# An Assessment of the Impact on Student Learning via the Use of Role-Play to Simulate Client Interactions within Software Engineering Assessments

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**Abstract.** For Computing degree programmes that don't currently include industry placements, strategies need to be formulated that will enable students to develop the soft-skills they will need to be successful in industry (e.g. interview skills, approaches to effective facilitation, presentation skills, etc.). This work explores the use of role-play based simulated projects, that support the development of software engineering practitioner relevant soft-skills, via embedded assessments within computing degree programmes. Evidence is presented that suggests the proposed methodology is beneficial for developing students soft-skills, enhancing student confidence and improving graduate employability. The work highlights the perceived strengths and weaknesses of the proposed approach and suggests several future areas of subsequent investigation relevant to this area of research.

**Keywords:** Role-Play, Simulated Case-Studies, Assessments.

## 1 Introduction

To cultivate the development of proficient software engineering students fundamental subject relevant academic underpinnings need to be taught effectively. Unfortunately, appropriate subject knowledge alone does not make a student a proficient software developer. Rather, practical application of a student's knowledge to industry resident software projects is essential to achieve practitioner level competence.
To support this concept, during a student's years at university, the learner should be exposed to a variety of practitioner relevant case-studies or ideally industry based placements to consolidate academic learning and develop the relevant soft-skills.

Sadly, not all University courses will be able to secure actual industry placements as a constituent part of their course provision. So, if industry placements can't be embedded into a given Software Engineering course programme and academics still want to provide practical support in developing the soft-skills needed to become a competent software developer, what can they do?

This paper provides one possible alternative strategy to industry placements. Formulated to provide students with progressively more sophisticated practice in dealing with client interactions throughout the software engineering life-cycle. A strategy based on simulated industry scenarios, played out via the use of academics role-playing key clients and client groups, with increasing complexity, throughout the duration of a student's programme of study.

## 2 Course Structure Design

With the explicit intention to provide Software Engineering students with opportunities to develop the practical skills needed to become a competent practitioner, the course team inserted simulated case-study based assessments in all three years of an existing Software Engineering degree programme of study. As well as the practical software development assessed projects, within each programme unit, formal taught material was provided to support the learners. Example taught content included, interview skills, facilitation techniques, software evaluation methods, presentation skills and technical report writing, as part of a package of material designed to foster practitioner competence. Throughout the three years of study, each simulated software project would progressively increase in complexity, forcing the learner to develop new strategies to effectively complete the assessment. The following sections outline the key features of each simulated project and attempts to highlight the new concepts and skills the learner is being taught.

### 2.1 Simulated Project 1 - First-Year of Study

The first simulated project displayed the following key characteristics:-

a) An industry based project with three distinct client groups.
b) Students obtain system requirements from each client group via interviews conducted with academics role-playing the essential clients.
c) The clients provide comprehensive answers with no inaccuracies, contradictions or conflicts.
d) Fabricated relevant business documentation (e.g. forms, business models, relevant regulations) is supplied to interviewing students with relatively little prompting.
e) As part of the specification process, the students conduct interface design workshops with the clients (role-played by academics) who provide detailed feedback to allow the development of suitable system interfaces.
f) Students develop a portfolio of problem domain research, a suitable system specification (including interface designs) and a basic systems architecture design for the construction of the proposed solution.
g) To conclude the assessment, the students make a formal presentation, to the tutors (role-playing the key project stakeholders) to seek to secure the contract for the subsequent build of their proposed software solution designs.
h) No software is built in this assessment.

Overall, as well as the implicit academic skills being taught, students should obtain a selection of key soft-skills from this assessment. These include, basic interview techniques, simple interface workshop negotiation and effective approaches to formal client presentations.

### 2.2 Simulated Project 2 - Second-Year of Study

Building incrementally on the first-year project, the second assessment displays the following fundamental characteristics:-

a) An industry based project with four distinct client groups.

b) Students obtain system requirements from each client group via interviews and workshops conducted with academics role-playing the essential clients.

c) The clients provide answers with some inaccuracies, contradictions and minor conflicts.

d) Students need to negotiate with the different clients to achieve a consensus for the required software features and resolve the inaccuracies and contradictions supplied during the interview process.

e) Important business documentation (e.g. forms, business models, relevant regulations) are only supplied to interviewing students, if, and when, the students ask for the material.

e) Students interact with the client groups, via a variety of channels, throughout the software life-cycle, as part of the project's focus on high-user group involvement.

f) Students develop the relevant specification and design documentation, as well as a prototype software solution build.

g) Students undertake software evaluation trials, including usability tests, with the clients and utilize the findings from this activity to iteratively improve their software.

h) To conclude the assessment, the students make a formal presentation, to the tutors (role-playing the key project stakeholders) to seek approval for the role-out and implementation of their prototype solution.

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As well as the academic skills implicitly taught, students continue to develop their soft-skills as a result of their interactions with the simulated clients. These developed skills include, advanced interview techniques, dealing with simple client disagreements, the validation and verification of information supplied during the requirements engineering process, the importance of ongoing client interaction throughout the software engineering life-cycle and the associated strategies that can be used to ensure effective user-group communication. Additionally, practical system usability experience and problem solving skills can be deployed to iteratively improve the final software prototype, to ensure high-levels of user-group satisfaction.

### 2.3 Simulated Project 3 - Third-Year of Study

As a final challenge, in their last year of study, students are exposed to an extremely challenging assessment vehicle that requires practitioner level soft-skills to effectively complete the project. The assessment displays the following characteristics:-

a) An industry resident project with three distinct conflicting client groups.

b) Students obtain details of the differing views of each client group via a challenging Joint Application Development (JAD) workshop process.

c) The clients provide answers with some significant inaccuracies, obvious contradictions and some major conflicts with respects to what features the final solution should include.

d) Students need to effectively facilitate the workshops and negotiate with the different clients to achieve a problem resolution that all the differing client groups support.

e) Important documentation supplied (e.g. current business operation guides) supplied to interviewing students, contain significant redundancy and inaccuracies.

f) Students seek to develop a universally approved system specification based on their negotiations with the conflicting clients.

g) In several cases, clients present at the workshops will explain existing business practice poorly, due to latent knowledge issues.

h) Students actively record all client negotiations and resolution outcomes before developing a prototype solution for the clients.

i) To conclude the assessment, the students make a formal presentation of their system designs and prototype software to all the system stakeholders. The reaction to the solution, from each client at the meeting, is provided as verbal and non-verbal feedback with respects to the overall acceptability of the solution presented.

The final simulated project presents students with some exceptionally difficult clients and a plethora of internal organizational disagreements that must be examined by the students in order to successfully develop a solution that will resolve the initial conflicts expressed by each client group. Key skills that are developed throughout this process include, advanced facilitation techniques, complex problem solving skills, sophisticated client negotiation techniques, dealing with client latent knowledge and advance interpersonal skill-set competency.

## 3 The Perceived Impact on Students

Although the results presented in the following section are not conclusive, the data provided gives the course team considerable optimism that the course design strategy, outlined in the sections above, is having a positive effect on the development of high-quality software engineering graduates.

### 3.1 Graduate Employability

Since the simulated project strategy was first deployed in 2012, successful student cohorts, who have completed the Software Engineering degree course, have seen increased success in achieving industry employment after graduation. Although relatively small graduate numbers are noted on the Software Engineering degree (i.e. 30 - 2015, 34 - 2016) students exposed to the simulated project strategy have displayed excellent employability rates (i.e. students in industry employment or further study) with 93.33% and 94.18% in 2015 and 2016 respectively. Informal course-team discussions with Software Engineering graduates, now in industry employment, have repeatedly pointed to an increase in overall graduate confidence based on working on simulated projects. This confidence, in some cases at least, has apparently led to job application success. One graduate commented "actually working on simulated projects, talking to the clients, working through their problems, really helped me feel confident that I could do the job in real-life. I am sure this came over when I applied for my current position."

### 3.2 Current Student Attitudes Towards the Use of Simulated Projects

In March 2016, key members of the Software Engineering course-team, responsible for delivering the simulated project assessments, distributed a short questionnaire to explore the current student perceptions regarding the use of simulated case-studies. A representative sample of some of the key questions from this survey is presented in Fig 1.

| | Statement | Strongly Agree | Agree | Disagree | Strongly Disagree | Don't know |
|---|---|---|---|---|---|---|
| A | I believe that using simulated role-played clients, within assignments, helps me develop the required interpersonal skill-set needed to become a effective software engineer. | | | | | |
| B | I find it challenging to effectively elicit the required information from the simulated clients during the role-play scenarios. | | | | | |
| C | I think have received appropriate feedback, during the assignments, on how my application of elicitation techniques (e.g. interviews, workshops) can be improved. | | | | | |
| D | I have been able to apply the feedback I have received from tutors during the simulated projects to improve my utilisation of the relevant elicitation technique. | | | | | |
| E | I believe that the practice I have gained, during the simulated client interaction, has helped me become more confident in potentially dealing with real clients post-graduation. | | | | | |
| F | I prefer using simulated clients throughout the software engineering life cycle (e.g. problem domain elicitation, requirements engineering, interface development, software evaluation, etc.) compared to working with a just a tutor supplied brief. | | | | | |
| G | I think the use of scenario-based simulated client documentation helps to add realism to the assignments I have worked on. | | | | | |
| H | I believe that having on-going access to the simulated clients throughout the software engineering life-cycle is essential to learning experience. | | | | | |
| I | I can see the benefits to me personally, of using simulated, client role-play based projects, compared to assignments where all client requirements are provided in a text-based format. | | | | | |
| J | I feed ready to enter a software engineering position, post-graduation, that involves client interaction, as a result of the practice I have gained during my time on the Software Engineering course. | | | | | |
| K | I believe the current balance of taught code content vs other software engineering life-cycle content (e.g. requirements engineering, software design, software testing, software evaluation, etc.) is appropriate. | | | | | |
| L | I would like to see more tutors utilising module resident assignments that use simulated industry based clients/scenarios. | | | | | |
| M | I believe that the development of my soft-skills (e.g. interview techniques, presentation skills, effective interpersonal skills, etc.) are equally as important to my coding skills, for post-graduation industry employment. | | | | | |
| N | I believe that the material taught on the software engineering course has prepared me for industry employment. | | | | | |
| O | I have enjoyed working on simulated client-based assignments more than assignments that utilise a text-based brief exclusively | | | | | |

**Fig. 1.** A Selection of Key Questions for the Student Perceptions Survey

50 Software Engineering students in total (34 current second-year students and 16 existing final year students) were asked to complete the anonymous, web-resident, questionnaire. With a 50% response rate (25/50) the tabulated results from the survey are presented in Fig 2.

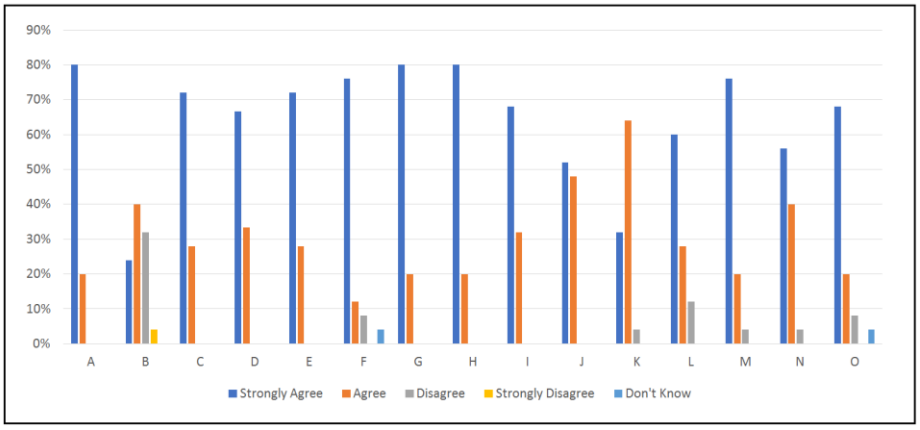

**Fig. 2.** A Graphical Representation of the Responses to Key Questions from the Student Perceptions Survey

Analysis of the results provided gave an exceptionally positive overall view of student perceptions of the Simulated Projects strategy, with an average question agreement response rate of 96% (either Strongly Agree or Agree) suggesting that the students can perceive real benefits from their experiences with this type of assessment. Additional comments, provided from students, included:-

a) "I vastly prefer this (simulated projects) to just receiving a brief. I find it to be more realistic and I think it has helped me feel more ready for industry."
b) "Using simulated role-play clients is extremely important due to the growing demand in developers needs for the skills to talk to said clients"
c) "I feel that simulated role-play based clients is a good way of learning real industry skills, as it is a stepping stone from the brief content to a real-life client."
d) "It (the use of simulated projects) has helped a lot with my dissertation, where I have a real-life client, as I can use the skills I have learned in class."

## 4 Conclusion

The current data available, relating to the use of role-play in simulated client based projects, as an integral part of assessments, would suggest that there are a number of positive benefits from utilizing this approach. These include:-

a) Improved student development of the essential soft-skills required to become a competent software engineering practitioner.
b) Apparent benefits in student confidence, with respects to all aspects of the software engineering life-cycle (not just coding), leading to improved student employability in industry positions.
c) Improved students satisfaction rates with respects to their perception of the teaching approaches being utilized on their course and their readiness for employment after graduation.

Despite these apparent benefits, the course-team working on the simulated projects, do currently acknowledge a number of potential drawbacks and/or limitations of deploying the strategies outlined in this document. Limitations include:-

a) Increased workload overheads for academics, compared to running text-based brief centered assessments.
b) Scalability issues when attempting to deploy the approaches discussed to large student groups (e.g. the number of hours needed to run the required number of interviews.)

c) Workload issues in relation to the development of the materials required to run simulated projects effectively (e.g. character profiles, client conflicts, fabricated system documentation, system workflow models, etc.)

## 5 Future Work

Although there are some obvious drawbacks/limitations to using simulated projects as assessment tools, the course-team currently using this approach to Software Engineering education strongly believe that the benefits outweigh the disadvantages for students, especially when industry placements cannot be an embedded part of the course. Despite significant work previously being carried out into the utilization of role-play in education [2, 3, 5] there is little existing work [1, 4] exploring the development of a framework for using role-play based simulated projects within Computing (and specifically within Software Engineering) degree programmes. With this in mind, one appropriate future strategy, for advancement of this area of research, has been proposed as:-

a) The development and evaluation of a framework for designing simulated case-studies, for utilization within computing degree programmes.

b) The continued investigation into the theorized benefits (and drawbacks) of using simulated projects for learners in higher education and the formulation of strategies designed to maximize the beneficial impacts of the approach, while minimizing any associated limitations.

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