Generic skills: Do capstone courses deliver?

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Generic skills are increasingly the focus of universities worldwide and are often developed in professional practice courses. This paper presents qualitative findings from students regarding their perceptions of the generic skills they developed during a capstone course in an Information Systems program. The study found that the capstone course improved their collaborative team-work, presentation skills and ability to apply skills/knowledge to new situations. The paper also demonstrates that students’ perceptions of generic skills were more closely tied to the discipline than university-wide generic skills. This lends support for generic skills policy/practice to be driven bottom-up rather than top-down.

Keywords: generic skills, capstone course, student perceptions

Introduction

Discipline knowledge alone is not sufficient for today’s graduates to obtain employment. World-wide, employer groups and government agencies emphasise the importance of graduates developing generic skills (Association of Graduate Recruiters, 1995; Crebert, Bates, Bell, Patrick, & Cagnolini, 2004; DEST, 2002; Taylor, 2005). These skills and attributes include communication, collaborative teamwork, negotiation, conflict resolution and problem-solving. If universities are charged with producing graduates with these skills, how do we develop courses to foster these skills?

Crebert et al. (2004) have shown that students believe that work-placement (a type of professional practice) improved their generic skills in the context of Microelectronic Engineering; Criminology and Criminal Justice; and Leisure Studies. Professional practice, more generally, provides learning experiences that focus on developing professional expertise; it is often promoted by industry-based learning, internships, practicums and capstone courses. In this paper we focus on a capstone course in Information Systems (IS). The purpose of a final year capstone course is to provide students with the opportunity to apply knowledge/skills acquired during their studies to real-world situations. Previous research has focused on course structure, content and generic skill development from the educators’ view point (for example, Goold, 2003; Mitri, 2008). This study aimed to explore students’ perceptions of whether an IS capstone course developed their generic skills.
The paper is organised as follows. Firstly, we discuss the nature of generic skills and then outline the current debate about the role higher education plays in developing these skills. We then describe the capstone course in an IS program at our university. The method of the study is explained, then the findings of the study are analysed through the lens of the IS discipline.

Background

What are generic skills?
There is lack of agreement on what is meant by generic skills (Green, Hammer, & Star, 2009) as evidenced by the many terms used to describe them (for example, ‘employability skills’, ‘soft skills’, ‘graduate attributes’ and ‘key competencies’) (DEST, 2002; Hager, Holland, & Beckett, 2002). However, an important definition of generic skills in the Australian context is articulated by in the Higher Education Council (Australia) (1992, p. 20):

These are the skills, personal attributes and values which should be acquired by all graduates regardless of their discipline or field of study. In other words, they should represent the central achievements of higher education as a process.

Hager et al. (2002) point out that most lists of generic skills also include attitudes, values and even dispositions. Indeed, DEST (2002, p. 15) lists, as part of the Employability Skills Framework, both generic skills and personal attributes, but the generic skills in the Framework are:

- communication skills;
- teamwork skills;
- problem-solving skills;
- initiative and enterprise skills that contribute to innovative outcomes;
- planning and organising skills;
- self-management skills;
- learning skills that contribute to ongoing improvement and expansion in employee and company operations and outcomes; and
- technology skills.

Variations of these skills are found in most lists of generic skills developed by universities worldwide.

Ongoing debate about what constitutes generic skills and the role of universities in developing these skills (for example, Green et al., 2009; Hager et al., 2002) has not deterred universities from claiming sets of generic skills for their students. Universities worldwide have been doing so for decades (Barrie, 2004). In an attempt to differentiate themselves, the lists of generic skills claimed by Australian universities are somewhat different for each institution, but most derive from the previously cited definition from the Higher Education Council (Australia) report (Barrie, 2004).

Development of generic skills
Given the lack of conceptual understanding around what constitutes generic skills, it is not surprising that universities are still grappling with how to design programs to develop and assess these skills (Green et al., 2009). A fundamental debate is whether generic skills can be developed outside of a disciplinary context. Proponents of the view that generic skills are indeed generic and thus can be taught out of context have existed since the 1970s (Green et al., 2009). However, evidence now seems to give more weight to the view that generic skills
are best developed within a specific discipline context because attributes such as critical thinking and communication have different meanings in different disciplines (Bath, Smith, Stein, and Swann, 2004; Hager et al., 2002). This is not to say that generic skills are not transferable, but evidence suggests this is more likely to occur when skills have been developed in diverse and complex situations, and when reflective learning processes have been applied (Moy, 1999).

However, if generic skills are best developed within disciplines, then it follows that these skills must be implemented within individual programs. Since research on the development of generic skills indicates that they are best developed by active approaches and deep learning (Luca & Oliver, 2002), it is clear that universities must design courses that focus on process and student-centred activities rather than just subject content (Bates, 2008; Biggs, 1999; Candy, Crebert, & O’Leary, 1994). Professional practice is one approach which may provide the deep learning that facilitates the acquisition of generic skills.

**The IS capstone course**

Many universities offer an industry-based capstone course to final year students in IS programs. The capstone course provides students with an opportunity to apply their theoretical knowledge and skills to a real-world situation, thus facilitating active, student-centred learning. While there are many models of capstone course, the one discussed in this paper involves students working in teams to complete a genuine industry project. It involves analysing, designing and implementing an IS solution to meet the client’s needs. Students are responsible for all aspects of the project including project management, requirements gathering, analysis, design, implementation and post implementation.

Staff place students into project teams of six or more students, and nominate one student to be project manager. The project manager is given a brief description of their allocated project, and the name and contact details of their client. While there is a framework of deliverables over the 12-week semester, all other decisions are the responsibility of the team such as the overall approach, tools, techniques and implementation strategies. The directive nature of team and project allocation is also consistent practice in industry.

A comprehensive document containing guidelines on the expectations of each deliverable is provided to students. The project is worth 80% of the course mark, and students complete an individual reflective essay on a project management topic, which they must illustrate from their course experience, for the remaining 20%.

A key feature of the course is a range of practical workshops. These experiential workshops cover a broad range of issues including team building, information gathering, presentation skills, negotiation, conflict management, cross-cultural communication, interpersonal communication and decision making. The workshops give students practical hands-on experience of these skills with particular emphasis on how they relate to their role as IS professionals. This ensures that students have experience with these skills in a non-threatening classroom setting in preparation for their interactions with the real industry clients in their project. These workshops also illustrate techniques which students can use to develop a successful team (for example, negotiation and team building skills), as well as techniques they can use should their team become dysfunctional (for example, conflict management). Team members can ask staff for advice, but it is up to the team members to work out solutions to teamwork problems.
Methodology

The aim of the study was to understand IS students’ perceptions of whether the capstone course helped them develop generic skills. Given that the prevailing view, as described previously, is that generic skills must be developed in context, we focused our study on an IS program which mandates that students undertake a capstone course in their final year of study.

In order to gain in-depth insights, the primary data collection method was semi-structured interviews to allow further exploration about relevant issues as required. The questions centred on students’ experiences in the capstone course and the skills they believed they gained. The interviews were conducted by telephone and took 20–30 minutes. The interviews were recorded if the students agreed, and later transcribed verbatim.

For those students who did not wish to be interviewed (for example, because of confidentiality concerns or their time constraints) we provided an anonymous web survey. The survey included 12 open-ended questions which were similar to the semi-structured interview questions.

This paper reports on the qualitative responses from students who participated in the interviews or the survey. All the qualitative responses were coded using a thematic condensation approach.

The participants in this study were current and past students of an IS capstone course in 2006–2009. Although only a minority of the approximately 90 students who were past students could be contacted, nine agreed to take part in an interview, and 3 participated in the survey. All current students enrolled in the 2009 course were invited to participate. Of the twenty-five current students, six took part in interviews and five completed the survey.

One limitation of this study is that self-reporting by respondents in interviews and surveys is not an objective measure of whether they have developed generic skills. However, self-reporting can be a valuable method for demonstrating aspects of students’ academic development (Tapper, 2004) and are argued to have merit in indicating the development of generic skills which can be difficult to demonstrate using more objective measures (Bath et al., 2004). In addition, the focus of this study was on students’ perceptions of their development of generic skills, so that self-reporting was appropriate for our purposes.

Findings

In analysing the findings, it became apparent that students’ comments were aligned most closely to the discipline-specific generic skills required of IS graduates. To facilitate discussion later, the findings are grouped around four IS-generic skills. These were derived from an analysis of generic skills suggested by a peak information and communication technology (ICT) body – the Australian Computer Society (ACS) (Gregor, von Konsky, Hart, & Wilson, 2008) – and two major IS industry surveys (Aasheim, Lixin, & Williams, 2009; Noll & Wilkins, 2002). The four clusters of IS-generic skills are:

- ICT problem-solving
- communication skills
- team skills
- organisational skills.
ICT problem-solving
Problem-solving for IS graduates is expressed in broad terms such as ‘the ability to interpret business problems and develop appropriate technical solutions’ (Noll & Wilkins, 2002). It includes using processes and modelling methods to understand problems, handle abstraction and produce design solutions (Gregor et al., 2008). It also requires creativity and innovation (Gregor et al., 2008). Thus for IS students, problem-solving is far reaching and involves a range of generic skills. This explains why many students discussed their skill development in terms of understanding and analysing the client’s business. Many students also found it difficult to distinguish between specific skills. This may be because of the wide-ranging nature of ICT problem-solving or simply because, as Hager et al. (2002) point out, generic skills overlap and interweave. For instance, one student described his perception of the way in which the project had improved his critical thinking skills as follows:

Learning about a new business – that was I think the biggest… because we had to really understand the business and analyse it in order to be able to develop something that they wanted.

A more specific aspect relating to problem-solving was how many students recognised that they needed to identify, gather, evaluate and use information in order to solve the client’s problem(s). As illustrated in the next quotes, students found this challenging without the structure they had been accustomed to in previous courses:

[In other courses] you get the all the information and everything given to you up front so all the lecture notes, study guides, everything’s just given to you. This year it was the opposite, we had to go get it. To get the information we had to go and retrieve it according to what we needed. So it was totally the opposite to what I was used to. That was quite a challenge and I really enjoyed that because it sort of enabled me to actually go out there and explore.

Sometimes you had to think a little bit outside the square to get the information that you needed, to get things done. Sometimes the information wasn’t right there in front of you, you had to do a bit of research to find information.

Communication skills
The communication skills required of an IS graduate emphasise persuasive oral/written presentations and technical writing, as well as interpersonal skills, because interacting with clients is an integral part of an IS job (Aasheim et al., 2009; Gregor et al., 2008; Noll & Wilkins, 2002).

The capstone course required students to interact with a client. Although many students had experience communicating with clients in their casual jobs, several students commented that the type of communication in the capstone course was different. During the project, students interviewed clients to determine their system requirements, negotiated the project scope, and presented their ideas to clients. All students, past and present, believed that the capstone course had improved these skills. Many students commented that the project had been their first opportunity to interact with a real client and this experience provided rich learning opportunities, as in the following typical quote:

That was one of the huge ones – learning how to deal with an actual real client. Learning how to read people and interviewing, not just going and reading a piece
of paper and asking questions like you do in high school when you did your projects.

Implicit in the previous quote is the student’s understanding of the need to control the interview; being able to elicit information while building a relationship with the client. Such reflections demonstrate a high degree of understanding of interview processes.

Students also identified another communication skill required of IS professionals – being able to negotiate with clients about project scope. As one student explained:

You know, the client says, ‘like, we need this and this and this’, but in the time frame we have, we said, ‘we could do this’. And we need to bargain, do a little haggling, maybe compromise a little bit here and there. But at the end we came to a good solution for both parties.

This is a particularly difficult skill for students because they often underestimated the time required to complete tasks, and often felt obliged to say yes to all client requests with predictable outcomes:

We offered to do so much, like everything we thought that we could do, but you don’t realise how much time things take and you are over shooting what you can actually deliver.

After gathering a client’s requirements the IS professional must be adept at analysing this information and presenting persuasively to clients. The project gave students this opportunity during five formal staff and client presentations. Students’ learning about communication was also supported by a workshop on presentation skills prior to these presentations, whereby each student was given confidential feedback on their individual performance.

The learning afforded by the genuine nature of the presentation was a theme echoed by many students, as explained next:

I think the thing I liked the most or gained from was probably the presenting. I’ve done presentations at uni before but it’s always to students and they’re usually not really that interested but when you’re presenting to a client it’s a bit different because they don’t know what’s happening and you have to discuss it in a way that they will understand.

This ability to present technical information in a non-technical way distinguishes the IS professional from other consultants. For example, marketing students would be more likely to present to clients in marketing roles. But IS consultants are more likely to present to clients who have no knowledge of the technical aspects of a solution.

**Teamwork skills**

The ability to work in a team environment is the third skill cluster required of IS professionals, and involves interpersonal skills including collaboration and conflict resolution (Aasheim *et al.*, 2009; Gregor *et al.*, 2008; Noll & Wilkins, 2002). Most students highlighted the improvement in their ability to work collaboratively in teams. Some students attributed the improvement to the authentic nature of the project, others to team size or to the length and intensity of the team interaction.
I gained a good experience in working professionally with a group of people aiming to achieve a given task at hand. I also developed communication skills which I have utilised since finishing the project.

There was a lot of teamwork and it’s a bit different to other uni assignments where the other ones were all based around getting like a pass or a good mark whereas this one actually had real life consequences I guess. Like we were actually working on something rather than just a uni assignment and so I think everyone was a bit more enthusiastic so it was good to actually work in a team of people that were keen on doing something.

However, some students who worked on unsuccessful projects (where students failed to deliver a working system) were not as sure the project had improved their teamwork skills. This is not surprising since the primary cause of project failure is team dysfunction as illustrated in the next quote:

The first challenge I think we all faced was that we weren’t productive. We kind of sat around in meetings … and it was just unproductive … Because there was no direction, it was just 12 people giving different points and by the end of the hour we’d have to pick the best one.

In this example, the student felt that the team leader was not effective at running meetings. This issue was resolved by the team splitting into two sub-teams, with the respondent becoming the leader of the second sub-team. As a consequence, this student experienced first-hand both teamwork problems and the techniques which can be used to overcome them.

Another student who worked in an unsuccessful team felt that the team experience in the project was no different from other group work he had completed:

It was something that had been covered by a few other units that I’d done previously.

Perhaps the difference can be explained by the fact that successful teams ‘gel’. One student from a very successful project had this to say about her team:

I have never worked in such a good team as that to be honest really. The amount of synergy that we developed over those twelve weeks to get everything done was just amazing really.

Although most students felt that their teamwork skills had improved, learning to work effectively together was not always straightforward. This was because students were placed into groups by staff and in most cases had to work with students with whom they had no prior relationship:

I would say the first thing was to learn how to work with people and you know different kinds of people in the sense that people with different demands and needs and requirements, so that was the first thing that I learnt.

Teamwork requires excellent communication skills, including conflict resolution:
There were things gained out of it, like teamwork, but … teamwork once again, certainly a lot of problem solving, conflict resolution, conflict resolution is massive.

The students were not asked whether they thought the teams would have worked better had they chosen their partners because they would rarely have this luxury in industry. The example quotes above emphasise the valuable skills students learned such as solving problems with dysfunctional teams and working with team members who have different expectations and work ethics. Indeed, students in more dysfunctional teams might have learned more skills than those who were in more successful teams, but determining this will necessitate further research.

Two other generic skills also emerged from the data: time management and applying skills. These two skills are not specifically mentioned in the defined ‘IS-generic skills’.

**Time management**

Although not a strong theme, some students believed the course had provided them with an opportunity to improve their time management skills, as in this typical statement:

> Prioritising your work and stuff – something I learnt was I didn’t juggle this properly with my other subjects, which I should have, so that is something I learned but towards the end I managed to do that.

**Applying skills**

An additional theme that is also not mentioned in the IS-generic skills framework, but emerged strongly in the findings, was the value students placed on the opportunity to apply the skills they had gained throughout their undergraduate program:

> I would say it gave me a lot of confidence because you did three years of study and you want some sort of experience after all that as to how to apply all that knowledge and so they’ve given me a lot of confidence in that.

**Discussion**

The findings show that the generic skills students believed which improved during the capstone course closely mirror IS-generic skills. This suggests the capstone course has contributed to fulfilling the professional needs of IS students.

There are only two points of departure between the students’ perceptions and the IS-generic skills. The first is organisational skills which were not mentioned by students but appear in the IS-generic skills. However, students did discuss improvements in time-management, which is a component of organisational skills. The second is the opportunity to apply knowledge and skills gained in their programs which is not mentioned in the IS-specific generic skills.

To situate the findings in the larger debate on generic skills, the themes from the study and the IS-generic skills are mapped in Table 1 against the generic skills from our university. From Table 1 we can see that ICT problem solving incorporates the university generic skills of critical analysis, problem solving, creative thinking as well as identifying, gathering,
evaluating and using information. On the whole, the IS-generic skills and the students’ perceptions align with the university generic skills except for the last two skills in Table 1.

ICTs are the IS professional’s tools of trade so it is unremarkable that effective use of ICTs is not mentioned in the IS-generic skills literature or by the students. The final university generic skill in the table, ‘applying knowledge learned in the program to new situations’ was a strong theme in the findings, but was not one that is defined as an IS-generic skill. This may be because it is taken as given that graduates will be able to apply their knowledge to new situations. However, given the strength of this theme in the findings, the implication is that the capstone course has the important role of providing students with the opportunity to integrate, consolidate and apply their skills/knowledge in ways that meets industry expectations.

<table>
<thead>
<tr>
<th>University-defined generic skills</th>
<th>IS-generic skills clusters</th>
<th>Skills clusters students believed improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical analysis, problem solving, and creative thinking</td>
<td>ICT problem solving</td>
<td>ICT problem solving</td>
</tr>
<tr>
<td>Identifying, gathering, evaluating and using information</td>
<td>ICT problem solving</td>
<td>ICT problem solving</td>
</tr>
<tr>
<td>Communicating effectively and appropriately in a range of contexts</td>
<td>Communication skills – presentations especially important</td>
<td>Communication skills – presentations especially emphasised</td>
</tr>
<tr>
<td>Developing, planning and managing independent work</td>
<td>Organisational skills</td>
<td>Time management</td>
</tr>
<tr>
<td>Working effectively as part of a team</td>
<td>Collaborative team working</td>
<td>Collaborative team working</td>
</tr>
<tr>
<td>Effectively using information and communication technologies (ICT)</td>
<td>Not specifically mentioned</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Applying knowledge learned in the program to new situations</td>
<td>Not specifically mentioned</td>
<td>Applying knowledge</td>
</tr>
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</table>

From a broader perspective, the fact that universities articulate a single set of generic skills for all graduates seems at odds with the literature affirming the need for generic skills to be developed in context. Certainly, our findings show that students described the skills they developed during the capstone course in terms of IS-generic skills rather than university generic skills. A recent study by Jones (2009) found that academic staff in five (non-IS) disciplines conceptualised generic skills in quite different ways. This study, taken from the student perspective, supports Jones (2009) contention that generic skills are shaped by the social practice of disciplines.
Conclusions

This study, although small, does lend support to the premise that an industry-based capstone course provides students with opportunities to develop generic skills in ways that may not be possible in the sanitised classroom setting. As Brooks, Nocks, Farris and Cunningham (2002) point out ‘it is not possible to capture the full scope of the messy political, procedural aspects of actual practice in the confines of an academic setting’.

In higher education where the trend is towards program modularisation rather than vertical program structures with pre-requisites (Green et al., 2009), a capstone course may be an important vehicle to consolidate both disciplinary expertise and generic skills.

The study also showed that students’ perceptions of the generic skills they developed in the capstone course were more closely aligned to IS-generic skills rather than university-wide generic skills. This lends support to the contention that generic skills are discipline dependent (Jones, 2009). The practical implication is that disciplines must determine the generic skills that are part of their social practice as a first step in creating programs that foster the development of generic skills. In other words, a bottom-up approach is more appropriate than a top-down approach. Focusing on a top-down approach runs the risk of obfuscating the policy and pedagogical approaches required to develop discipline appropriate generic skills.

This paper has presented student’s perceptions of their generic skill development in an IS capstone course. Further studies, however, are needed to capture other stakeholders’ views including the graduate employers and the clients of the capstone courses.

References


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