Students as co-producers in a multidisciplinary software engineering project: Addressing cultural distance and cross-cohort handover

David Foster

The Centre for English Language Education, University of Nottingham Ningbo China, Ningbo, China.

Filippo Gilardi

The School of International Communications, University of Nottingham Ningbo China, Ningbo, China.
Orcid: 0000-0002-5702-4391

Paul Martin (corresponding author)

The School of International Communications, University of Nottingham Ningbo China, Ningbo, China.

Email: paul.martin@nottingham.edu.cn
Orcid: 0000-0002-3464-2103

Wei Song

The School of International Communications, University of Nottingham Ningbo China, Ningbo, China.

Dave Towey

The School of Computer Science, University of Nottingham Ningbo China, Ningbo, China.
Orcid: 0000-0003-0877-4353

Andrew White

The School of International Communications, University of Nottingham Ningbo China, Ningbo, China.

Orcid: 0000-0002-0793-0142

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This article reports on an undergraduate software engineering project in which, over a period of two years, four student teams from different cohorts developed a note-taking app for four academic clients at the students' own university. We investigated how projects involving internal clients can give students the benefits of engaging in real software development while also giving them experience of a student-staff collaboration that has its own benefits for students, academics, and the university more broadly. As the university involved is a Sino-Foreign university located in China, where most students are Chinese and most teaching staff are not, this 'student as co-producer' approach interacts with another feature of the project: cultural distance. Based on analysis of notes, reports, interviews, and focus groups, we recommend that students should be provided with communicative strategies for dealing with academics as clients; universities should develop policies on ownership of student-staff collaborations; and projects should include a formalised handover process. This article can serve as guidance for educators considering a 'students as co-producers' approach for software development projects.

Keywords: Students as co-producers; student projects; inter-cultural communication; multi-cultural education; multi-disciplinary projects; [software engineering]

Introduction

There has been substantial criticism of the 'student as consumer' paradigm (McCulloch 2012; McMillan & Cheney 1996; Molesworth, Scullion, & Nixon, 2011). Most critics of this model acknowledge that students are consumers, but that they are also capable of inhabiting other roles in relation to their university, and that such an expansion of roles is positive. As an alternative to the student as consumer, McCulloch (2012) puts forward a 'student as co-producer' model that establishes a more active role for the student in creating new knowledge, developing teaching practices, and improving university governance policy (see also Trowler & Trowler, 2010).

There is evidence that the taking on of different roles and different kinds of relationships with faculty is of benefit to students. Student-faculty interaction outside the classroom benefits students by improving their 'academic self-concept' (Kim & Sax, 2014) and cognitive skills (Kim & Lundberg, 2016), and increasing their social capital (Dika, 2012). Projects involving students as co-producers help create such outside-of-class interactions. These partnerships can improve learning, lead to better work and increase motivation (McCulloch, 2012). They can result in positive shifts in student identity, increased trust between students and institution, increased sense of belonging to the institution, and challenges to the ingrained power structures in the university (Marquis, Black, & Healey, 2017). Capstone, and other longer-term, faculty-advised projects are a clear opportunity to develop this kind of co-creative partnership, and to give students an opportunity to demonstrate and build on skills that they have learned over the course of their undergraduate degree (Dugan, 2011).

It has been argued that student projects benefit from the inclusion of real-world clients, as this can give students an experience that is similar to working in industry (Pastel, Seigel, Zhang, & Mayer, 2015; Bruegge, Krusche, & Alperowitz, 2015; Polack-Wahl, 1999). Bruegge et al. (2015) suggest that clients who are internal to the university should only be used if it is not possible to use external clients. We argue here, however, that projects involving internal clients can give students the benefits of engaging in a real software development project that leads to software with real value, while also giving them experience of a student-staff collaboration that has its own benefits for students, academics and the university more broadly.

This article examines a software engineering project designed and implemented by the authors as a 'students as co-producers across cohorts' project. The project took place at a Sino-Foreign university located in China where most students are Chinese and

most teaching staff are not. It was completed over two years and involved four consecutive teams of students across two cohorts. The core objective of the project was the development of a note-taking software application (an app) (Towey et al., 2015) that would be used by both students and researchers looking into the note-taking and online research habits of students. The project involved a non-Chinese academic supervisor in the Computer Science department, different teams of students from the Computer Science department (all but two of whom were Chinese), and four non-Chinese academic clients in the faculty of Humanities and Social Sciences of the university (none of whom were computer scientists or software developers).

In addition to the development of the app, the academics involved wanted to use this project to involve students in research activities and give them real-world experiences that would benefit their academic development and employability. By the end of the project, the app—now named 'QuickNote'—was ready to be deployed for learning and research purposes.

We were very satisfied with the app that was produced, and have discussed its features elsewhere (Towey et al., 2017a). The present article focuses on developing recommendations for this kind of project; examining the processes surrounding the software development rather than evaluating the software itself. The article explores our experiences, and those of our students, offering analyses and suggestions for future implementations of such projects.

The next section gives an overview of the project. This is followed by a description of our methodology, then an analysis and discussion of the findings of our research. We finally discuss the theoretical contributions of the project, offer recommendations for educators who may be considering designing similar projects, and conclude the article.

Project overview

The project was undertaken between September 2014 and August 2016. The first phase was developed by a team of five level 2 (penultimate year) undergraduates on the 'Group Software Engineer Project' module of a computer science degree. They worked on the project from September 2014 to May 2015. The second student team was composed of two students from the first team who then continued to work on the development as part of an internship—funded by the university—over the summer of 2015. The third team (five students) was from the following year's cohort of the same module. All members of the third team were new to the project, necessitating a transition of responsibility from the old team to a new, inexperienced one. This team worked on the project from September 2015 to May 2016 as part of their coursework. This was followed by a final team of four students—comprising two students from the third team and two others selected by the team leader who considered them amongst the best students of their cohort. This fourth team finalised and tested the app as part of two internships over the summer and autumn of 2016.

Methodology

Our data collection was carried out over the entire development period, was from a qualitative approach, and was divided into two different phases. The first phase involved the collection of the various documents, including supervisors' and clients' reflective notes after meeting with students, minutes of regular meetings among staff members, and students' final software reports. The second phase involved semi-structured interviews and focus groups with students. To analyse material we adopted thematic analysis, an approach that employs the structure of coding while enabling a qualitative approach based on a small number of recurring themes (Bryman, 2008). We

first generated conceptual themes through a literature review of work on intercultural communication in higher education, student projects, and students as co-producers. The analysis of the reflective notes, minutes, and reports yielded the following themes:

(1) Students as co-producers.
(2) Intercultural communication between students and between students and staff.
(3) Difficulty with requirements engineering (Laplante, 2013).
(4) Cohort-to-cohort transfer.

Around these very general themes a series of questions were developed for the first round of semi-structured interviews that took place in autumn 2016. We wanted to allow the interviewees as much freedom as possible to comment and elaborate on their experiences during the project, especially in relation to their teams, their supervisor and the clients. Examples of questions used are:

- How did you (generally) find the experience?
- How do you feel about your final product?
- How do you feel about leaving the project to other students?
- How did you find the experience of working with others?

Only the team leader of the first and second team (the same person) was interviewed from those teams. The rationale behind this choice was that this was the only student who worked on the transfer of information to the third team, and that we had already gathered enough data from the other members based on their discussions with their supervisor and their final report. We then interviewed the team leader of the third and fourth team (again one person), and two other members of the third team (one of whom was also a member of the fourth team).

After the first round of interviews we refined and developed our themes, reducing them to four:

(1) Academics-as-clients.

(2) Ownership and copyright.

(3) Cultural distance.

(4) Handover of project.

We further developed these themes through a second interview with the leader of the third and fourth team, and two focus groups attended by all members of the third and fourth teams. Because academics-as-clients was a key theme, and to give students as much freedom as possible to speak, a research assistant who was not involved in the project was recruited to lead these meetings. In this case, to facilitate interaction, the research assistant simply asked students to comment or discuss together the different themes identified.

We finally combined the material from the interviews and focus groups with our own insights as supervisor and clients. The analysis of this is discussed in the following section.

Analysis and discussion

Academics-as-clients

A challenge for this kind of student-teacher partnership is adjusting to the new role (Marquis et al., 2017; Kotzé & du Plessis, 2003). Students and academics may find this difficult, particularly given the short timeframe of many student-staff collaborative projects (Marquis et al., 2017). In this project, students had to figure out how to deal with the academics as professors, as clients, or as a mixture of these. In our project, all

but two of the students said that they felt able to treat the academics like ordinary clients, thinking of them as ‘workmates’, ‘collaborative peers’ or ‘employers’. This was a satisfying outcome, since an aim of the project was to give students a realistic sense of the developer-client relationship. Some students noted that because the clients were from a different faculty, and were not involved in grading the assessment, it was easier to treat them in this way. Students would likely find it more difficult to adopt this position if they had already formed a student-teacher relationship.

However, even in the absence of an existing student-teacher relationship, two students had difficulty treating the clients as ordinary clients, saying that they felt compelled to treat them with greater respect (as ‘gods’ or as ‘kings’). The Chinese education system is often seen as inculcating a Confucian idea of the educator as authority (Chan, 1999; Cummings, 1996; Ho & Ho, 2008; Leng, 2005; Towey, 2014; Towey, 2016), which may help explain this attitude. Because most of the students had spent their pre-university education in a culture that characterised the teacher in this way, taking on a new role was challenging. However, these students were aware of the challenge and, for the most part, were able to work through it. The students were immersed in a British-style university and were in the process of reconciling their cultural expectations with the demands of British education. This aligns with work which views Chinese students’ approach to western education as a dynamic process (Wang & Byram, 2011; Wu, 2015).

Students reported feeling nervous before the first meeting with the academic clients, which was part of the requirements engineering activities of the project—where the students attempted to identify exactly what software would need to be developed. Their initial nervousness, some claimed, reduced the meeting’s effectiveness. They also reported not having prepared a strategy for communication before the meeting. Over the

course of the project, students did develop such strategies, for example in dealing with the clients' relative lack of computer science knowledge. Students reported learning how to indirectly decline technical requests that clients did not realise were impossible for undergraduate students to implement.

The clients' lack of technical knowledge also had a positive side. The students had an advantage in expertise, which some students said made the clients less intimidating. This difference in expertise also implicitly challenged the power structure between students and staff in universities (Marquis et al., 2017). However, students did not discuss the wider implications of their relative expertise. If staff-student partnerships have the capacity to challenge existing power structures at the university (Marquis et al., 2017) this did not seem to be an important aspect of the process for students. Perhaps such a challenge would only manifest with a wider implementation over a longer time period. Alternatively, our students may simply be uninterested in the kind of power that is at stake in these kinds of projects, and thus did not see this project as having a bearing on wider issues of student-staff relationships. For example, students did not report that participating in this project had a significant effect on their relationship to faculty members or to the university.

Ownership and copyright

The relatively strong sense of ownership that students may feel over group work is one of the benefits of this form of activity (Helle, Tynjala, & Olkinuora, 2006). Sense of ownership is a significant motivating factor for students, and such motivation can help socialise students as co-producers (Kotzé & du Plessis 2003). Pastel et al. (2015) argue that a sense of ownership in student projects depends on who among the stakeholders is responsible for making the major decisions: supervisor, client, or one or more students. Another important aspect of ownership is the practical matter of copyright and

intellectual property. Chan (2006) makes a strong argument against universities pursuing copyright claims in general, as such claims are detrimental to academic freedom, potentially leading to institutional censorship of academic work. In the specific case of student work, the advantages of not pursuing copyright claims, in most cases, far outweigh any economic advantage of pursuing them. By refusing students' claims to ownership of their work the institution marks them as 'lesser members of the academy' (McSherry, 2001, p. 83) with a resulting loss in students' sense of academic capability. That is, when a university denies students legal ownership of their work, it impacts negatively on their academic self-concept. Academic self-concept improves with the kinds of staff-student interactions we see in student as co-producer projects (Kim & Sax, 2014). Copyright and intellectual property are not then merely a way for students to make money from their work. Students' sense that they have ownership over their work is positively related to their sense of themselves as people capable of generating valuable academic knowledge (and, in our case, software), which is precisely the sort of shift in self-concept that allows students to move toward more central forms of academic practice.

In our case the university supported the project through internal grants. However, even with this support the project encountered resistance. This was not due to overt hostility but rather because adequate policies relating to copyright and intellectual property were not in place. The university, like many UK higher education institutions, does not claim copyright over student-produced work, but does reserve the right to claim copyright over employees' work (Chan, 2006). In most cases this claim is not pursued. However, this project represented a potentially significant source of income. On the one hand, the university was entitled to claim copyright since it was partially the product of their employees' efforts and had been supported in the form of grants. The

proposals for these grants stated that the finished app would be distributed for free online, so the university had no expectation of direct financial return. However, holding the copyright would allow the university to ensure the app would not damage the reputation of the university. More positively, the university could devote resources to ensuring the app would actually benefit the university's reputation. They may also want to retain the right to develop another version of the app that could be monetised. On the other hand, the project was also the product of student work, and so pursuing a copyright claim would conflict with the university's policy of allowing students to own their own work.

Through negotiation between student-developers, supervisor, academic-clients and the university, an agreement was made which allowed both the university and the students to develop the app independently if they wished. Such agreements have precedent (Lichtenstein & Eftychiadis, 1993). It is important that such negotiations happen in a fair way, acknowledging the asymmetrical relationship between students and the university and the concomitant bargaining power of the university (Chan, 2006).

While the students were involved in discussions over copyright, it was clear from the focus groups that they remained confused over who actually owned the app. This may be explained by a general lack of knowledge of copyright law amongst students (Muriel-Torrado & Fernández-Molina, 2015) or the specifics of attitudes to copyright in China (Barraclough, 2016). However, it may also simply be a lack of interest. For many of the students the app was simply a piece of coursework and they may not have thought much about how it would be developed in the future.

The students agreed that students, supervisor and clients all contributed to the project, and so all had some ownership of it, but were not very clear on how that ownership was distributed. The students did identify one factor that gave them a sense

of ownership. The supervisor took a more hands-off approach than they had been used to in previous projects, and students reported that this relative autonomy they had in determining the project's directions contributed significantly to their sense of ownership. However, they did not choose this project but were assigned it, and this may have lessened their sense of it as 'theirs.' Students clearly made the link between ownership and decision-making powers, as predicted by Pastel et al. (2015). To the extent that students felt they were the ones making creative decisions, they felt ownership of and pride in the finished product. To the extent that they were responding to decisions made by the supervisor or client, they felt it was just a piece of coursework.

Cultural distance

One means of developing students' ability to work in a multi-cultural atmosphere is to immerse them in multi-cultural teams during student projects. Multi-cultural teams tend to perform either very well or very poorly, with teams that manage to draw on the advantages while minimising the challenges doing well (Adler, 2008). It is essential, therefore, to educate students in cultural differences so that they can maximise the benefits possible in a multi-cultural team. Casey (2010) argues that students who are equipped with knowledge of intercultural differences will perform better in multi-cultural team situations. However, knowledge of intercultural difference may not be enough. Partly, this depends on the specific theories of cultural difference that are taught. In a critique of Hofstede's theory of cultural difference, for example, McSweeney (2002, p. 112) argues that the theory, by focusing on cultural difference rather than similarity, may end up being 'a restricter not an enhancer of understanding particularities.' He recommends that, rather than an overarching theory of cultural difference, it is necessary to develop understanding of how national culture is mediated in specific situations by more local factors. Signorini et al. (2009) take a similar view in

relation to multi-cultural education, seeing cultural difference as best understood in a bottom-up manner, taking into account 'micro-cultures' that are constituted at the crossroads of national culture, language, the specific learning situation, and individual subjectivity and learning experiences.

Berg (2015) also advocates for a focus on local specificities, arguing that it is necessary for students to learn strategies for dealing with cultural difference in specific situations. Students must not only be aware of their own cultural identity and how it might be specific to their own culture, but also be skilled in communicating about this difference with people who may have different styles of communication.

Cultural distance was an issue both for communication between students and academics and within the teams themselves. All meetings with the academic clients took place in English. None of the students were native English-speakers, though their level of proficiency did vary, with the international students being the most proficient English-speakers. In early meetings, some students reported finding the speed of talking and specific accents difficult to understand, but this became easier in later meetings. The only area where students explicitly mentioned cultural difference between students and academics was in relation to humour. Students reported occasionally feeling uncomfortable when they did not understand an academic's joke but felt compelled to laugh. Also, they were not always clear when a client was serious and when they were joking. These difficulties of intercultural humour have been discussed previously in the context of the classroom (Wang, 2014). In the present case, our Chinese students had mixed feelings about the use of humour. Students did make sense of humour through the lens of cultural difference, saying that it would be easier to understand the clients' intention if the clients were Chinese. However, they also reported that jokes helped put them at ease and improved communication.

The general ease of communication between academics and students could be attributed to the specific institutional context: students and teachers at this institution are used to inter-cultural communication, and likely have an intuitive sense of how to avoid serious cultural misunderstandings. This accords with Signorini et al.'s (2009) warning that it is necessary to look at 'micro-cultures' that take into account institutional specificity and individual experiences to understand how cultural difference might be understood or misunderstood in a specific situation. Here, the difference in 'national cultures' across academics and students was largely negated (though not entirely) by the local experience of studying and working in an institution with a particular multi-cultural structure.

Students frequently used cultural explanations for both positive and negative aspects of team dynamics. For example, the teams frequently met with their supervisor over dinner and this was seen as a good way of creating group cohesion that was specifically Chinese, but was also done because socialisation of academics and students can help to establish a culture of students as co-producers (Kotzé & du Plessis, 2003).

Conflict between Chinese and international students was also understood in terms of cultural difference, with different attitudes to leadership and discussion put down to typically 'Chinese' ways of approaching tasks. In one case, the only non-Chinese student in a team criticised the group dynamic as being too goal-oriented and not allowing for discussion. She put this down to cultural difference. By attributing the conflict to something as hard to change as 'culture' there was little room for negotiation and the student felt cut off from the team. This demonstrates Berg's (2015) contention that knowledge of cultural difference is not enough to manage conflict in multi-cultural settings. The students seem to have lacked the communicative strategies necessary to take their awareness of cultural difference further to actually solve the problems that

arose through this cultural difference, or even to figure out if the conflict was to do with cultural difference in the first place. The awareness of cultural difference here seems to have blocked communication.

Handover between teams

Careers involving large-scale projects demand skills in managing smooth handover to new teams. For example, in software engineering, poorly planned handovers can have negative impacts in terms of quality (Jabangwe, Börstler, & Petersen, 2015; Mockus & Weiss, 2001; Ŝmite & Wohlin 2012). Important factors in successful handover include minimizing the need for communication between outgoing and incoming teams; training the receiving team; and increasing the receiving team's familiarity with the product (Jabangwe et al., 2015). This involves skills on the part of both the sending and receiving teams. Students involved in projects that span multiple academic years can learn these skills.

In our project, the software was developed iteratively across several semesters involving different teams. Interviews with members of the later teams demonstrated the importance of good communication with members of the earlier teams, not only in order to learn about the current state of the software, but also to learn about ways of working and engaging with the academics.

The leader from the first and second team took on a role of 'mentor' (her term) to the third team. She shared specific information about the state of the app and also advice about dealing with clients and the supervisor and distributing tasks within the team. This is a potentially valuable way of incorporating peer-to-peer learning in projects. However, there was also a general feeling that the different teams were working on separate projects rather than on the development of the same. Marquis et al. (2017) report students being concerned about the legacy of their project and whether the

work they do—both the specific project and the work towards establishing and normalising student-staff partnerships—would continue after they graduated.

The decision to have an iterative project that spanned academic years was intended to give students a sense of being part of something bigger than a single piece of coursework. It was hoped that this would give students a greater sense of affiliation with the university and with the project. However, this turned out not to have had a significant effect. This may be due to a lack of a co-creative institutional culture that, according to Carey (2013) and Marquis et al. (2017), sometimes leads to students seeing the project as tokenistic. It is important, therefore, that if staff-student partnerships are to have lasting and continuing benefit to all stakeholders in the university, there must be some mechanism to implement a culture of co-creation.

Theoretical contributions

Based on the above analysis and discussion we identified a number of issues that contribute to the theory outlined at the beginning of this article and that people may wish to consider when preparing for similar projects. These issues can be categorised as:

(1) Communication and cultural distance.

(2) University policy and copyright.

(3) Ownership and handover.

Communication and cultural distance

As an empirical case study, this project contributes to theory of the student as co-producer paradigm. Some of our findings lend support to previous work in this area. Students felt they benefited from interaction with teachers in their new role of co-

producer and this is in line with literature on student-staff interaction (e.g. Dika, 2012; Kim & Lundberg, 2016; Kim & Sax, 2014; Lundberg & Schreiner, 2004; McCulloch, 2012; Marquis et al., 2017). However, little work exists on the student as co-producer approach in a multi-cultural or multi-disciplinary context. Our discussion shows that the relationship between students and staff is mediated by factors such as cultural and disciplinary affiliation, and we found that differences across these factors were important in the success of the project. The involvement of clients from different faculties in the university so that there were no pre-existing student-teacher relationships, and so that students had an expertise advantage is a case in point. Other projects would no doubt have other salient factors, and theoretical work on students as co-producers would do well to attend to the ways in which these 'different differences' play out in individual projects.

University policy and copyright

Marquis et al. (2017) argue that the student as co-producer approach can challenge the power structures of the university, and while we agree that this is a possibility, we found that issues of copyright are an obstacle to achieving this goal. We found that students were confused about the copyright status of the project, even after we explained it, and this conforms to previous work on students' knowledge of copyright (Muriel-Torrado & Fernández-Molina, 2015). Based on our experience, we recommend that universities develop clear policies on copyright for staff-student collaboration. It is important that this happens in a fair way that acknowledges the asymmetrical power relations between university, students and academics (Chan, 2006). It is not ideal to establish contracts on a case-by-case basis as students' lack of understanding of copyright law makes it unlikely that an individual group of students would be able to advocate for a fair deal. This could lead to a lack of motivation. Also, there may be a fear amongst students that

being too demanding in such negotiations could impact negatively on their marks for that module. Given this lack of bargaining power it would be ideal for an examplar contract to be negotiated independently of any specific student-teacher partnership, perhaps by the students' union and relevant university representatives.

Ownership and handover

A key aim of this sort of project is to give students a sense of ownership over their work (Kotzé & du Plessis, 2003). Pastel et al. (2015) argue that ownership depends largely on agency in decision-making processes, and our findings accord with this. Students commented that the relative autonomy they were given contributed to their sense of ownership. We encouraged students to participate in presentations of the product to the wider university community and at national and international conferences (Towey et al., 2017a; 2017b); we found that the students who participated in such presentations had a better understanding of the project as a whole, and of their own part in it, resulting in a greater sense of ownership.

However, most students in our project did not feel the project was a continuation of the first phase, though academics felt that the first iteration was an important stage in the overall development. This was unfortunate, since the handover process was seen both as a means of educating students for a career in software engineering (Jabangwe et al., 2015; Ŝmite & Wohlin, 2012) and to give students a sense of the project being part of something larger (Marquis et al 2017). Based on this, we would recommend instituting a formal handover process, where the teams involved in the transition meet on a number of occasions. These meetings could be led or facilitated by students who have engaged in the project in previous years. This would have the added advantage of encouraging the older students to reflect on the process they underwent which would lead to a deeper

understanding of this process.

Students from the earlier team should also be appointed as mentors for the later team, and the process of handover should be made a part of the marking criteria. This would give a greater sense of the continuity and demonstrate the importance of managing project handovers effectively, as discussed by Ŝmite & Wohlin (2012). Furthermore, this would give students of the new cohorts some information in advance about the sorts of cultural/linguistic/disciplinary challenges they are likely to face, and encourage them to develop strategies for dealing with these challenges before their first meeting with clients. This would be in line with Stokols' (2006) recommendation that in interdisciplinary teams a lot of time needs to be spent on finding common ground between team members.

Conclusion

We have argued in this article that student projects in which the clients are internal to the university represent a way in which universities can socialise students into the 'student as co-producer paradigm.' This paradigm can help to redress some of the problems of the student as consumer model by encouraging active, communal learning.

These projects have a range of benefits that are not available in projects with an external client. Of course, using external clients also has its own advantages, including in establishing relationships between students and prospective employers. Internal clients, however, offer the benefit of creating a larger variety of ways for students to engage with academics, and enhance cooperation models and processes. In addition, an ability to work in multi-cultural teams on long-running projects requires important

skills, and designing student projects that help students develop these skills will benefit them in their future careers.

In addition, for this paradigm to have a significant effect on the socialisation of students across the university, it is necessary to establish institutional structures that facilitate rather than impede the continual development of these projects (Carey, 2013).

Finally, the key challenges for educators are: ensuring that projects address the challenges of multi-cultural teams, and equipping students with skills necessary to make the most of these projects; establishing university structures that facilitate the implementation of these projects; and developing specific strategies to foster a co-creative institutional culture.

We are not arguing that all student projects should follow the lead of this particular one. However, our findings demonstrate the value of this kind of collaboration for students, academics and the university. The experiences gained in this project by the academic staff, and in particular by the supervisor, led to identification of a number of best practices for student-staff project engagement (Towey et al., 2017b). That supervisor has subsequently assumed responsibility for administration of all the penultimate year software engineering team projects, and feeds the experience and insights from this particular project into the Computer Science department's running of these projects. Recent projects have also included recruitment of real academic clients (from outside of computer science) and other students and student organisations as stakeholders. This new position also affords an opportunity to further investigate the possible introduction of producer roles in earlier stages of university studies, potentially aiming to overcome some of the issues related to student responsibility and ownership that we have identified—such as the difficulty of taking on new roles, and better understanding of student and staff copyright ownership.

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