period above) as a "secretary". |
| **Forms and methods:** | The students performed projects in groups of 2-3 students, through finding, reading and analyzing research articles and books within a given area. The result is a report and a presentation. The final exam of the course is an individual oral exam. Each exam there is a "secretary" who notes down the student's answers and helps the examiner to grade the student. |
| **Language:** | English and Swedish |
| **IT-support:** | LMS: PingPong. |
| **Course responsibility:** | No |

## Teaching on Bachelor level (including shorter programs, e.g. KY)

### Bachelor courses (or below) and supervision in 2016

| | |
|---|---|
| **Course title:** | PBL-group supervision at the IT-program (Civilingenjör IT) |
| **University:** | Linköping University |
| **Time period:** | 2016-HT (4 classroom hours per week) |
| **Level:** | 2:nd year students |
| **Scope:** | Supervising one group, working according to PBL principles, with two meetings of 2 hours each every week during the semester. Scenario topics originate from all the courses of this semester. |
| **Forms and methods:** | PBL (problem-based learning) group work supervision |
| **Language:** | Swedish |
| **IT-support:** | Google drive for shared documents. |
| **Course responsibility:** | Yes, responsible for the whole program semester. |

| | |
|---|---|
| **Course title:** | TDDD99 Ingenjörsprofessionalism |
| **University:** | Linköping University |
| **Time period:** | 2016 |
| **Level:** | Students from years 1-3 of the D program |
| **Scope:** | Mentoring two groups of 8-10 students, working according to a methodology called "dialogseminarium". The students perform some tasks related to a theme, hand in some assignments, then write a reflection text related to their experiences of the themes, and texts are discussed in a seminar (dialogseminarium). |

| | |
|---|---|
| | Reflection texts are graded by the mentor on a scale U, 3-5. |
| **Forms and methods:** | Dialogseminarium |
| **Language:** | Swedish |
| **IT-support:** | Excel sheets and Webreg for grading. |
| **Course responsibility:** | No |

### Bachelor courses (or below) and supervision in 2015

| | |
|---|---|
| **Course title:** | PBL-group supervision at the IT-program (Civilingenjör IT) |
| **University:** | Linköping University |
| **Time period:** | 2015-HT (4 classroom hours per week) |
| **Level:** | 2:nd year students |
| **Scope:** | Supervising one group, working according to PBL principles, with two meetings of 2 hours each every week during the semester. Scenario topics originate from all the courses of this semester. |
| **Forms and methods:** | PBL (problem-based learning) group work supervision |
| **Language:** | Swedish |
| **IT-support:** | Google drive for shared documents. |
| **Course responsibility:** | Yes, responsible for the whole program semester. |

| | |
|---|---|
| **Course title:** | TDDD99 Ingenjörsprofessionalism |
| **University:** | Linköping University |
| **Time period:** | 2015 |
| **Level:** | Students from years 1-3 of the D program |
| **Scope:** | Mentoring two groups of 8-10 students, working according to a methodology called "dialogseminarium". The students perform some tasks related to a theme, then write a reflection text related to their experiences of the themes, and texts are discussed in a seminar (dialogseminarium). Reflection texts are graded by the mentor on a scale U, 3-5. |
| **Forms and methods:** | Dialogseminarium |
| **Language:** | Swedish |
| **IT-support:** | Excel sheets and Webreg for grading. |
| **Course responsibility:** | No |

### Bachelor courses (or below) and supervision in 2014

| | |
|---|---|
| **Course title:** | PBL-group supervision at the IT-program (Civilingenjör IT) |
| **University:** | Linköping University |
| **Time period:** | 2014-HT (4 classroom hours per week) |
| **Level:** | 2:nd year students |
| **Scope:** | Supervising one group, working according to PBL principles, with two meetings of 2 hours each every week during the semester. Scenario topics originate from all the courses of this semester. |
| **Forms and methods:** | PBL group work supervision |
| **Language:** | Swedish |
| **IT-support:** | Google drive for shared documents. |
| **Course responsibility:** | Yes, responsible for the whole program semester. |

### Bachelor courses (or below) and supervision in 2013

| | |
|---|---|
| **Course title:** | 725G61 Programmering, grundkurs |
| **University:** | Linköping University |
| **Time period:** | 2013-10 - 2014-02 |
| **Level:** | Course in the program Systemvetare (180hp), year 1 |
| **Scope:** | Complete course responsibility, including course design and planning, examiner. Course consisted of programming basics, as well as object oriented programming concepts. Practical exercises in Java, both in the form of labs and a course project. |
| **Forms and methods:** | Lectures with demonstrations of practical programming in Eclipse, lessons with more practical focus. Computer labs and course project in groups of 2 students. Small tests ("duggor") for checking individual understanding. |
| **Language:** | Swedish |
| **IT-support:** | PowerPoint for lecture slides. Programming using Eclipse and Java SDK. |
| **Course responsibility:** | Yes, examiner and course designer |

| | |
|---|---|
| **Course title:** | Informationslogistiska tillämpningar |
| **University:** | Centrum för Informationslogistik, Ljungby |
| **Time period:** | 2013-02-18 (3 hours) |
| **Level:** | Course in the program Informationslogistik (180hp), year 3 |
| **Scope:** | Guest lecture |
| **Forms and methods:** | Lecture with demonstrations of tools and methods. Focus on research questions and applications. |

| | |
|---|---|
| **Language:** | Swedish |
| **IT-support:** | PowerPoint for lecture slides. |
| **Course responsibility:** | No – but responsible for this particular part of the course. |

### Bachelor courses (or below) and supervision in 2012

| | |
|---|---|
| **Course title:** | 725G61 Programmering, grundkurs |
| **University:** | Linköping University |
| **Time period:** | 2012-10 - 2013-02 |
| **Level:** | Course in the program Systemvetare (180hp), year 1 |
| **Scope:** | Complete course responsibility, including course design and planning, examiner. Course consisted of programming basics, as well as object oriented programming concepts. Practical exercises in Java, both in the form of labs and a course project. |
| **Forms and methods:** | Lectures with demonstrations of practical programming in Eclipse, lessons with more practical focus. Computer labs and course project in groups of 2 students. Small tests ("duggor") for checking individual understanding. |
| **Language:** | Swedish |
| **IT-support:** | PowerPoint for lecture slides. Programming using Eclipse and Java SDK. |
| **Course responsibility:** | Yes, examiner and course designer |

| | |
|---|---|
| **Course title:** | Bachelor thesis supervision |
| **University:** | Linköping University |
| **Time period:** | Examined 2012 |
| **Level:** | Bachelor thesis, 10,5 p |
| **Scope:** | Main supervisor and examiner of Johannes Dahlberg, thesis with title "En Android-applikation: för övervakning av varningar och fel" |
| **Forms and methods:** | Supervision and examination through written report and oral presentation + opposition. |
| **Language:** | Swedish |
| **IT-support:** | Word |
| **Course responsibility:** | Examiner of this particular thesis |

### Bachelor courses (or below) and supervision in 2011

| | |
|---|---|
| **Course title:** | Informationslogistiska tillämpningar |
| **University:** | Centrum för Informationslogistik, Ljungby |
| **Time period:** | 2011-03-15 (3 hours) |
| **Level:** | Course in the program Informationslogistik (180hp), year 3 |
| **Scope:** | Guest lecture |
| **Forms and methods:** | Lecture with demonstrations of tools and methods. Focus on research questions and applications. |
| **Language:** | Swedish |
| **IT-support:** | PowerPoint for lecture slides. |
| **Course responsibility:** | No – but responsible for this particular part of the course. |

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To whom it may concern.

This is to certify that Eva Blomqvist (770816-0028) has taught in total 2591 hours at School of Engineering, Jönköping University during the years 2004 to 2011. The table below contains a specification of the teaching hours in terms of year, course title, course level, the teaching role, and the amount of hours spent.

Department Director,
Department of Computer and Electrical Engineering,
School of Engineering, Jönköping University

Inger Palmgren Jönköping 2012 02 14

Inger Palmgren City and date

| Year | Course title | Level[1] | Role[2] | Planned Hours[3] | Actual Hours |
|---|---|---|---|---|---|
| 2004 | Databasteknik 1 | PB | T | 93 | 114 |
| | Software Project and Quality Management | M | T | 60 | 73 |
| | Bachelor thesis | B | Supervisor | 18 | 22 |
| | Bachelor thesis | B | Supervisor | 18 | 22 |
| | Master's thesis | M | Supervisor | 36 | 44 |
| | Individual Competence Development[4] | - | - | 50 | - |
| | | | **Sum:** | **275** | **275** |

[1] Levels: PB = Pre-Bachelor, e.g. Swedish KY, B = Bachelor, M = Master, P = PhD
[2] Roles: T = Course teacher, i.e. not involved in designing the overall course, only responsible for individual modules, R = Course responsible, i.e. responsible for course design, in addition to teaching certain modules, E = Official examiner of the course, in addition to designing, planning and teaching certain modules.
[3] Plan is prepared by Department Head the previous autumn – updates to the plan and actual outcome is reflected as "actual hours".
[4] Each year 50 hours of individual competence development is planned for every employed teacher, e.g. to update and incorporate new elements in courses. In the actual outcome, these are included in the hours spent on the respective courses.



Vidimeras
Karl Hammar 073 509 59 10

Zlatan Dragisic
Zlatan Dragisic 070-405 8704

| Year | Course title | Level[1] | Role[2] | Planned Hours[3] | Actual Hours |
|---|---|---|---|---|---|
| 2005 | Databasteknik 1 | PB | R | 175 | 383 |
| | Software Project and Quality Management | M | T | 70 | 83 |
| | Bachelor thesis | B | Supervisor | 18 | 22 |
| | Master's thesis | M | Supervisor | 36 | - |
| | Individual Competence Development | - | - | 50 | - |
| | | | **Sum:** | **349** | **488** |
| 2006 | Databasteknik 1 | PB | R | 178 | 228 |
| | Software Project and Quality Management | M | T | 40 | 46 |
| | Software Project and Quality Management | M | T | - | 58 |
| | Bachelor thesis | B | Supervisor | 18 | 21 |
| | Master's thesis | M | Supervisor | 36 | 42 |
| | Master's thesis | M | Supervisor | 36 | - |
| | Individual Competence Development | - | - | 50 | - |
| | | | **Sum:** | **358** | **395** |
| 2007 | Databasteknik 1 | PB | T | 50 | 79 |
| | Information and Knowledge Management | M | T | 75 | - |
| | Bachelor thesis | B | Supervisor | 18 | - |
| | Master's thesis | M | Supervisor | 36 | 57 |
| | Master's thesis | M | Supervisor | 36 | - |
| | Master's thesis | M | Supervisor | 36 | - |
| | Individual Competence Development | - | - | 50 | - |
| | | | **Sum:** | **301** | **136** |
| 2008 | Information and Knowledge Management | M | T | 50 | 62 |
| | Knowledge Management & Knowledge Representation | M | T | 49 | - |
| | Information Logistics | M | T | - | 73 |
| | Bachelor thesis | B | Supervisor | 18 | - |
| | Bachelor thesis | B | Supervisor | 18 | - |
| | Master's thesis | M | Supervisor | 36 | 44 |
| | Master's thesis | M | Supervisor | 36 | 44 |
| | Master's thesis | M | Supervisor | 36 | 44 |
| | Individual Competence Development | - | - | 50 | - |
| | Informationslogistik (guest lect. Tranås) | PB | T | - | 15 |
| | Informationslogistiska tillämpningar (guest lect. Ljungby) | B | T | - | 9 |
| | | | **Sum:** | **293** | **291** |



Vidimeras

Karl Hammar 0735095910

Zlatan Dragišić

Zlatan Dragisic 070 405 3704

| Year | Course title | Level[1] | Role[2] | Planned Hours[3] | Actual Hours |
|---|---|---|---|---|---|
| 2009 | Informationslogistik | M | T | - | 120 |
| | Enterprise Knowledge Management | P | T | - | 48 |
| | | | **Sum:** | -[5] | **168** |
| 2010 | Informationslogistik | M | E | - | 282 |
| | Knowledge Management and Knowledge Representation | M | T | - | 103 |
| | Individual Competence Development | - | - | - | - |
| | | | **Sum:** | -[6] | **385** |
| 2011 | Information Retrieval | M | E | - | 286 |
| | Master's thesis (x3) | M | Supervisor | - | 149 |
| | Individual Competence Development | - | - | - | - |
| | Forskningsmetodik (guest lecture) | M | T | - | 6 |
| | Forskningsmetodik | P | T | - | 6 |
| | Informationslogistiska tillämpningar (guest lect. Ljungby) | B | T | - | 6 |
| | | | **Sum:** | -[6] | **453** |
| | | | **Total sum:** | | **2591** |

[5] In 2009 Eva was only employed on a "per-hour" contract, hence no plan was made, and no hours for competence development were assigned.
[6] For the academic year 2010-2011, Eva received no plan broken down into hours, but was supposed to spend 40% of here yearly work hours on teaching activities.



vidimeras
073 509 59 10
Karl Hammar

Zlatan Dragisic
Zlatan Dragisic 0704058704

# Supporting student teams with diverse backgrounds

Eva Blomqvist
Jönköping University

**Abstract:** In this report the main problems discovered in the current instance of an Information Retrieval course are analysed, with respect to literature on collaborative learning and teamwork in intercultural settings. It is concluded that the new competencies to be trained need to be introduced more gradually, introduced explicitly, and discussed as learning outcomes in their own right. The multiculturality of the teams need to be taken into account when forming teams and supervising the group work. This results in changes of the seminar structure, e.g. gradually increasing the autonomy of the student groups, as well as introducing more continuous monitoring into the project work.

## 1 Introduction

During the DUO course I have studied and developed a master's course in Information Retrieval (IR), given in the first year (second semester) of the master program in Information Engineering and Management, School of Engineering, Jönköping University. The first instance of this course, as planned in the first part of the DUO course, has now finished (runtime January-March 2011), and this report focuses on the analysis of that course instance (continued from [1]) to suggest further improvements for next year, based on existing theory in the field.

## 2 Analysis of this year's course

An extensive description of the course design and initial experiences was described in [1], this information will not be repeated here. In this report we focus on summarizing the discussion in [1] and adding the results of the final course evaluation, in order to draw conclusions on the problem areas of the course.

One of the main parts of the course was a set of five seminars that were planned and ran by one group of students each (between 4 and 6 students). Each group got the responsibility of one seminar, with a set topic. Starting from a list of possible literature they should select an appropriate focus, including additional literature they found on their own. Based on that literature they should formulate a set of study questions and exercises that the other groups should solve when studying for the seminar. Finally, they should pose a set of discussion questions to be the basis of the discussion in the seminar. The attending groups should read the material, solve the exercises, and the day before the seminar they should also post an additional discussion question. In the seminar the group leading it first presented the material in brief, then led a discussion on the exercises and discussion questions.

A second important part of the course consisted of a software project, where the student groups (same as above) should develop a search engine based on a requirements specification. This involves both to study and to be inspired by some recent research articles, to solve the problems in the requirements, and to actually set up and deploy a search engine, including both the reuse of existing software and the development of new program components. The project had a set of milestones that should be passed at certain times, and a final presentation including oral presentation and a written report. Together with the seminars, the project was graded as *pass* or *fail*, depending on if all requirements were met.

In [1] the following main problems were observed:

**Related to the project work**

1. Most students found the start-up of the project very fuzzy, they found the instructions hard to understand and they were scared by the amount of work the project seemed to imply. This led to delays in the project work for all the groups.
2. Some students claimed that they cannot program in Java, although general programming skills is a prerequisite, and that they would not be able to learn during the course, hence, they feared that they could not contribute much to the implementation of the project.

**Related to the seminars**

3. Some students found the seminars more or less useless, since they claimed that their fellow students were so bad at presenting the topics that they didn't learn anything.
4. Some of the students see the seminars as an opportunity to show the teacher how bad the other students are, in order to look better themselves, e.g. by asking really complex questions (that they do not know how to answer themselves) and then smiling and pointing out to the teacher that the group presenting could not answer them.
5. Some students started putting pressure on the students in the other groups to reduce the amount of material for the seminars, in order to reduce the total amount of work needed for the course.
6. Most students have no idea how to discuss and argue their point in the seminars. The seminars usually turn out as a kind of "lecture" when the group presenting goes on to present the "right answers" to both the exercises and the discussion questions, and none of the other students dare to object and suggest additional things.

**Overall for the course**

7. Most students feel that this course takes too much time, however, it is very difficult to measure this objectively.

To summarize the bullets above, one of the problems experienced in the current course instance was the competitive environment that the students created in the course. This despite the teacher's efforts to create a more collaborative environment, to let students learn from each other, especially with respect to general competencies such as oral presentation, critical discussion etc. The

second major problem was the workload. This mainly resulted from the lack of proper background in some of the students, e.g. lack of programming experience, as well as lack of experience in general competencies such as presenting material to others, finding literature, working in a team etc.

After the written exam, a course evaluation was conducted as a questionnaire in PingPong (the LMS used for the course). The questionnaire was based on a selection of the questions suggested by [2], extended with a set of questions concerning the student's estimation of the time they spent on different activities in the course. Most of the answers confirmed the problems observed earlier (see bullet list above). Basically the students find this course very difficult, both with respect to the skills that are considered prerequisites, and the skills and knowledge they are supposed to learn during the course. The students also seem to agree that there is a problem related to the support they feel from fellow students. They rate "Working with other students." as very difficult, and although the replies to the statement "Students supported each other and tried to give help when it was needed." are quite diverse, most tend towards being unsure or disagreeing. This seems to indicate that the students feel the same kind of competitive environment as I as a teacher observed, and that they have problems coping with teamwork issues.

With respect to the time spent on different activities, the students' answers can be compared to the estimate made by me as a teacher before the course[1]. This comparison is presented in Table 1. Lecture preparation means the time spent on reading the material for one of the lectures, and doing some exercises suggested at the lecture. Seminar planning involves the time the students individually spent on preparing for the seminar their group were going to lead. Attending a seminar means the time for preparing for attending a seminar, i.e. reading the material, solving exercises and preparing for the discussion. Working with the project, means the average time each student spent on the project work each week. Finally, studying for the exam means the time spent studying at the end of the course, in addition to the previous activities. Students' estimations are presented as an average of the respondents' answers, except for the "Working with project" question where students' answers were clearly grouped in two categories; those that feel it takes a lot of time, and those who spend less than a day on the project each week.

**Table 1:** Workload in the course.

| | Estimated time | Students' estimations |
|---|---|---|
| **Lecture preparation** | 2 hours | 2-3 hours |
| **Seminar planning** | 1.5 days | More than one day |
| **Attending a seminar** | 4 hours | 5 hours |
| **Working with project** | 1.5 days | 4-8 hours/2 days or more |
| **Studying for exam** | 3 days | More than three days |

[1] In retrospect, the alternatives given were in some cases not the best for being able to compare to the original estimates. For instance, letting the students select that seminar planning takes "more than one day" does neither confirm nor contradict the estimation of 1.5 days, similarly for the exam study question.

Overall, the estimates made by the teacher are not that far off from the time the students actually spend on average, but the main conclusion is that there is too big difference between students, while some spend even less time that expected some also have to spend a lot more. The course should support this group of students in a better way.

Based on the analysis above, the main questions we will try to answer in this report are how to (1) better support the students in learning the general competencies needed for the course, e.g. presentation, critical discussion, and teamwork skills, (2) leverage the previous knowledge of the students, especially for the project work and seminars, and (3) how to reduce the workload of the group of students that felt the course takes too much time and effort, without reducing the quality or lowering the level of knowledge and skills this course intends to provide to the students.

# 3 Theoretical background

In this section some literature related to the above mentioned problems is reviewed. We focus on the two parts of the course that needs improvement, i.e. the seminars and the project work.

## 3.1 Seminars, and how to teach higher-order thinking

To the best of my knowledge, there is not much research specifically targeting the seminar format, especially not for the computer science domain. In general, Biggs stated in [3] that seminars need careful planning, and especially student-led seminars might be very difficult to conduct properly, risking the situation when seminars become just another lecture but with a presented that is much less experienced than the teacher. The risk is then that other students feel they are not getting anything out of a student-led seminar.

In [4] he also discusses peer teaching more in-depth, and acknowledges that making students teach about things they are trying to learn enhances their knowledge and gives them a deeper understanding of the subject. However, examples are taken mostly from the setting where “senior” students teach students in earlier years, rather than students teaching students in the same course, as was the case in the IR course.

Seminars are on the other hand a widely used teaching method in health sciences. In [5] a study is reported where the researchers tried to teach students critical appraisal, based on a seminar format. Although the study was mostly focused on investigating the correlation between critical appraisal skills and the overall success of the students, a part of it was also designated to studying the seminars as such, and the students’ perception of them. In general, the students seem to appreciate the teaching method, due to its interactive nature, but an important factor seems to be the *gradual introduction* of critical appraisal.

In [6] a somewhat similar study is conducted, to study student’s ability to ask “high-level questions” based on what teaching methods were applied in the course. The authors compare a course where the students work cooperatively

during class, get assignments that involves posing interesting questions, and are explicitly introduced to different types of questions and their implications on the cognitive level, to a course taught in a traditional classroom setting. Not very surprisingly, the students that are *explicitly exposed* to the task of posing "good" questions (and who discuss what "good" means) indeed do ask more interesting and thoughtful questions in the end. Similarly to the previous study, this is a *gradual process*, involving explicit discussion of such general capabilities.

### 3.2 Projects, and how to teach teamwork in multicultural environments

Related to the problems of the project work, there exist some literature discussing how to improve the student experience and effectiveness of group work. The study in [7] concludes that students are actually often quite positive towards working in groups from the beginning, but how their experience actually turns out is influenced by several factors, e.g. the support of the instructor, handling of conflicts, and the overall coordination in the group. The study concludes with a set of suggestions for instructors to improve the outcome and the student experience. For instance, the instructor has to make explicit that the group work serves several learning outcomes (including the ability to work in a group, communicate well etc.) and that these are all beneficial for the students. The students should also be instructed to discuss their previous experiences with group work, and set up an agreement in the group around their expectations. If the process dimension is emphasized, i.e. that the process is equally important as the outcome, then it is more likely that the students take this dimension seriously and considers it a learning opportunity.

Concerns in work and grade equity are also very central to the student performing group work, according to [7], and need to be carefully addressed by the instructor. A way to reduce these concerns is to use some method to assess individual performance in the group, e.g. peer assessment or using ways to record the progress of the individuals. The instructor can also discuss this issue in a wider perspective, e.g. asking the students if they think that such inequities will also occur at the workplace. The final suggestion to remedy these concerns is to allow students the option to work on the project alone, although beneficial to some students, they should also be warned about the increased workload.

In [8] the effectiveness of teams in performing group work is studied, and ideas are given on how to maximize the effectiveness. The authors study a model (see Figure 1) where the outcome of group work, i.e. performance and goal achievement, is affected by the teamwork process, which is in turn affected by three main factors; team size, gender diversity, and level of cohesion. Cohesion is here defined as "the degree to which the team remains united in reaching its goals". Based on this rather simplistic model, they find from empirical data (on self-selected teams) that cohesion of the team and the teamwork process applied are the two most influential factors. For the other two factors (gender diversity and size), the results are inconclusive, and the authors open up for the possibility that increased gender diversity even might support the effectiveness rather than reduce it. Conclusions include that consensus building to achieve cohesion is an important step, as well as explicitly teaching teamwork skills, e.g. team building, goal setting, conflict resolution etc.

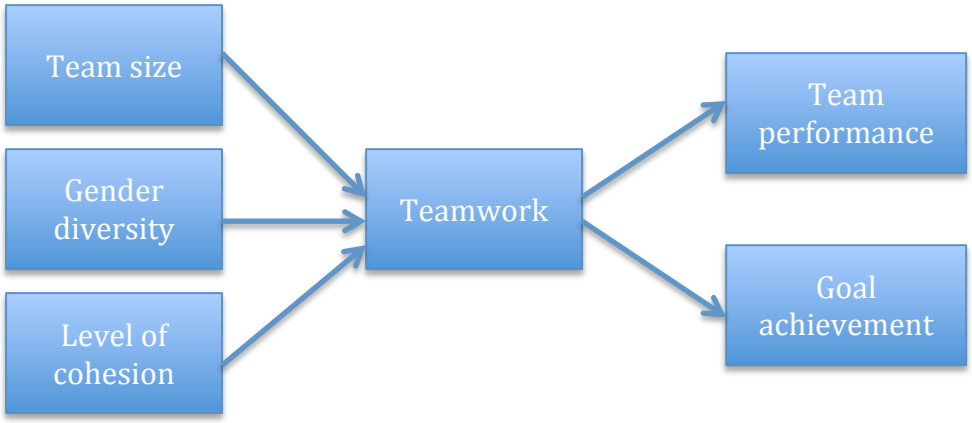


**Figure 1:** Hypothetical model of student team effectiveness.

One factor that might be of essence in the IR course is the fact that all but a few students are from abroad. In [9] multicultural groups are discussed, and some specific advice is given. For instance, it has been shown that exchange students usually stick to "their own kind" when picking groups, and so do the home students [10]. Home students are commonly even more concerned with grades and effort when taking in a multicultural class, often being reluctant to pick group members among exchange students due to the belief that the group work will take more time or effort and will give them a lower grade. This fact leads to the conclusion (according to [9, 10]) that the teacher should pick the groups, but should also make sure that the intercultural experience is introduced as one aspect of the group work.

Some practical hints when selecting the groups are given in [10]:

- Do not place only *one* international student in a group of home students, put at least two in each group (even if the total number is small).
- Do not try to avoid groups where several students share the same language, this will usually not create a split in the group but simply a task for the group to deal with.
- Remain sensitive to global conflict when putting students in a group.
- Make more diverse groups smaller, while larger groups should be more cohesive.
- Consider using different criteria for dividing members, i.e. base the criteria on the task to be performed and your knowledge of the students.

Explicit discussions in the groups about teamwork and process issues become even more important when introducing a multicultural perspective, than in monocultural groups, and so does helping the groups to cope with problems in the group process. The task to be performed should be tailored to the groups that should perform it, according to [10]. This means, for instance, that the task should contain "inclusive verbs", such as compile, collect, or compare, which imply that the members can contribute each from their own point of view. The task should also be sufficiently complex, it should require the students to take on

different roles or stances, and it should give the opportunity to divide the work depending on previous experience, knowledge, and skills.

Finally, the task should be a bit "fuzzy" in its nature (although with clear requirements for assessment) so that the students are forced to discuss and come up with a joint understanding of it [10]. For computer science this is supported by studies such as [11], where Open Ended Group Projects [12] are suggested as a good way to learn both teamwork a process skills, as well as intercultural competencies. To be able to assess each student in the group, the authors of [10] suggest that students should be asked to document the process somehow, e.g. by logging their activities or writing a diary. Such documentation can also be used to spot problems in the group process if they arise.

# 4 Analysis of problems in light of the theory

This section contains an analysis of the problems and suggestions for improvements, based on the theory discussed in the last section.

## 4.1 Seminars

Student-led seminars may be problematic, as noted in [3] and in issues 3-6 of the IR course, however they can also be very valuable, and produce a better understanding of the material by the students (as discussed in [4]). Most likely the main problems of this year's seminar were twofold:

- Lack of specific focus on, an explicit introduction to, the learning outcomes concerning general competencies particularly related to the seminars, e.g. ability to find literature, summarize and present advanced material, critical discussion, and so on. This was pointed out as important both for seminars as a teaching method (in [6]) and in general for group work done by students (in [7]).
- Too abrupt introduction to the seminar format, without being able to practice and gradually get familiar with the tasks and exercise the general competencies needed (as suggested by [5, 6]).

Many of the changes that can be envisioned actually address both of those problems to some extent. First of all, the seminars should not have the uniform structure that they have today. The first seminar needs to be an introduction to the format, then seminars should slowly progress towards the end of the course when students should be able to take on more responsibility and be more autonomous. The first seminar could therefore be run completely by the teacher, starting with a small "lecture" and discussions on the issues of critical thinking, literature search, feedback, and so on. This would partly remedy problem number 6, and to some extent also 3 (since the students will see other learning goals being reached, rather than just learning the material).

In general, a more fixed structure of the seminars, with mostly pre-selected material rather than student-selected, may also remedy problem 5. A more structured approach will also help to support the gradual introduction of new general competencies, as discussed above. As for the difficulty of the tasks, this

can also be progressed during the course, letting the students end with a final seminar where they use their own material, lead the discussion on their own etc.

During the seminars of this year's course, in practice every seminar ended by a small "meta-discussion" led by the teacher, as a kind of evaluation of the seminar. For next year, this should be a formalized part of the seminar, when the students are exercised in giving and receiving feedback, as well as reflecting on what they have done and what they have learned. Similarly as in [6] the students should be introduced to certain meta-reflections on what types of discussions they were engaged in, what types of questions were asked and so on. This intends to give the students the opportunity to also reflect on issues (such as 3-6), which will hopefully then reduce the impact of those problems.

### 4.2 Project work

When analysing the two first problems (bullets 1-2), related to the project work, it should be noted that already now the teacher is the one picking the groups (as suggested by [9, 10]). However, for this year's course the groups were picked randomly, rather than based on some specific criteria, which may have contributed to the difficulties experienced.

For future course instances, the background questionnaire (see description in [1]) issued at the start of the course should not only be used when analysing the course evaluation, but also for placing students in groups. A group size of 4-6 students is within the range of what most literature advice, hence this should not be changed. However, when picking students for the groups the following criteria could be used (conforming to the suggestions in [10]):

- If possible, picking students two-by-two or three-by-three from the same country or area, so that groups do not become too diverse.
- Placing at least one good programmer in each group, to reduce the feeling of an impossible task (that some groups have expressed) due to lack of anybody being familiar with Java programming.

The feeling of "fuzziness" at the beginning of the project (problem 1) is probably a good thing for a multicultural team (according to [10, 11]). The tasks are already today formulated as somewhat open-ended problems, in the sense that it is up to the students to decide how to address the problems given by the requirements specification. The only thing that is clearly specified is the functionality, i.e. what the end result should be able to "do".

However, the teacher needs to explicitly present the learning goals of the group work, i.e. not only the goals related to the subject, such as the functionalities of the end product, but also goals related to teamwork and multicultural inter-action. To further support this, the teamwork process should be more structured than today. The students can be asked to take on certain predefined roles in the group, e.g. by selecting the "project leader", the "report responsible", the "lead developer", and the "ontology engineer" etc. Such roles will let them contribute their own expertise to the group, from different perspectives (as suggested in [10]), and make them feel more included and important for the group as a whole, inclining them to take responsibility for the success of the group.

Such distribution of roles should be done in a first project meeting, when the students also have to discuss a number of issues, such as expectations and experiences of previous group work, and set up a "teamwork contract". Such a "contract" will make their assumptions and expectations explicit, and increase the cohesion of the group, as suggested by [8]. They will also be more aware of their cultural differences and each individual's competencies.

During this course instance, the project had a number of milestones for checking progress, but all of those were focused on the progress towards the end result, e.g. showing a design of the system, showing an evaluation plan, demoing the system and so on. In accordance with [7, 10] there should be some more careful monitoring during the project work, not only focussing on outcomes but on the process itself. This could be combined with an individual assessment of the students, reducing the anxiety for unfairness of grades and allowing the teacher to step in if workload is too unevenly distributed or there are other problems in the group (issues raised in [7]).

Such a monitoring could be done in the form of weekly logs written by each participant individually. In the logs the student can reflect on both the progress in his or her responsibility within the group, as well as on the overall process and on teamwork issues. This could be combined with some peer assessment. The group work is already now graded only as pass or fail, and should probably stay that way in order not to increase the students' concern with grading.

### 4.3 Workload

The third problem area of this year's course concerned the workload required for this course, i.e. the workload was perceived as too heavy. Based on some questions in the final course evaluation, it can be concluded that two main problem areas are the planning of the seminar, and the project work in general.

With a new seminar organization, as discussed above, that problem should be more or less taken care of on the seminar side. By gradually introducing new tasks involving general competencies, rather than throwing it in all at once, the cognitive load on the students will be reduced. As can be noted from the comparison of time estimation in Table 1, it is not so much that preparations actually takes a huge amount of time, but most likely rather an anxiety over tasks that are unfamiliar and unclear to the students. By changing the seminar format, to allow for a progression of task complexity, this will be improved. As a consequence it has to be made sure that the tasks of student groups are uniform in terms of workload, now that the seminars will no longer be uniform in structure. However, this is just a matter of careful planning and organization.

For the project work, some of the proposed changes will also reduce the workload of the students somewhat, e.g. if every group has at least one good programmer they will not have to spend so much time on learning the programming language. However, in addition, the project tasks could also be slightly reduced, without neither compromising the "real world" feeling of the tasks nor the connection to research results. The current requirement

specifications can be slimmed down, and more reusable components can be proposed for integration, even further reducing the programming effort.

## 5 Conclusions

In section 2, three main questions were posed: (1) How to better support the students in learning the general competencies needed for the course? (2) How to leverage the previous knowledge of the students, especially for the project work and seminars? (3) How to reduce the workload of the group of students that felt the course takes too much time and effort, without reducing the quality or lowering the level of knowledge and skills this course intends to provide to the students?

With respect to the first question, the main change will be the introduction of a new seminar format that lets the students practice the general competencies and slowly progress toward the desired level. To further improve this, formalized occasions will be introduced for presenting and discussing general competencies as learning objectives, e.g. discussing how to best organize a team for the project work. With respect to the second question, a more formalized team organization and more inclusive formulation of the tasks, together with a better method for picking students for the groups, should improve the situation. Problems will be monitored through a more continuous logging process, which also should reduce the students' anxiety with respect to grading and workload distribution in the groups. Finally, the overall workload will be reduced, both as a result of the new seminar organization, the improved organization of the project groups, but also the project tasks in themselves will be somewhat reduced.

The main lessons learned from this literature study, in combination with the first IR course instance, include that teachers need to take cultural diversity serious and adapt the organization of project work to the situation. Additionally, general competencies need to be learned through a gradual progression of their complexity, and an explicit discussion of them as learning outcomes in their own right.

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## Pedagogical reflections and teaching experience

At the bases of my pedagogical view are a constructivist viewpoint, i.e. that students are responsible for their own construction of knowledge. Knowledge is built up within an individual and the role of the teacher is to provide the best possible environment and context where this can happen. The most important focus of the teacher is to engage the students in their own learning, so that they take an active part in exercises and discussions, and create their own internal motivations for learning and truly understanding the content of a program or course. Teachers have a great responsibility, since they plan and administer the programs and courses taken by the students, but in the end learning is up to the individual. To show trust and confidence in students is a key factor for creating motivation, i.e., to assume that the student has the ability to learn and wants to perform well.

These views have been challenged several times during my years of teaching, especially during my time at Jönköping University. It is well known that the smaller universities in Sweden do not always attract enough ”good” students, i.e. students with adequate previous knowledge and that already have their inner motivation to study when they arrive at the university. Instead a certain fraction of the students are usually unmotivated or have varying degrees of missing previous knowledge. Note that ”good” does not in any way refer to their ability to learn, merely to their motivation when arriving, and level of previous knowledge. A cynical teacher could classify many of these students as ”impossible students”, who will not be able to internalize the knowledge that is offered to them. However, this view is a self-fulfilling prophecy, in the sense that if a teacher believes that the students will fail they will most likely also do so. Instead, the teacher should find ways to engage the students in order to help them to see why they should learn a certain thing, because as soon as they become motivated to learn they are also receptive to new knowledge and the teacher and student can together find ways to overcome any lack of prior knowledge.

The subsequent challenge is to teach things to students that do not always have the right prerequisites, either in terms of theoretical knowledge or practical skills. Classical techniques, such as lectures and independent homework exercises, work well when the students are already motivated and have enough background to understand what is being taught. If this is not the case the teacher should not be afraid to try new methods, initially to create motivation in the students and subsequently to let students with less previous knowledge catch up, without boring the students that know the basics already. This is not an easy task, but it is a challenge that must be taken seriously by all university teachers, without resorting to “easy” solutions such as reducing the amount of content to cover or the depth of understanding required.

At Jönköping University an advantage was that PhD students very early had to accept a lot of responsibility. Additionally, we had a freedom to plan, if not course content, so at least teaching methods and try the things we had heard about in the theoretical lectures of our pedagogical courses. This has been a great benefit in my own learning and given an increased maturity, from a pedagogical perspective, already when I was a PhD student. In addition, during the months I spent in Jönköping after my post-doc I was responsible for independently redesigning, planning and carrying out two master courses. In parallel I was taking the second level pedagogical course (DUO) at LiU, where I used one of the courses as my “case study” in the DUO course. This was of great help, since I at that time did not have a lot of experience in course design, and it led to introducing several changes in the course in order to activate the students more. I switched from the previous 9 lectures to 4, and instead introduced student-led seminars, and introduced a larger student project instead of

isolated labs and exercises. This let the students on one hand feel more involved in the course, and on the other hand focus the course more towards real-world applications instead of “toy” examples (due to the project work). Many students found the course quite challenging, nevertheless, at the end of the course several students also thanked me for giving them a feeling that they can "really do something" now. A few of them even considered starting a company, further developing their ideas from the course project. Although the latter may be taking things a bit too far, considering that the project did not involve any innovation, hence, their product would just be one among many similar systems, nevertheless, it does say something about the mindset and interest that the course awakened. As a teacher I found this very satisfying.

When designing a course, *quality* is an important principle, which to me means to set an appropriate standard, i.e., decide beforehand what is reasonable to require of a graduate and then make sure they reach this level before their graduation. Students should be able to trust the university to give them all that is needed for them to successfully pursue their future career, and be competitive among other graduates in the same field, from universities around the world. One thing that in many cases is lacking, is the relation to real problems outside the university world. This is another motivation for introducing more realistic course projects, e.g. as mentioned above. This gives the students important practical skills useful in their future career. *Fairness* is another basic principle, i.e., it is important to treat all student equal, no matter if you happen to like some of them better. However, fairness also means to take into account any inherent differences in students, both individual differences, and others such as gender and cultural differences. In my opinion, one important method to increase the fairness in teaching is to vary the forms of teaching and examination, and preferably to apply several different forms in each course. By introducing seminars in the course mentioned above, I tried to give the large fraction of international students an opportunity to practice their analysis and argumentation skills, which had earlier been a problem. However, the course still had a written exam as well.

To summarise my teaching experience I started out by teaching database technology to bachelor and pre-bachelor students, together with supervising a few bachelor theses. Quite early during my PhD studies I also got involved in a course on software project management and quality assurance, where I mainly supervised student projects in configuration management, risk analysis and software cost estimation. One year I also participated in a course on information and knowledge modelling. My last year in Jönköping I planned and carried out a module in a master course in information logistics concerned with ontology engineering, containing both lectures and exercises. The year after I was hired as a consultant to give the same module once more, although I was already living in Rome, and the year when I returned I developed and examined that same course on my own. During my five years as a PhD student in Jönköping I also supervised a number of master theses, primarily with subjects close to my research focus. While doing my postdoc I did not have regular teaching obligations, however, I taught modules on ontology engineering in several PhD courses and gave a number of guest lectures. Once I returned from Italy, I gave the information logistics course again, as well as the course in Information Retrieval I used as an example previously. Once at Linköping University I started out by teaching a basic course in Java programming for two consecutive years, and then moved on to become responsible for a semester at the IT program, supervising problem-based learning groups at the same program, as well as supervising student in a course on academic writing and professionalism for engineers. In addition I have independently planned and carried out a PhD course at Linköping University in 2012, and supervised several masters theses.