Capstone Projects in Computer Science: Evaluated by Stakeholders

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ABSTRACT
This study evaluates several aspects related to capstone projects in a computer science degree: level of advisor involvement, type of student, and type of project. We consider the points of view of students, advisors, and evaluation committees. Students claimed the level of advisor involvement to be significantly greater than that perceived by the advisors themselves. Regarding students skills, we found no significant differences between the opinions of advisors and students. And lastly, students have a significantly better opinion about their projects than advisors do.

Categories and Subject Descriptors
D.2.9 [**Management of Computing and Information Systems**]: Project and People Management – *Life cycle, management technique, systems development.*

General Terms
Management; experimentation.

Keywords
Capstone project; computer science degree.

1. INTRODUCTION
Computer science degree programs [1] often expect students to undertake a capstone project integrating the specific knowledge and skills acquired over the course of their studies, along with other orthogonal skills required by professional work. The project generally comprises the life-cycle of an information system development. An advisor guides the student and supervises the process. Although the scope may vary, a considerable proportion of projects follow comparable guidelines. When the project is completed, students present a portfolio compiling the written deliverables and the product itself (when appropriate). Finally, students give an oral presentation on the project to a committee of three professors. Each project is graded by both the advisor and the committee.

This study compares the points of view of students, advisors and evaluation committees regarding capstone projects. Three questionnaires were developed to survey each stakeholder.

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2. RESULTS AND CONCLUSIONS
We successfully gathered the surveys corresponding to 36 projects developed during the last academic year.

Level of advisor involvement: Our questionnaires addresses the primary facets of project supervision [2]: technology, initial arrangements, keeping the project alive, execution, meetings, management, and reports. Students indicated a level of advisor involvement significantly greater than that perceived by the advisor. This is a telling observation, since it is difficult for advisers to strike the proper balance between encouraging student autonomy and monitoring project development. Consequently, advisors could slightly reduce the level of monitoring in the future

Student skills: The questionnaires assessed the autonomy, project management, meetings/communication, technology, methodology, and writing skills of students. We did not find significant differences between the opinions of students and their advisors, although students' opinion is slightly higher regarding all the aforementioned items.

Project features: We also evaluated the need for training, product usefulness, project complexity, technological innovation, and scope. The surveys of advisors and committees solicited the project grade. We found significant differences among the three points of view regarding scope, complexity, and usefulness of the product (the latter showed only a significant tendency). Students had a better opinion of their projects than the other stakeholders. In fact, there were significant differences between student and advisor perspectives on all these project features, except for the need for training and technological innovation. Committees held a better opinion –but not significant– of the projects than advisors (except for the need for training). However, committees proposed slightly lower grades than advisors. It appears that the views of committees and consultants on projects were very similar, while students deemed their work to be of a higher quality. Students' lack of a comparative overview of other projects may explain this difference of opinion. Students consider only their own project while professors review multiple projects developed during multiple academic years. Another factor that may explain this result is that students may have failed to adequately demonstrate the strengths of their work to the other stakeholders.

ACKNOWLEDGEMENTS

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3. REFERENCES
[1] ACM/IEEE-CS, *Computer Science Curricula 2013*.

[2] Domínguez, C., Jaime, A., García-Izquierdo, F.J., Olarte, J.J. "Supervision Typology in Computer Science Engineering Capstone Projects". *J Eng Educ*. 4: 679-697, 2012

Foreword

Welcome to ITiCSE 2014 in Uppsala.

The second ITiCSE was in Uppsala 1997 and a delegate inquired late one night; “Mats, could you turn off the sun please”. That was in early June and this year the conference will be at a time with fewer hours of darkness as it is close to the Midsummer celebration in Sweden. There are similarities and differences between the two instances of the conference. We will run the conference dinner at the same “nation” as last time and will again have a reception in the main university building, reflecting that traditions are important at our University that was founded in 1477. The conference organizers are researchers from the University’s newest research groups, Uppsala Computing Education Research Group (UpCERG), and an even newer center for subject didactic research (MINT). Respecting tradition, but striving for change, the steam train excursion has been updated to a boat trip on the Fyris river out to Skokloster castle (perhaps the most beautiful castle in Sweden). The conference, while being held in the same campus area, will be located at Ångström laboratories (a building that is quite large and in some sense not at all a reflection of its name :-p).

The conference continues to be a truly international conference with 164 submissions from 36 countries on six continents (Africa - 3, Asia - 19, Europe - 38, North America - 51, Oceania - 17, and South America - 7); and that is only considering the first author. These submissions consisted of 150 papers, 4 panels, and 10 working group proposals. Additionally, there were 48 posters and the tips & techniques submissions spanning 19 countries.

All research papers were double blind reviewed by at least three reviewers, though most papers received between four and six reviews. Following the peer review, a meta review was conducted by the members of the programme committee to ensure the reliability of the reviews and to make recommendations to the chairs regarding the acceptance and rejection of each submission. A final selection phase was conducted by the programme chairs who reviewed all reviews and meta-review recommendations before making a final decision on the submission. After this process, 53 research papers with universally high quality (35%) were ultimately selected for presentation and inclusion in the proceedings. The first authors of the 53 papers are distributed over 16 different countries on five continents.

All posters and tips & techniques submissions were double blind reviewed by two members of the programme committee and the chairs for the submission categories before being selected by the programme chairs for final inclusion in the conference. Thirty-six were accepted, representing first authors from 15 countries.

The theme of the conference is “Learning for life” and this will be addressed by our two keynote speakers. Yvonne Rogers from University College London, under the title “New technology, new learning?” will present a perspective on the impact design has on the value of technology for learning, focusing on aspects such as collaboration, mindful engagement, conversational skills and the art of reflection. Jan Gulliksen, of the Royal Institute of Technology in Stockholm, will talk about how to meet educational challenges in the “digital” era with a holistic perspective including the whole population.

There are five accepted working groups dealing with a broad spectrum of topics. They include the role of methodology in education, influences of new technology on education, and pre-university

computing education to more specific areas such as peer reviewing and gaming as educational methods, and understanding programming exam questions. Participating in a working group is probably one of the most efficient ways to become part of the ITiCSE community. It provides participants a unique opportunity to work with people from different countries who are interested and knowledgeable in the area of the working group.

Again, we welcome you to Uppsala, to enjoy ITiCSE and Midsummer in Sweden.

Åsa Cajander
Mats Daniels
ITiCSE 2014 Conference Chairs

Tony Clear
Arnold Pears
ITiCSE 2014 Programme Chairs