Using Activity Theory in Developing Instructial Tools for Project Management Studies

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Keywords: Project-based Learning, Project Management Education, Activity Theory, Supervising, Instruction.

Abstract: Competence and skills of the project manager are significant to project success. The skills needed in project managers' work cannot be learned only by reading the books or a lecture hall; one learns them by practice. Therefore, an important challenge for educational institutions is to develop pedagogical practices that allow students to participate in working life projects and to confront real-life problems. Project-based learning (PBL) offers a model that enables students to practice the skills and competences needed in working life projects by utilizing real-world work assignments in time-limited projects. Using PBL method alone does not necessarily guarantee learning result. In order to be successful, PBL method requires effective and competent supervision and guidance of students as well as appropriate tools for instruction. In this study the concepts from activity theory (AT) are applied to development tools for supervising project-based learning.

1 INTRODUCTION

The connection between project manager's skills and project success has been addressed in several studies (Iacovou and Dexter, 2004); (Müller and Turner, 2007). Often these skills are learnt in real-life working situations, because acquiring skills necessitates experience instead of studying theoretical facts by reading a book, or attending a lecture. Learning necessary soft skills required in IS project management and leadership during the project studies might support IS projects succeeding in "real world" working scenarios. Therefore, project management education needs to focus on practical issues of managing rather than on tools and techniques of management itself.

Project-based learning (PBL) offers a model for students to practice the skills and competences needed in IS projects by utilizing real world work assignments in time-limited projects (Tynjälä et al., 2009). However, using PBL method alone does not guarantee learning results. In order to be successful, PBL method requires both effective and competent supervision and an uniform learning environment that enables easy access and use of online materials.

The goal of the research in progress is to develop pedagogic methods and tools to support the learning of skills and competencies required in IS project work. Activity Theory (AT) concepts provide an analytical framework for developing the instructional methods responding to the educational needs. Particularly the concept of contradiction ("historically accumulating structural tensions within and between activity systems" (Engeström, 2001, p. 137) is seen to provide rich and fruitful insights into the system dynamics.

This paper is organized as follows. First, we depict the course, which is based on the project-based learning approach. Second, pedagogical background for project-based learning is reviewed. In the following chapter brief description of activity theory is presented. This is followed by the description of the project management course as an activity in AT. Finally, an outline of our ongoing research is presented.

2 PROJECT MANAGEMENT COURSE

The project-based learning (PBL) approach has been adopted in information system education at the University of Jyväskylä for years (see more Pirhonen 2009, 2010). For example, the implementation of the Project Management and Execution (PME) course (10 ECTS credits) is based

Pirhonen M..
Using Activity Theory in Developing Instructial Tools for Project Management Studies.
DOI: 10.5220/0004963203230328
In *Proceedings of the 6th International Conference on Computer Supported Education* (CSEDU-2014), pages 323-328
ISBN: 978-989-758-021-5

on PBL approaches (Tynjälä et al., 2009). The course belongs to the elective studies towards the degree of Master of Economic Sciences in the field of ICT. The main aim of the PME course is to offer the students an opportunity to gain authentic practical experience of an ICT experts' work. In addition, the goal is to provide students with a comprehensive and a realistic view of the work in IS projects. In more detail, students are expected to learn project management, leadership, group work, and communication by managing, leading and executing information systems projects. In addition, they are expected to learn an assessment of the significance of team leading as a part of project success.

The learning environment is maintained in co-ordination with three parties – a student group, the university, and a client organization. A legally binding cooperation contract is drawn up between the three parties before project starts. It covers the subject matter (a description of the project objectives), the obligations and rights of the contracting parties, copyrights, guarantees and maintenance, confidentiality and the concealment of confidential information, payments and the payment schedule.

The project course lasts from the beginning of November to the end of April (26 weeks). During the course each student is expected to use 140 hours for implementing the project task and 130 hours for demonstrating project-work skills, including team leading, group work, and communication. The groups plan their work, complete the scheduled tasks, and produce deliverables. Each student is expected to take the role of project manager and project secretary. These roles rotate every month to ensure that each member of the project team works in both roles at least once. In total, a group of five students uses 700 hours in planning and executing the client project.

During the course, students work in close co-operation with their client and they meet with the client representatives on weekly basis. In addition, the guest lectures from collaborative companies are invited to give lectures on relevant topics to project management. The collaboration with a client ends in a steering group meeting at which the results of the project are approved.

During the course seminars are arranged to enhance students´ communications skills.. Pedagogical activities such as peer reviewing, group discussion, peer coaching and self/peer assessment are being set up by supervisors to enhance the learning effectiveness of the project.

Each student group is evaluated twice during the six-month period of the project. The first evaluation takes place in the middle of February after three months' work. The second evaluation is carried out at the end of the course in April. The content of the evaluation is grouped and structured around the themes covering issues to the course's learning objectives and critical to project management success. The course grade (1-5) for a group is calculated on the basis of the following factors: project management, project work, and communication. The evaluation involves composing an evaluation report using the assessment framework. Both students and their supervisors compose the report. Written evaluations are uploaded in the digital learning environment Optima (the day before an evaluation discussion). The evaluation is based on the perceptions of the students´ work capabilities with their clients as well as the documentation produced during the project. Both supervisors and the student groups are acquainted with the each other's evaluations before an evaluation discussion. The grading of the course is mainly based on the debates that emerge during discussions concerning the reports.

3 PROJECT-BASED LEARNING

Problem-Based Learning (PBL – nowadays also the abbreviation for Project-Based Learning) has become widely recognized over the last 40 years. PBL has been proven to be successful educational approach in many different study domains. It has been adopted for years in Aalborg University in Denmark (Graaff and Kolmos, 2003). According to Kjersdam (1994) students graduated from Aalborg are more productive and competent compared to graduated students from other educational institutions.

Project-based learning (PBL) refers to a theory and practice of utilizing real-world work assignments on time-limited projects to achieve mandated performance objectives and to facilitate individual and collective learning (Smith and Dods, 1997). The theory of PBL is based on constructivism and according to the constructivism theory, the learner is guided to build and modify his or her existing mental model. This means that the focus is on knowledge construction rather than on knowledge transmission as in the theory of behaviourism. Constructivism takes account of the situational nature of learning and thus advocates authentic or simulated environments (von

Glasersfeld 1984). There are five significant features of PBL (Helle, Tynjälä, Lonka and Olkinuora 2007):

- a problem or a question serves to drive learn-ing objectives;
- a concrete artifact is constructed;
- the learners control the learning process (pacing, sequencing, and actual content);
- the learning is contextualized (what we learn in a particular context we recall in similar contexts); and
- projects are complex enough to induce students to generate questions of their own.

In many models of project-based learning, students are assumed to work on real world projects by default. This creates good conditions to learn a vast range of skills in various project areas. Students learn management, teamwork, and communications, as it involves both individual and co-operative activities, interactive discussions and writing in the form of plans, reports, memos etc. This type of learning offers a very concrete and holistic experience of certain processes such as the process of construction work or managing a project (Helle et al., 2006). Often collaboration skills are put into action by the collaborative nature of project management. In fact, the studies have suggested that project work may have many educational and social benefits (Moses et al., 2000), such as the development of communication skills (Pigford, 1992), along with team-building and inter-personal skills (Roberts, 2000). Supervisors support the work of their students by guiding and assisting them to learn independently and helping them to retrieve relevant information when required. Supervisors oversee the project process and monitor the progress and performance of each student. The role of the supervisor is vital, especially in the early stages of the project when students may need more guidance in situations where they need to communicate and collaborate with their client.

4 ACTIVITY THEORY – AN OVERVIEW

Activity theory (AT) offers a theoretical framework to study both individual and collective activities. It provides an analytical framework within which to study human activity in general. A model of the structure of an activity system (AS) includes two types of constituents: core components, such as subject, object/outcome, and community; and mediatory components, such as instruments (tools), rules, and division of labor (Figure 1).

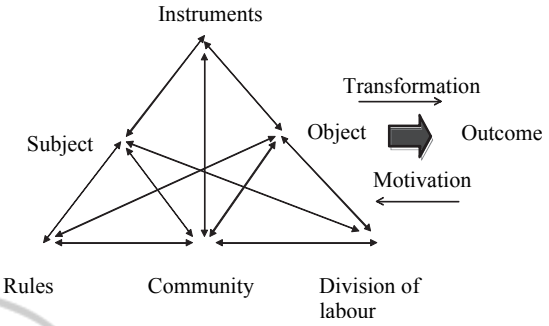

Figure 1: The structure of a human activity (adapted from Engeström, 1987, p. 78).

An activity is a collective phenomenon; it has a subject (an individual or collective) who understand its motive, and who uses tools to achieve an object, thus transforming objects into outcomes. An activity is always associated with long-term purposes and strong motives. All members of the community share the object (and the motive) of the activity. Tools mediate between a subject and the object, which is transformed into the outcome. The object is seen and manipulated within the limitations set by the tools. Rules mediate the relationship between the community and the subject, while the division of labor mediates the relationship between the community and the object. Rules cover both implicit and explicit norms, conventions, and social relations in a community as related to the transformation process of the object into an outcome. The responsibilities of the members of the community are coordinated by some division of labor (e.g., the division of tasks and roles among members of the community and the divisions of power and status), yet guided by rules. These rules regulate, as well as constrain, their actions and relationships in the activity system (Engeström, 1990; Kuutti, 1996).

Engeström (1987) added the concept of contradiction onto Vygostky´s (1978) thinking. Primary contradictions are those found within a constituent of the activity (i.e., in the object, rules, tools, etc.) and secondary contradictions are those that appear between constituents of the activity (e.g., between the tool and the subject). Contradictions constitute a key principle in AT and shape an activity (Engeström, 2001). When contradictions arise, or when they are observed, they expose dynamics, inefficiencies, and importantly, opportunities for a change (Helle, 2000). Kuutti (1996, p. 34) describes contradictions as “a misfit within elements, between them, between different

activities, or between different development phases of a single activity". They generate "disturbances and conflicts, but also innovative attempts to change the activity" (Engeström, 2001, p. 134).

Contradictions are significant for development and they exist in the form of resistance to achieving goals of the intended activity. They also exist as emerging dilemmas, disturbances, and discoordinations. In spite of the potential of contradictions to result in development in an activity system, the development does not always occur. Often contradictions may not be easily recognized or acknowledged, visible, or even openly discussed by those experiencing them (Engeström, 2001). On the other hand, contradictions that are not discussed may be embarrassing, or uncomfortable in nature. They may also be culturally difficult to confront, such as personal habits, bad behaviour, or an incompetence of the leader.

To summarize, subjects, who are motivated by an object, carry out activities. A subject transforms the object into an outcome. An object may be shared by a community of people, working together to achieve a desired outcome. Tools, rules, and a division of labor mediate the relationship between the subjects, community, and the object. Contradictions are a key principle in AT and they are driving force of change.

5 PROJECT MANAGEMENT COURSE AS AN ACTIVITY

In the depiction of PME course as an activity system, a student group is chosen to be subject. A subject plays a key role when analysing other elements of an activity. In this case we are interested in student group´s perspective – how the tools support their learning and achieving the course's learning objectives - when analysing PME activity. The objectives of the cooperation parties differ. From the students' and supervisors' points of view, the main object is to learn useful skills needed in "real project work". Correspondingly clients' main motive to co-operate with the university and by doing so, find potential employees to recruit. Certainly, clients' objective is also to obtain results from the project they are involved with. This is a goal they naturally share with the students they have worked with. Different types of objectives, however, might cause contradictions between the parties involved. If such an event occurs, the supervisors need to intervene in the situation by discussing openly about the issue with all parties. In our study we focus on the objective seen from the point of student group´s view. Their motive is to achieve the course's learning objectives. The outcome of course of is that students are provided with skills needed in projects. The activity "PME course" is presented in the terms of activity theory (AT) in Table 1.

Table 1: PME course as an activity.

5	Description
Subject	Student group
Object	To learn skills needed in project management
Outcome	To enable students to develop skills needed in project
Instruments or tools	Project management tools, communication tools, guiding meetings, written instructions, pedagogic methods
Community	Students, teachers, clients
Division of labour	Responsibilities according to the contract
Rules	Constraints on schedule, contract, assessment

The tools include a project management system (e.g. software, standards), weekly meetings between the supervisor and the student group, and written instruction. During the meetings, the weekly project reports and project plans are discussed and reviewed. The project manager and team members keep providing updates of their project, which are compared with the documented expectations in the project plan.

The present tools are seen to have troublesome features. First, the amount of the tools required in the project work is great, and they are located in several, different environments. Project management tools (e.g. software for managing the schedule or the resources) are located in multiple systems and data transmission between systems has been proven to be difficult and time-consuming. Second, the written instructions are stored in the digital learning environment into which students need to log in separately in order to gain access to project documentation, or upload and share new documents. Students are frustrated while working with so many incompatible systems, which may even decrease their motivation to study.

Activity theory emphasizes that a tool should come fully into being when it is used and that knowing how to use it is a crucial part of the tool. Therefore, the use of tools entails an evolutionary accumulation and transmission of social knowledge, which influences not only the external behaviour but also the mental functioning of individuals. Therefore, the pedagogic tools supporting and promoting learning are vital part of supervisors work with their students.

6 CONCLUSIONS

Effective and competent supervision and guidance of students is a vital part of a project-based learning method; PBL method alone does not guarantee learning results. Hence, appropriate pedagogic instructional tools and methods are of critical importance of achieving learning goals.

To understand the underlying contradictions between a student group and tools used in project studies, we adopt the activity theory (AT) as our lens to explore possible misfits. The strength of AT is that it allows to break down the structure of an activity into smaller categorical elements (Basharina, 2007), and to identify contradictions and structural tensions of the activity (Engeström, 1995); (Engeström, 2001). Contradictions relate to tendencies or forces that need each other, but at the same time negate each other. The contradictions generate disturbances, conflicts, and eruptions in an activity, thus making contradictions indirectly visible. By recognising structural tensions that causes disturbances and conflicts in activity it is possible that new forms and qualitative stages of activity emerge as solutions to the contradictions (Engeström, 1987). This being the case, we argue that the AT provides us with the proper theoretical lens to develop instructional tools for project management studies at the University of Jyväskylä.

So far we have modelled the PME course as an activity system. Next step in our study is to start an exploratory study by interviewing students, supervisors, and clients having participated in the PME course in 2011 - 2014. The aim of the study in progress is to identify the disturbances emerged during the course and contradictions that cause "problems, ruptures, breakdowns, and clashes" (Kuutti, 1996, p. 34). In this phase of the study we are especially focusing on contradictions found between the student group (subject) and pedagogic methods and tools used during the course. Further studies may also benefit from a deeper investigation of the objectives of the PME course from clients' points of view for purposes to find contradictions between different objectives of the cooperation parties.

ACKNOWLEDGEMENTS

I wish to thank Eliisa Jauhiainen and Minna Silvennoinen their insightful feedback in the development of this study.

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