

Project-Based Learning in Industry-University Collaboration – Three Normative Models

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ABSTRACT

This paper reports three normative models for project-based learning (PjBL) in university-industry relations in computing. The models are inspired by normative theories on business ethics, and are designated as archetypes that describe the objectives and responsibilities of parties in collaboration: 1) The Slaver model prescribes that a university should sell students as slaves for business and reap the benefit, 2) The Educator model recognizes that the knowledge and skills development of students is also important, and 3) The Reformer model integrates the development of working life and project work practices into collaboration and represents a form of ethics teaching in this manner. The aim of the three models is to sensitize teaching professionals in PjBL in computing to critically reflect on their current practices. The Reformer model combines PjBL and ethics teaching, and a solution based on this model is presented.

Keywords

Project-based learning, business ethics, industry-university collaboration, ethics teaching

INTRODUCTION

When successful, industry-university collaboration benefits all parties (Slotte and Tynjälä, 2003). The firm is able to obtain novel knowledge and a capable work force, and the university can develop its contacts with the working world. For students, such collaboration is extremely beneficial, as they can use it to create contacts within a relevant industry. A variety of different types of collaboration are formed between university and industry: education planning, research centers, internships, and projects (Keithley and Redman, 1997; Santoro and Chakrabarti, 1999; Watson and Huber, 2000). There is a collision in the different underlying values of these organizations in such collaborations: simply described, the university searches for truth and the business looks for a profit (Kenney, 1987; Brown, 1985; Carroll 1991). In computing, a collaboration that is formed is project courses or project-based learning (PjBL). In PjBL, students study project management and work skills, while completing a real project task for a genuine client, such as a firm. On the basis of my experience from project teaching and developing project teaching in a variety of universities in Finland, I have defined the project skills as: Universal know-how around completion of a single large task in a controlled manner.

In computing, education project teaching means information system (IS) or software (SW) development for a genuine client, a firm. In these types of courses, the learning objectives may relate directly to project skills, such project management, communications, planning, or group work, or to substantive issues, such as programming and planning the user interface or the internal structure of the IS/SW. In this type of collaboration, the collision of values may cause conflicts (Vartiainen 2007, 2009), so I argue that it requires frameworks to steer its planning and implementation. As universities should consider business from a larger viewpoint than that of a single firm and its objectives, a social responsibility perspective might prove fruitful in better understanding the collaboration and its possibilities at large. In this study, I aim to find new insights with regard to PjBL, by integrating business ethics-thinking with the collaboration between university and industry in computing. In this way, PjBL comes close to ethics teaching. I state the following research question:

How can we promote social responsibility in society via PjBL?

As a response to this research question, I will present three archetypes; the Slaver model, the Educator model, and the Reformer model, which describe widening and developing the focus with respect to tasks, and taking responsibility for the relationships of clients, students, and society. The moral viewpoint is emphasized in the models, as teaching is an inherently moral activity (Oser, 1991), and PjBL collaboration can be used as basis for moral development (Vartiainen, 2010). Indeed, the most developed model, the Reformer model, will add a new perspective to existing computer ethics frameworks (e.g., Tavani, 2001; Davison, 2000). The three archetypes are based on three normative theories of business ethics that I will present. I will then describe the method and the models. Finally, I will compare the models to business ethics theories and discuss the limitations of this study.

THREE NORMATIVE THEORIES OF BUSINESS ETHICS

The major moral requirements confronted in business are discussed in the context of corporate social responsibility (CSR). Carroll (1991; 1999) argues that there are four aspects of business social responsibility: economic, legal, ethical, and discretionary (philanthropic). Economic responsibility or profitability is the foundation upon which the other responsibilities are predicated, and without which they cannot be achieved. Legal responsibilities mean that corporations can pursue economic goals within the limits of the written law, while ethical and discretionary responsibilities relate to doing good and avoiding harm. The differing roles of business form part of the debate between the stakeholder and shareholder viewpoints (Branco and Rodrigues, 2007). However, three major normative theories of business ethics, stockholder (or shareholder) theory, stakeholder theory, and social-contract theory (Smith and Hasnas, 1999; Smith 2002; Hasnas, 1998), have been identified.

Stockholder (or shareholder) theory

Stockholder theory holds that managers have an obligation to maximize profits, because, in that manner, stockholders gain the greatest value from their investments. The basic idea is that firms providing society with its most valuable goods and services are rewarded, and in the long-run the stockholders of these firms receive the profits. Smith (2002) summarizes the theory as follows:

“... all of society is best off if managers take actions that maximize returns to stockholders, since this means that the firm is providing what society most desires.”

Stakeholder theory

Stakeholder theory holds that a corporation must consider all those who are affected by its actions: employees, consumers, suppliers, the surrounding community, and society at large. There are two types of stakeholders: primary stakeholders are those who are needed for the survival of the corporation (e.g., investors, employees) and secondary stakeholders influence, and are affected by, the company, but are not essential for its survival (Clarkson, 1995). Indeed, according to Smith and Hasnas (1999, 115), stakeholders refer to parties that are vital to the survival of the corporation or whose interests are vitally affected by it. Social responsibilities towards these parties are seen to be of equal concern to a corporation as are its responsibilities to its investors and owners. There is a fundamental distinction between normative stakeholder theory and stockholder theory, which Smith (2002) summarizes as follows:

“stakeholder theory demands that interests of stakeholders other than stockholders be considered along with those of the stockholders even if it reduces firm profitability.”

However, taking a stakeholder viewpoint is not a charitable act: companies engage in CSR because they benefit from such activities (Branco and Rodrigues, 2007).

Social-contract theory

Social-contract theory posits that managers should consider not only the interests of consumers and workers, but also the canons of justice. It promotes the idea of a hypothetical contract between society and certain individuals who form an enterprise. This contract would include the expectations and obligations between these parties: the individuals forming the enterprise would ask society for legal recognition as a single agent (e.g., to sign contracts), authorized to use its resources to hire employees. Conversely, society expects firms to adhere to social-welfare principles, which means that consumers' and workers' interests should be protected through the maximizing of advantages and the minimizing of disadvantages. Managers should also consider the consequences of their actions for society: they should avoid pollution, should not misuse political power, etc.

These three theories have distinct and incompatible perspectives, but they have two common dimensions (Smith and Hasnas 1999, 117). First, they were designed to provide ethical guidance to individuals working in profit-seeking businesses in a market environment. They cannot be applied in non-market settings (e.g., communal and socialist environments). Second, they provide guidance for individuals working in such environments: they set down independent standards covering the ways in which people should act and how they should react to the orders of their business superiors. Although these theories are directly applicable in the business context, I argue that they provide useful lenses through which to consider university-industry relationships in the case of PjBL. In such collaboration, the business objectives have an important role.

METHOD

The development process of the three models is based on the use of a theoretical framework, together with a reflection of my own personal experiences in PjBL, which covers 12 years at three universities, the University of Jyväskylä, the University Consortium of Pori, and the University of Oulu, in Finland. During these years (2000 to 2012) I had numerous discussions on the objectives and means of PjBL with my colleagues and students, as well as with client representatives. In my experience, many issues in PjBL are morally challenging, and, as teaching as such is considered inherently moral (Oser, 1991), a reflection on PjBL from a moral viewpoint is needed. Comparative discussions with my colleagues from different universities have revealed that PjBL may be based on different assumptions and objectives. Although the learning objectives of PjBL have been thinly described in some instantiations, in others there is major pressure on students to reflect their experiences. On the basis of these views, I argue that we require thinking tools to critically reflect on PjBL instantiations.

In the field of computing, PjBL aims to coach students in the IT business, so the inclusion of theories of normative business ethics into analysis provides a believable, albeit provoking, base. The three basic objectives, maximizing profits (cf. stockholder theory), considering affected parties (stakeholder), and justice (social contract) are purposefully integrated in PjBL in a simple manner, to build simplified and provocative archetypes that are next described.

THE THREE NORMATIVE MODELS FOR PJBL IN COMPUTING

In all three models, the university is responsible for the entire collaboration (Table 1). Therefore, the university has the primary role in defining the responsibilities of all parties. Notwithstanding, the collaboration must be attractive to the industry partners and the students, therefore their viewpoint and potential benefits are also important.

The Slaver model

In the Slaver model, the underlying purpose of the collaboration is to economically benefit the university. Clients pay for the labor of student groups, and, at the same time, student groups learn project work practices. The Slaver model is inspired by stockholder theory (Smith, 2002), which states that maximizing profits is the only objective of any business, and that PjBL in a university is perceived as business. The student group is guided by the client or university teachers and the sole purpose of the student project is to develop or support the business of the client. From the university side, the students are taught to adopt client orientation in all their practices. The success of the student project is assessed through the benefit that the client obtains. If the project is a failure, the students may not be able to complete the project course. The client may pay wages, as this motivates students. The clients are selected to participate in the collaboration via auction, and in this way the university maximizes its benefits.

The Educator model

The Educator model is inspired by stakeholder theory (Smith, 2002), and states that the interests of the student and clients must be considered in a PjBL collaboration. Students' project work is perceived as a means of developing their associated skills, and, at the same time, the client benefits via the results of the project. A university selects the clients in terms of the qualities of the project task and how these support the pedagogical objectives of the PjBL. The client naturally benefits via the students' work, but the students are also obliged to use their resources for reflecting project work practices. In this model, the benefits of both parties are more equally distributed than in the case of the Slaver model; when assessing a student's project, the benefit that the client receives and the learning outcomes are given equal weight. This means that if the results do not satisfy the client, the students still have the possibility of completing the course if they show that they have learned from the experience.

The Reformer model

The Reformer model is inspired by social contract theory (Smith, 2002), and states that an imagined contract between a university, a corporation, and society is formed with respect to the objective of the university at large and the objective of a

single PjBL course. (Here, we take the position that society accepts a market-based economy, and we bypass debate regarding different economical structures that society could be based on.) In this imagined contract formulation, universities and corporations are perceived to have critical positions in affecting society. It can be expected that they help society to progress: In the contract, firms are given the possibility of exercising their basic functions in creating revenues, but they are also expected to participate in activities of social responsibility to a reasonable extent. In this imagined contract, clients are expected to support the aims of the university in providing education that critically reflects future IS professionals, with respect to the PjBL environment. In addition to research, the university is obliged to play a greater part in the so-called service task, by investing resources in developing society via teaching, in this case via PjBL. In practice, this would mean that the university makes it possible for students and clients to reflect work life and project work practices in PjBL. The Reformer model inherently possesses the objectives of the Educator model, but the objectives are enlarged by the inclusion of the development of justice and care in society. Ideally, this means that students would be engaged as reforming agents that are sent to progress the IT business and society.

	Slaver model	Educator model	Reformer model
Goals and motivation	Underlying motivation is to obtain benefit for the university via students' work.	Underlying motivation is to teach students project work skills through implementation of a project for a real-life client.	Underlying motivation is to progress society, via having parties (clients, students, university) critically reflecting on working life and project work practices.
How client enters the collaboration	Auction: Client selection is based on the maximum fee they will pay to the university.	Negotiation. Negotiation of pedagogical suitability of the project task (sufficiently challenging, according to the requirements of the curricula).	As in the Educator model, but client motivation to take part in critical reflection on working life practices is considered.
Assessment of successful student project	Project success is assessed with respect to the benefits the client obtains.	As in the Slaver mode, but, in addition, learning outcomes are given equal weight in assessing project success.	As in the Educator model, but, in addition, the reflection on the effect of outcomes on working life practices is considered.
Responsibilities of university	Guarantee that client benefits from collaboration.	Support student group in implementing project and in reflection.	Support student group in implementing project, in reflection on both project work skills and critical reflection on working life.
Responsibilities of student	Complete the project in the way that it benefits client.	Complete the project in such a way that it benefits the client and simultaneously learn project work skills.	As in the Educator model, and, in addition, the student's responsibility is to take part in critical reflection on working life practices.
Responsibilities of client	Support students' activities when completing the project.	As in the Slaver model, and, in addition, the client must give reflective feedback on students' actions and learning.	As in the Educator model, and, in addition, the client must take part in critical reflection on working life and project work practices.
Definition of project skills	Universal know-how regarding completion of single and large tasks in a controlled manner.	Universal know-how regarding the completion of single and large tasks in a controlled manner, and in the way that the know-how develops project by project.	Universal know-how regarding completion of single and large tasks in a controlled manner, and in the way that the know-how develops project by project and the development of know-how aims for justice and care in working life.
Practical example	A project course that is targeted to benefit the client via a student work-force (e.g., implementation of an IS).	A project course that is targeted to benefit both students (learning) and client (benefit) via implementation of a project (e.g., an IS).	A project course that is targeted to benefit society in the long run via students' and clients' joint critical reflection on issues of working life.

Table 1: The three models

DISCUSSION

This study proposed three normative models for PjBL in computing; the Slaver model, the Educator model, and the Reformer model. The models are archetypical in nature to simplify the possible implementations of project courses in computing. In the Slaver model, students are merely a means for the university and clients, and in the Educator model the students' learning outcomes, together with the benefit for the client, are in focus. In the Reformer model, the focus is on progression of society, via the collaboration of different parties, and participants in PjBL are integrated in the development of a just society.

The Reformer model offers a new perspective on ethics teaching in computing that is based on moral psychology: Students are exposed to higher level argumentation, via discussions with other students and IT professionals. They could also be exposed to exercises that directly aim to develop their moral decision-making abilities to post-conventional level (Penn, 1990). The Reformer model might be more interesting for students, as it deals directly with the working life concerns that will affect them in their near future. This model also considers the history and context of moral problems, which is important with respect to fully understanding the practical moral challenges (McDonald, 1993).

When firms engage themselves in a PjBL collaboration they expect to benefit from it. The activity level of the client may differ, depending on the course model; the Reformer model requires very close engagement with the course, while in the Slaver model, the role of the client is restricted purely to guiding the students in the particular project task.

The definition of project work skills becomes more enlarged from model to model. In the Slaver model it is a question of getting a single project completed. In the Educator model, inherent in the project work skills is also the ability to develop one's skills from project to project, and in the Reformer model, inherent in the project work skills is the idea that one aims to promote justice and care in society.

Evaluation

There is always tension between the ideals and the reality. Although we aimed to advance the use of the Reformer model in PjBL, in practice it would be very challenging, given the resources that the clients possess, for example. However, there are firms that invest in social responsibility and therefore there are possibilities for the Reformer model. The three models of collaboration are inspired by a theory and they have not been empirically tested. The Reformer model is a result of my own deliberation on the type of social contract that would be accepted by the key players. This represents a possible bias as there is a single person representing a Nordic country (cf. the status of government in the USA, central Europe and the Nordic countries); however, my experience in PjBL and in ethics research can be perceived as a strength.

Implications

The Slaver model is not proposed as a model for courses, but instead it aims to show a practice to be avoided, and it may be possible to identify courses that represent the model and to begin developing these courses. The Educator model and the Reformer model aim to show possibilities that could be realized in different ways. A solution might be based on successive courses. A project course based on the Educator model would be followed by a Reformer model-based course. In addition, the Reformer model might be realized with a course that is arranged in parallel with the project course. Such an example is reviewed next.

An example of practical implementation of the Reformer model

An example of practical implementation that resembles the Reformer model, but does not totally conform to it, is now described. In addition, ideas to develop the example of implementation toward being more fully representative of the Reformer model are suggested.

At the beginning of 2000, I taught an Ethics of Project Work course that was arranged alongside a project course. In the ethics course, students were expected to develop their moral sensitivity, and become capable of identifying morally relevant issues to support them in moral decision-making (Rest, 1984). To attain these objectives, the students were to i) reflect on the moral conflicts they confronted during the project course in a diary, and ii) to take part in exercises. One of the exercises considered drawing on moral conflicts in a student project. I have previously reported the analysis of the moral conflicts (Vartiainen, 2010). An example of such a moral conflict is presented in Figure 1, in which the picture on the left represents a moral conflict, while the picture on the right describes the conflict as solved. The figure shows that in student project courses, project managers must find a balance between getting the work done and upholding the spirit of the group. Students raised other moral conflicts in their pictures, such as the effects of the information system on the organization and the commitment of team members to the project task.

The course described above could be developed to conform to the Reformer model as follows. First, inclusion of client representatives as active participants in an ethics course would increase the exposure of students to the complexity of morally relevant issues in IT project work. This would speed up the development of moral sensitivity (Rest, 1984) with respect to issues of working life. Given the moral conflict shown in Figure 1, client representatives could express their experiences of business IT projects on the same issue. Client representatives might even express solutions that represent a more developed and mature way of thinking that students could adopt. Second, a greater number of exercises pertaining to the development of post-conventional thinking, that is, how society should be arranged, are required. Penn (1990) showed that students'

development in moral decision-making can be intensified if they were taught the three elements of moral reasoning; logic, role-taking, and justice operations. Therefore, in coaching our IS students for their future careers, it is vitally important to develop their skills in post-conventional reasoning (Kohlberg, 1981) to support them in making morally wiser decisions on restructuring society via their practice in the IS field.

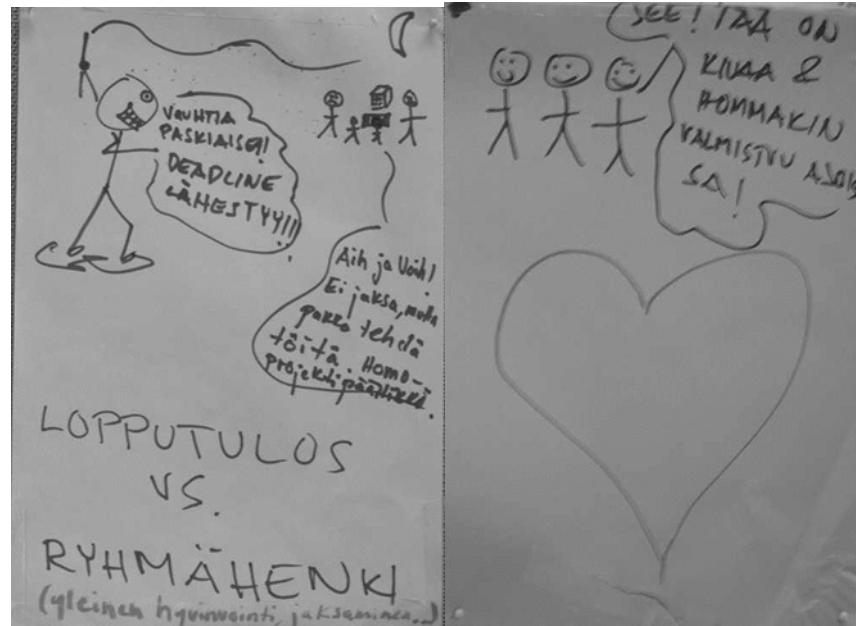


Figure 1: A moral conflict as confronted (left) and as solved (right).

A project management unit

A solution for the Reformer model would be the establishment of a university unit that concentrates on project management and that implements its mission via research, teaching, and service (Kataja et al., 2005). This would mean that the unit concentrates on the scientific study of project management (in the IT field), and teaching project management skills, and aims to promote social justice via all its activities.

Research implications

Future research should study to what extent the Slaver, Educator, and Reformer models are present in current IS curricula worldwide, and on the basis of that information it would be possible to support the development of courses. In addition, the educational consequences of these models should be considered.

REFERENCES

1. Branco, M.C. and Rodrigues, L.L. (2007) Positioning Stakeholder Theory within the Debate on Corporate Social Responsibility, *Electronic Journal of Business Ethics and Organisation Studies EJBO*, 12, 1, 5-15. Available http://ejbo.jyu.fi/pdf/ejbo_vol12_no1.
2. Brown T.L. (1985) University-Industry Relations: Is There a Conflict? *Journal of Society of Research Administrators*, 17, 2, 7-17.
3. Carroll, A.B. (1991) The pyramid of corporate social responsibility: Toward the moral management of organizational stakeholders, *Business horizons*, 34, 4, 39-48.
4. Carroll, A.B. (1999) Ethics in Management, in R.E. Frederick (Ed.) *A Companion to Business Ethics*. Oxford, UK, Blackwell, 141-152.

5. Clarkson, M.B.E. (1995) A stakeholder framework for analyzing and evaluating corporate social performance, *Academy of Management Review*, 20, 65-91.
6. Davison, R.M. (2000) Professional Ethics in Information Systems: A Personal Perspective, *Communications of AIS*, 3, 8, 1-34.
7. Hasnas, J. (1998) The normative theories of business ethics: a guide for the perplexed, *Business Ethics Quarterly*, 8, 19-42.
8. Santoro, M.D. and Chakrabarti, A.K. (1999) Building industry-university research centers: some strategic considerations, *International Journal of Management Reviews*, 1, 3, 225-244.
9. Kataja, M., Raunio, T., Suominen, L., Ojala, P. and Yliselä, T. (2005) Procedo-ryhmän loppuraportti. (A final report by Procedo student project; In Finnish).
10. Keithley, D. and Redman, T. (1997) University-industry partnerships in management development, A case study of a "world-class" company. *Journal of Management Development*, 16, 3, 154-166.
11. Kenney M. (1987) The Ethical Dilemmas of University-Industry Collaborations, *Journal of Business Ethics*, 6, 127-135.
12. Kohlberg, L. (1981) *The Philosophy of Moral Development, Moral Stages and the Idea of Justice*, Harper & Row, San Francisco, CA.
13. McDonald, J. (1993) Thin examples of moral dilemmas, *Social Theory & Practice. Summer*, 19, 2, 225-238.
14. Oser, F. (1991) Professional Morality: A Discourse Approach (The Case of the Teaching Profession), in W. Kurtines and J. Gewirtz (Eds.) *Handbook of Moral Behavior and Development*, 2, New Jersey, Lawrence Erlbaum Associates, 191-228.
15. Penn, W.Y. (1990) Teaching ethics - a direct approach, *Journal of Moral Education*, 19, 2, 124-138.
16. Rest, J. (1984) The Major Components of Morality, in W.M. Kurtines, J.L. Gewirtz (Eds.) *Morality, Moral Behavior, and Moral Development*, New York, A Wiley-Interscience Publication, 24-38.
17. Santoro, M. & Chakrabarti, A. (1999) Building industry-university research centers: Some strategic considerations, *International Journal of Management Reviews*, 1, 3, 225-244.
18. Slotte, V. and Tynjälä, P. (2003) Industry-University Collaboration for Continuing Professional Development, *Journal of Education and Work*, 16, 4, 445-464.
19. Smith, H.J. (2002) Ethics and Information Systems: Resolving the Quandaries, *The DATA BASE for Advances in Information Systems*, 33, 3, 8-22.
20. Smith, H.J. and Hasnas, J. (1999) Ethics and Information Systems: the Corporate Domain, *MIS Quarterly*, 23, 1, 109-127.
21. Tavani, H.T. (2001) Curriculum issues and controversies in computer ethics instruction, *Proceedings of International Symposium on Technology and Society*, 41-50.
22. Vartiainen, T. (2005) Moral Conflicts in a Project Course in Information Systems Education, *Dissertation*, Department of Computer Science and Information Systems, University of Jyväskylä, Finland.
23. Vartiainen T. (2007) Moral Conflicts in Teaching Project Work: A Job Burdened by Role Strains, *Communications of the Association for Information Systems*, 20, 681-711.
24. Vartiainen T. (2009) Moral Problems Perceived by Industry in Collaboration with a Student Group: Balancing between Beneficial Objectives and Upholding Relations, *Journal of Information Systems Education*, 20, 1, 51-66.
25. Vartiainen, T. (2010) Moral Conflicts in Project-Based Learning in ISD, *Information Technology and People*, 23, 3, 265-280.
26. Watson, H.J. and Huber, M.W. (2000) Innovative ways to connect information systems programs to the business community, *Communications of AIS*, 3, 1-32.