More Successful IT Projects by Low-Cost High-Interactivity Project Leadership Education

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Abstract

Several surveys suggest that today's biggest leverage in improving the success of IT projects lies not in improving IT skills but in improving project leadership and project management skills of IT personnel. Yet, there are basic challenges to the education of these skills which make this improvement difficult to achieve. A new course concept will be presented to overcome these problems within university education. This course concept is currently being expanded to ongoing professional education.

Keywords

higher education; leadership, IT project management; ongoing education of IT practitioners

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Introduction

Projects are an omnipresent work form in the IT industry. The causes for their success or failure are well-documented in a plenitude of existing surveys. Hence, when considering questions of education, projects provide good means to find out which education measures will have key effects on practical IT work. Following this path of argumentation, section 2 will examine challenges to the education of IT personnel that can be concluded from IT project success factors. Chapter 3 will examine the causes of the found problems. Finally, in chapter 4 a possible solution in the form of project leadership and project management education is presented and discussed.

Success Factors in IT Projects

The Chaos Report by the Standish Group (2003) is one of the best-known surveys on IT project success. It provides the following ordered list of success factors:

1. User Involvement (m)
2. Executive Support (m)
3. Experienced Project Manager (m)
4. Clear Business Objectives (m)
5. Minimized Scope (m)
6. Agile Requirements Process (m)
7. Standard Infrastructure (m)
8. Formal Methodology (d)
9. Reliable Estimates (m)
10. Skilled Staff (d)

Eight out of the ten success factors listed (marked with 'm') are rather management issues (leadership and project management) than part of the (traditional) qualifications of the IT team members ('d' – developers). Amongst the people working directly on a project, these factors are influenced mostly by the IT project manager (IT-PM) and also influenced by team members with IT-PM skills or attitude. (This is also true for "executive support", as executives are permanently short of time and it takes a skilled PM to win support.)

Addison & Vallabh (2002) provide another list of IT project-specific factors. In contrast to the above survey, failure causes are considered and their list is not based on a survey but on references to many other publications:

1. Unclear or misunderstood scope/objectives (m)
2. Unrealistic schedules and budgets (m)
3. Lack of senior management commitment to the project (m)
4. Failure to gain user involvement (m)
5. Inadequate knowledge/skills (d)
6. Lack of effective project management methodology (m)
7. Misunderstanding the requirements (m&d)
8. Gold plating (m&d)
9. Continuous requirement changes (m)
10. Developing the wrong software functions (m&d)
11. Subcontracting (m)
12. Resource usage and performance (m&d)
13. Introduction of new technology (m)
14. Failure to manage end user expectations (m)

Most of the listed points are rather indicators of poor skills of the project manager than indicators of the qualifications of the developers. (Ambiguous points include, e.g., "gold plating" or "misunderstanding the requirements", which can be attributed fairly to both PM and project team members).

To sum up the above-said in one sentence: in order to make IT projects more successful, the project leadership and project management[1] skills of IT personnel should be increased.

Regarding the contrary, we are not aware of any research which states that skills of IT personnel would be the premier success factor for IT projects. The factor-skilled IT personnel is ranked 10 by the Standish Group (2003) and five by Addison & Vallabh (2002).

1993, at a time when not many survey results were available, Sauer already suggested that a consensus had been reached among researchers that failure is generally caused by neglect of the behavioural and social factors in IT projects and not because of technological issues. – Another point supporting the idea that management education is the solution for improved IT projects - and not IT education. Now, the research results cited above in mind, this should be regarded as proven. Further research on success factors of IT projects that support the importance of management issues include: Bupa (2005), Dorgan & Dowdy 2002, Younker et al. (2002), Timekontor (2001), Thite (1999) and Pinto & Slevin (1987). An extensive overview of project success factor literature can be found in Fortune & White (2006).

Finally, there is also plentiful evidence that industry has an unsatisfied need of software engineers and other technical professionals with project management abilities (IWS, 2000, Buonopane, 1997, EducationMinistry, 1999).

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[1] There is usually some ambiguity regarding the exact difference between these terms. In this article "skills of project leadership" denotes the ability of leading people who are involved in a project towards the project goal, including ,e.g., selection and motivation of team members or communication with stakeholders. "Skills of project management" means planning and steering the project. "Skills of a project manager" sums up both.

The Challenge of Teaching more PM

The main conclusion of the section above was: in order to make IT projects more successful, one should increase the project leadership and project management skills of IT professionals. Following this idea, it should be asked why not all (interested) IT professionals receive an excellent education in these domains? We attribute this to the challenge of providing education of these skills that has

a low teacher:learner ratio AND the ability to serve many learners AND affordable costs (1)

This problem applies to universities and companies as well. The following overview of survey results underpins this for universities:

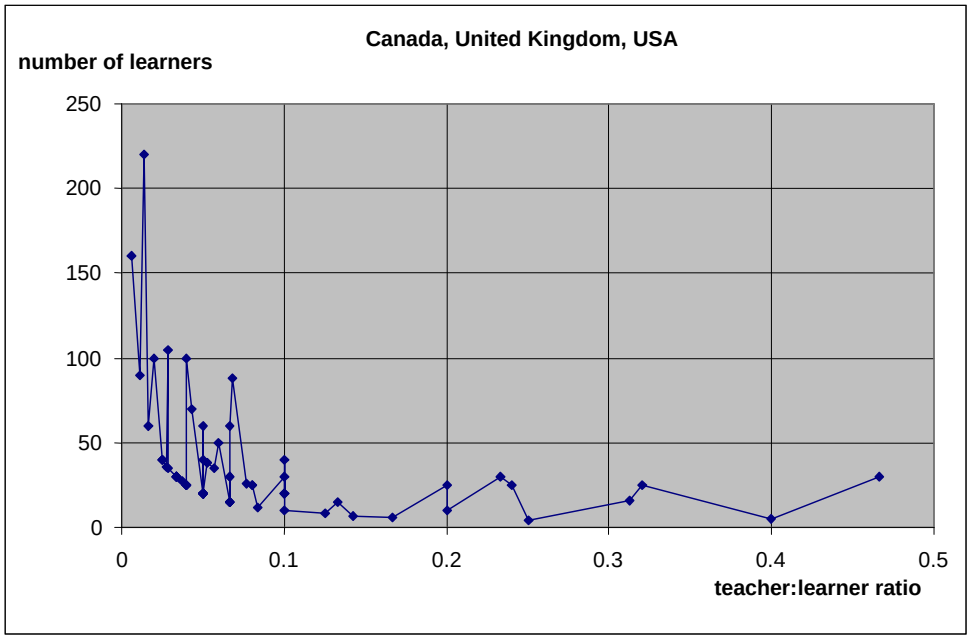

Diagram 1: Courses in project management and project leadership in computer science studies

Our survey that has been carried out as student theses at Zurich University (Winkelmann 2006, Ruther, 2006) examined courses in which project management and/or leadership are taught in regular bachelor or master programs in computer science and related studies (software engineering, business informatics) at universities in Canada, the UK, and the USA. The data were collected in 2006 by web research on the web presence of randomly selected accredited universities as well as e-mails to faculty staff.

As diagram 1 shows, a course is either for a high number of learners or has a good ratio of teachers:learners. Certainly, paying many teachers without caring about the expenses, one could offer highly intensive courses for arbitrary numbers of learners. Hence, we arrive at the challenge (1) stated above.

This highly compressed reasoning needs more explanation. Certainly, the real goal is high-quality education that is accessible to many learners and that is affordable. High-quality here means: causing a high and lasting learning effect. In the following, it will be argued that, in the context of project management and leadership education, high interactivity is a prerequisite for a high learning effect and a good “teacher:learner ratio” is a prerequisite for high interactivity.

Certainly, high interactivity does not ensure that the students learn much, but it is a necessary precondition, in our opinion the limiting one. Since Dale (1969 p. 107) published the third edition of his Cone of Experience,, it became generally accepted among didactical experts that, regardless of which learning subject is considered, for long-lasting learning effects teaching forms are required that show a high interactivity. This has been empirically validated for various teaching forms and different subjects. See, for example, Bloom (1984). For leadership (as an important, if not the most important job of a project manager) the requirement of high interactivity appears to be particularly convincing, as it is not about reproducinged facts or about applying learned standard methods but about interacting.

The last step in the argumentation, which began with a high-quality course, is the good teacher:learner ratio as an essential prerequisite for high interactivity. A good teacher:learner ratio is generally considered as a marker of quality. Concerning skills such as programming, it is possible to master them without any human interaction. Obviously, this is not true for leadership. While in both cases the learning outcome will profit substantially from more interaction (assuming that this is didactically well-directed), this is a prerequisite for leadership education. Furthermore, within the soft skill domain, there is an obvious and fundamental challenge in regard to education of leadership: even in a small learning group, not everybody can simultaneously be the leader. When learning, e.g., teamwork, everybody can do it simultaneously, and active phases of the learning process are merely interrupted by purposeful phases of, e.g., knowledge input or reflection. When it comes to learning leadership, the time share of a participant to act as a leader will be 1 / group size, and even less if we take reflection and knowledge input into account. Many things can be said and done about this challenge, e.g., that one also profits from watching how others lead, or that strategic leadership (e.g., of companies) can be acquired by letting an equal team discuss which leadership actions should be taken in a simulated environment. Yet, regarding the type of leadership that is needed for project management, i.e., leadership of a limited team, it becomes clear that in a class of 20 students per one teacher (a ‘good’ rate in project management courses), little build-up of active skills will take place. This simple argument is further reinforced by the particular importance of feedback: while, e.g., software development is a skill that has to be acquired from zero, leadership is not. Everybody has leadership skills, but these have to be improved / corrected by individual feedback till someone is a proficient leader. Thus again, also in this regard, there is a call for more individual teaching in order to make people acquire leadership skills.

Finally, in this discussion we also have to take e-learning into account. In the statistics presented in diagram 1, only “traditional” courses were considered, some featuring an e-learning part. Certainly, pure e-learning without any teacher:learner ratios can make a valid and important contribution to improving leadership skills but, at the present state of technology, it will be far from being enough to master leadership skills. This may change in the future.

All in all, based on the above arguments, there is plentiful reason to claim that a good teacher:learner ratio appears to be today’s prerequisite for having a high-quality education in leadership. This is similarly true for education in project management, although the link is not as strong, as the possibilities are better to learn it through teaching forms such as, e.g., homework, that require less teachers.

Proposal of a Course Concept

As a solution to challenge (1), we offer the course model developed and implemented at the University of Zurich. The course participants are master students and some bachelor students. The course has been operating for two years and had a significant growth from 25 students in 2005 to 160 students in 2006. Since 2006, professionals from industry also participate in the course. To encourage this, the participants who complete the course receive not only academic credit but also a certificate with a detailed description of the course in the style usual for business courses.

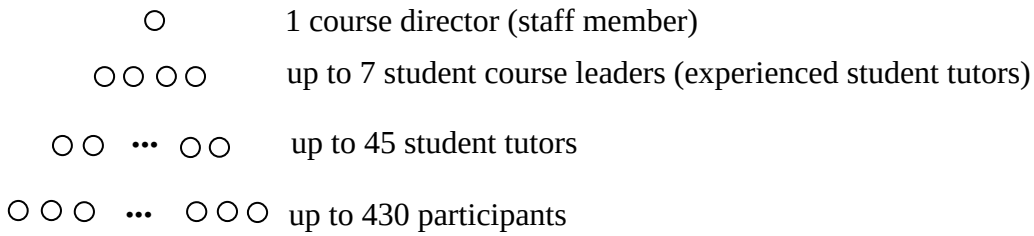

Diagram 2: The tutor pyramid

The course contents address the skills that are necessary to successfully lead a project team with one hierarchy level. The current list of 35 lecture units covers leadership, customer communication, crisis management, planning, reporting, risk management, etc. The course work is 90 hours worth 3 ECTS.

All participants are taught intensively, in small groups of six learners per trainer. By means of a train-the-trainer course, we enable students to teach other students. This well-known teaching model is not without difficulty for project leadership and project management, as there are very few students who have sound experience in the two. Hence, the essence of the course method is a subdivision of these domains into didactically well-streamlined small lecture units that are reproducible by student tutors on a high level of quality. The large numbers of participants are taught by a multilevel tutor pyramid.

The numbers are estimated maximum numbers when one staff member works on the course. Because of the feature displayed in diagram 2, we call the underlying teaching method that supports this course "Tutor Pyramid Method". This will be described in the following.

Didactical principles

The course is designed along a small set of didactical principles – some of them are general, while others are specific to the employment of student tutors or to the subjects of project leadership and project management that are taught.

First instructional design, then context design

For best learning outcomes, the study by Nussbaum (1989) suggests the following: when approaching a new learning content, at first, learning units with instructional design should be used and followed by learning units with context design. Our course implements this consequently. All contents within the course are first approached with roll plays, group work, or home work with closely defined tasks and closely defined learning contents that have to be followed. According to Nussbaum, the challenge in this phase of the "first encoding of knowledge" should be tentatively low for best learning effects. Here, where required, our instructions are as simple as, e.g., "When asking a customer about requirements, summarize what you have heard and ask if this was complete!" For someone who has little or no experience in asking customers about requirements, this is a real help. Later, role plays or group work of increasing complexity and with more freedom of action follow. Finally, a full context design teaching method is applied: the students have to run a project on their own. Here, only the context of the learning activity is designed; the students are fully responsible for choosing their actions in order to reach the project goals and to apply or modify learnted tactics and principles.

Handle different skill levels

Students at today's universities are selected on the basis of academic/school performance and not according to social abilities or because of the ability to complete a major project on their own, e.g., to manage a project in order to reach its goals. This results in a broad range of skill levels ("as if you had literates and illiterates in one class"). Opening up different courses would complicate organization (pre-test, etc). Instead, our method handles this challenge within one course by means of a variety of methods:

- possibilities and encouragement to choose challenges: if a roll play is easy when facing a nice team member, increase pace by trying to cope with a bad, sad, or frustrated team member.
- free choice of groups and partners (the students find out soon with whom they work well)
- time for reflection, so that the more experienced participants can profit from discussing the learnted matters in the light of their own experiences, while among the less experienced participants the discussion is often about how they felt while being in the situation for the first time.
- some tutors have more industry experience

These measures are necessary for coping with the major differences in abilities among university students. Once implemented, they open up the possibility to teach beginning professionals as well.

Multilevel quality assurance integrated into course execution

In the 2005 course, it proved to be very hard to foresee the reception of lectures. Hence, 2006 the following procedure was applied: a new lecture is first tested with course leaders, then modified and tested again with tutors, and finally modified and introduced to the course participants. The course director joins one group of students to directly experience the effect. This is eventually concluded by a feedback session among the tutors. This laborious testing procedure might sound overdone; however, it proved necessary to ensure high quality. It implies that course development largely takes place while the course is held and the tutor pyramid is available. Development before or after the course would result in much less pressure and a "peaceful" work flow, but not in well-tested lectures.

No grades

In the course, students receive no grades but only a passed / not passed mark. The course contents are divided into project management and project leadership. For both parts, "no grades" plays important but different didactical roles:

- Leadership is taught in class room. Tentatively, there are no requirements in order to pass the course, except for having to be present and participate in class room work. (Actually, it is not possible to remain passive as many roll plays are performed in pairs. In addition, the supervision of the tutors is very close, as one tutor has six students at a time.) This is in order to avoid unproductive stress when assuming new roles or trying to implement new ways of coping with a situation. To reinforce this, extra time is allocated to diminish performance orientation and to build up an "experimenting mood" that is more productive here. Repeatedly, the participants are encouraged to "try out themselves" in new roles: "Please make mistakes!" "Remember that here, in this 'secure environment' mistakes are completely for free – while in real life they might bear tremendous consequences"
- Project management is taught in the form of homework. Only 100% perfect results, implementing all principles taught, are accepted. To achieve this, detailed feedback is given and rework is requested. This is repeated till the homework documents implement all principles taught. Four iterations are allowed and are fully sufficient for the students to succeed. Grading would be counterproductive: in case that the compliance with learned principles is graded, it would just mean that students are told being good or bad without improvement to occur. In case that the realism of e.g. an estimate would be graded, it would not be possible to held the course with student tutors, but experienced project managers would be required to judge and/or discuss if the estimate is realistic or not.

Mixing vocational and university education

It might sound questionable whether the mixing of vocational and university education would lead to good results. We made positive experiences. Practitioners from industry profit from the questions of university students that make them re-think their opinions. University students often profit from professionals' greater practical experience. In addition to this synergy, the presence of professionals is of great help to the teachers: when too many university students question something that is written on the slides or is said by a tutor or course leader, there are always one or more professionals who speak

up, confirming that what is presented is realistic and is exactly what happens in industry. This teacher-independent confirmation is particularly important in the Tutor Pyramid Method, as the entire teaching force (with exception of the course director) consists of students and not of experienced project managers.

Summary of further didactical principles

A detailed description of our Tutor Pyramid Method would not fit into this paper. Further crucial points include the motivation structure (most students work for ECTS credit points and/or for the experience), the selection structure (basically a specialized assessment center), the PR structure (to establish this course at a traditional university), the train-the-trainer structure (how to train all student tutors and course leaders by only one single staff member), the measures for a teaching quality of 100% (complete documentation, role manuals, and teaching contents for student tutors and student course leaders. The most crucial point is to avoid the standard university practice of employing tutors who attended last year's course but teach them directly in the days before they are to teach the participants. Further measures include teaching in pairs, supervision, role play training, etc.)

Student feedback

The students perceived this course as being of great value to them: 87,7% of the 130 respondents of this survey considered this course to be more valuable for them than the other courses taken.

The course participants were asked the following question:

> In comparison with the other academic courses taken so far, the value of this course was for me:
>
> 1 = the lowest
>
> 2 = much lower
>
> 3 = lower
>
> 4 = higher
>
> 5 = much higher
>
> 6 = the highest

87,7% of the participants answered 4, 5, or 6. The exact distribution of the answers was the following:

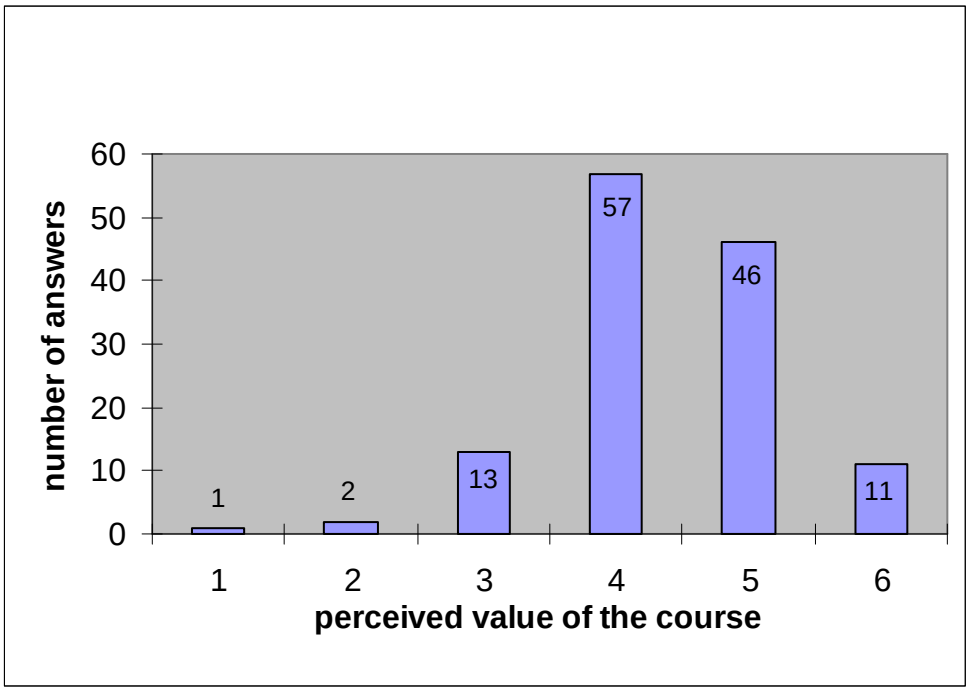

Diagram 3: Participant satisfaction with the 2006 course is over average compared to other courses

Discussion

The main achievement of this teaching method is depicted in the following diagram

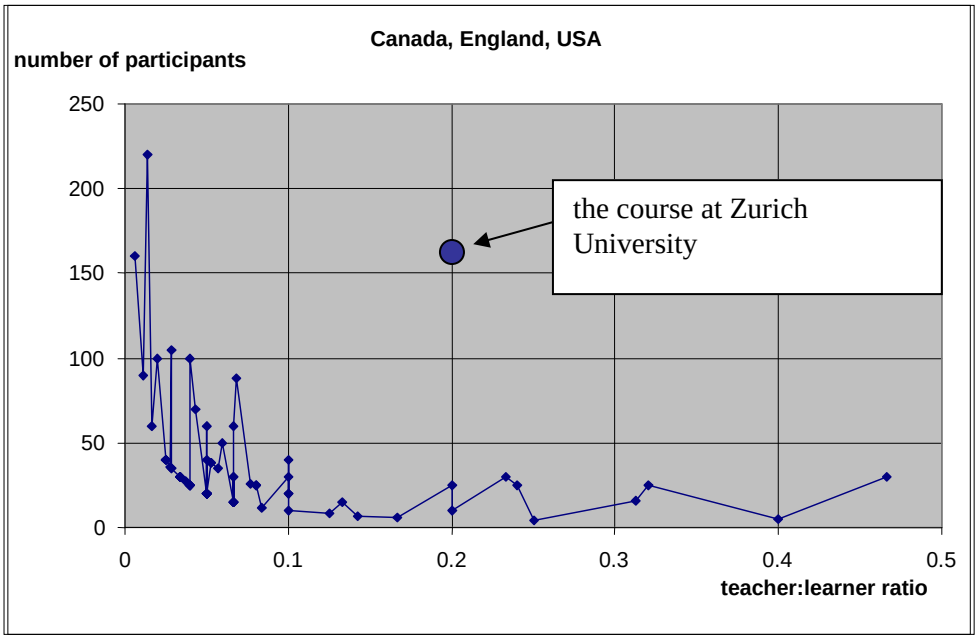

Diagram 4: The Zurich University course teaches many students with intensive tutoring

Remark: The teacher:learner ratio of 0,2 is calculated taking into account the tutors (one tutor at a table of six participants) and the course leaders (one course leader in a class room of 36 participants).

A further important point is, that, once developed, the execution of the course is cheap (as all student tutors work without payment).

Why has a similar course concept not yet been implemented for teaching project management and leadership everywhere worldwide?

One part of the answer might be, that developing the lectures for the course is highly laborious, partly because of the great number of learning resources needed (course leader instructions and slides, tutor instructions and handouts, student handouts, multimedia materials, …) but also because of the sophisticated quality assurance that is required. But this can't be the full answer as e-learning applications have been developed for many contents in spite of the same phenomenon of high development effort but low execution cost.

The other part of the answer could be that the mentioned advantage of low cost execution arises from the higher education-specific possibility of motivation via credit points instead of payment. Otherwise, the course concept would be expensive. Within higher education, a credit point system allowing flexibility in acquiring points from tutoring work instead of taking lectures was (at least in Europe), introduced recently.

Yet, within higher education, courses that use advanced didactical methods with student tutors are common in other subjects (often paying them money and often not with that good learner:teacher ratios). But we are not aware of any other higher education course where so many participants acquire active project leadership skills. IT faculties would need it and other disciplines too. Perotti (2000) provides an inside view of American business faculties that yields a possible explanation from the point of view of faculty traditions: business faculties (from which the learning contents of project management and project leadership could originate) tend to be "discipline oriented". The newer computer science faculties are often more customer-oriented, i.e., don't only focus on being scientifically sound but are also oriented towards fulfilling the needs of practical knowledge of students as their customers. Indeed, the first ideas for the course have been taken from software engineering education, see Stoyan & Glinz (2005).

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