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How to apprehend leadership related skills in a project management experiment?

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ABSTRACT

The ambition of our engineering school is to train competitive engineers who are able to manage complex projects in fast-changing environments. To this end, we have developed a project based course, controlled by teachers (Steering Committee), where students are confronted with a practical long term assignment which includes unexpected events.

Over the six years of experience gained in running the course, the important question of leadership has emerged, even though it was not an a priori explicit objective of the course. In a large group, if responsibilities can be relatively easily identified and assigned, the group dynamic often relies on the presence of one or several leaders. The Steering Committee puts pressure on the student groups to highlight the capacities of the leader(s) and those around him/her/them. The bounds of the exercise are established by the natural peer-to-peer relationships between fellow students in each year group.

Even if the project does not run well, even if the project leader makes mistakes, leadership skills are understood by the whole group and students still acquire skills. We debrief with the students in order to relativize the success of their production in relation to the organization of the group. Different leadership situations are analysed and discussed in this paper.

Conference Key Areas: Engineering Skills, Ethics in Engineering Education

Keywords: Leadership, project management, return of experience

1 INTRODUCTION

A practical knowledge of project management tools and methods is certainly of great help to properly manage a project. However, being able to motivate teams, to take decisions at critical moments, to resolve disputes, to negotiate with customers and other third parties are some of the numerous skills that will eventually make the difference between managers. These so called "soft skills" are facets of what is called leadership. They are

difficult to apprehend in the traditional academic education with respect to the technical "hard skills" that an engineer must display as an accomplished professional. Although these key skills are best addressed in a project context, they still remain difficult to teach as they rely on a complex alchemy between students' characters and aspirations, working group dynamics and circumstances. In this paper, we propose an analysis of group leadership scenarios that we have experienced over six school years in large project groups where the students have to organize themselves. The diversity of scenarios, the extreme sensitivity of team organization to group composition and dynamics, the influence of a teacher's behaviour and policy once again testify that managing and leading are not the same thing and that complexity remains undoubtedly the main descriptor of human organizations.

2 LEADERSHIP

Literature on leadership is abundant. Politicians, the military, CEOs are obviously interested in leadership. On a smaller scale, leadership is employed within communities, teams or projects. It is in this context of project management that our training meets this leadership skill.

Historically, our project management-oriented curriculum emphasizes task management, i.e. forecasting, planning, organization, quality, risk, documentation, reporting, etc. without explicitly addressing leadership. We are reluctant to use the term "project leader", and prefer the words "responsible" or "facilitator". It is difficult for students - and for teachers - to break the egalitarian relationship between peer students. However, the role of a leader is important as will be shown by the student feedback from section 4.

Leadership includes several functions. (1) Give direction, vision, meaning to work. (2) Decide, arbitrate, select in accordance with the vision. (3) Motivate, inspire, animate, create and maintain momentum. (4) Ensure group cohesion, avoid or resolve conflicts. Ann Senn summarizes this in [1] as "leadership is about inspiring and enabling others to do something that they otherwise could not or would not do". To do this, "the greatest measure of leadership is the ability to gain the trust and loyalty of others." C. Richard Panico adds [1].

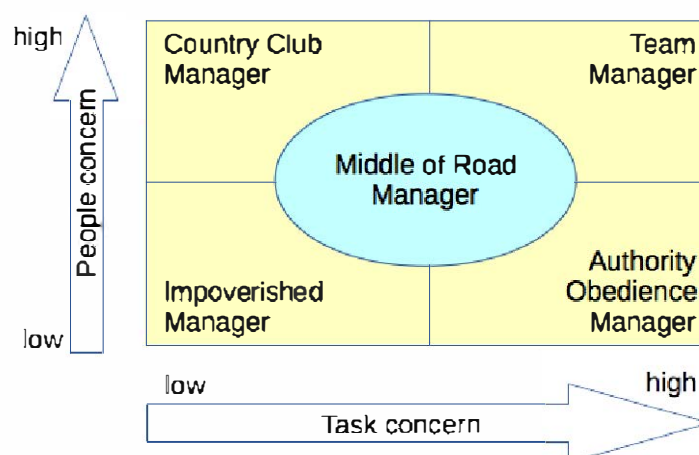


Fig. 1. Blake and Mouton's managerial grid

In the management model of Blake and Mouton [2], our teaching is therefore mainly focussed on "task" and little focus is placed on "person", thus covering the Authority-Obedience Manager and Team Manager styles (see Figure 1). In practice, the human

aspects are obviously very present with a pedagogical backing for the management of conflicts in particular. The following questions arise: How does the performance of the leaders and especially of the project manager impact the quality of group's execution and the final level of production? Is there a clear correlation between good managers and good results? Can the leadership skills be acquired in educational experimentation? The next section describes our current pedagogical choices.

3 PEDAGOGICAL ORGANIZATION AND EXERCISE LIMITATIONS

3.1 Educational situation for students in the co-op engineering program

In our undergraduate school, we train engineering students, most of whom will be future managers, in a three-year Information and Communications Technology (ICT) program. They have a particularly strong profile in the technical area, which they wish to practice further on at a high level or even at an expertise level. Our training is carried out in a school-company co-operative program with periods of several months at both sites. In the first and second years of school the students, who then work in small groups, discover the traditional tools of project management such as the analysis of the client's needs, planning, risk and delay management. At the end of the second year, the students are thus armed to manage simple, well-targeted projects in small groups. In the third and final year, we bring an extra dimension by putting the students in a position to undertake a complex project in a large group where random situations arise irregularly. Our goal is to bring the students, who are generally much more centred on technical skills, towards strong skills in project management methods [3]. This exercise has been carried out six times and has evolved to a course unit that now lasts 63 hours spread over 12 weeks, consisting of a few lectures and three-hour long tutored sessions.

3.2 The type of technical projects

What could be better than having the students carry out a project [4] in order to make them discover the notions of complexity? The director of the school, together with his executive committee, is the client of the specific projects that we propose to the students. When we initially designed this course unit we proposed a project whose technical core was centred in the ICT area where the students already had acquired some expertise. However, the students' taste for these technologies is such that, contrary to our expectations, the energy spent during the activity was focused on the technical aspects at the expense of the organization and the management of the team. Since this first inconclusive experience, we have chosen a project whose technical framework lies completely outside the skills already acquired by our students. These projects are chosen outside the students' normal comfort zone of technical skills, which ensures that they are equally unprepared for the technical tasks to be accomplished. After the initial moments of destabilization, the groups have to organize themselves to acquire the needed technical skills and to distribute the work to be performed in order to try to reach the client's objectives at the project end. It is at this stage that we see natural leaders emerge and contribute strongly to the structuring of the group. Much of the work at the beginning of the project is then people centred and on the organizing of the group. Conversely, in the absence of a leader, we have observed that this "forming" phase is slow and unproductive [5, 6].

3.3 Course organization

To introduce complexity into this course we have addressed several parameters which, once aggregated, make the project management complicated. First, we divide the students into two groups of about fifteen. This high number of members forces the group to

structure itself effectively. We let the groups organize themselves autonomously. It is up to them to choose the project manager. We claim that the choice of leaders by and for the group is a fundamental element in the structuring of the group. They must also define the management rules that seem to be the most appropriate to them. To organize their project, the students must go beyond their regular friendly classmate structure that they have experienced for two years and create a work hierarchy that will apply during the project. The project manager and work package leaders will have to take decisions that hold and handle conflicts with their peers, a task that is far from simple. To help, a communication coach regularly intervenes to help the students deal with human relations, to address conflict management and to advise them on management methods. Students, who wish to do so, can consult this coach freely for counselling.

A Steering Committee (SC), made up of eight professors of different cultures and skills, organizes the course. This SC only intervenes in project management aspects and organization of groups. The SC organizes weekly methodological discussions where representatives of the two groups explain how the group functions, what works well and what doesn't. The SC questions, suggests and formulates proposals that students are free to implement. In general, the SC is not directive; we leave the initiative to the student managers to lead their groups. In special cases of blocked projects, the SC puts pressure on the group to bring out the capacities of the manager and of his team. It is then observed that managers use different strategies according to their personality and according to their experience. Some project managers voluntarily delegate decision making power to the work package leaders while others decide for the group.

After one third of the duration of the course, we organize an audit to evaluate the processes defined by the group. The audit examines elements such as: the hierarchical organization chart of the group, decision-making processes, document management, risk management, time management, and management of internal and external communication. At the end of this audit, the SC makes a report containing recommendations which highlight the strengths and gives suggestions to improve the weak points of the group's organization.

The SC organizes a debriefing at the end of the course during which the students express themselves on the functioning of the course. Often, they comment/criticize the grade they have been awarded. The SC emphasizes the acquisition of relational and project management skills by relativizing the importance of the technical production. This is an essential moment to make students aware of the skills they have actually acquired during the project [7]. It then becomes clear to the students that the lack of decision-making or bad decisions made at the wrong time during the project illustrate the need for good leadership. The success of the course in these terms is sometimes difficult for our students to accept or understand.

4 FEEDBACK

We present six stories that have particularly struck us by looking at the role of the nominal leader and then we analyse the results. The natural leader is the one that was identified by the steering committee, because of his/her previous actions in courses or projects. A project is deemed a success when the project satisfies the client's request. Over the 6 years there were no project failures, all missions were completed, but they were carried out with varying degrees of effort where the difficulties related mainly to the methodological and human aspects of project management.

4.1 Six stories

Case 1: The first story concerns a project where the natural leader was chosen. He carried out all the expected functions. He proposed a vision by applying an original management style, based on fair management¹; he delegated and guided; he ensured the cohesion of the team by generating confidence. The project was a success and the work of the team and its leader was unanimously appreciated.

Case 2: In the second group, several natural leaders could have been chosen, but it was another student who wished to try this role. Uncomfortable at first, she was kindly assisted by others and gained confidence and fulfilled the role effectively throughout the project. She knew how to get support when she needed it and the help she got was fine. The project went well and was a success. At the end of the project, she acknowledged that she had met the challenge and was now able to fulfil this role alone. This is one of the biggest individual progressions we have seen throughout the six years of teaching this course. However, she remained more manager than leader. She has benefited from very favourable conditions. So far, she is the only female team leader.

Case 3: In this third story, two candidates wanted to be the project manager. A close vote chose one, leaving the second frustrated. The second student supported the first throughout the project but without conviction. The leader was not confident about his managing abilities. He was made aware of the difficulties of this project by the older students which disturbed him. The team was poorly organized and the progression difficult. The Steering Committee organized an audit and reported on organizational shortcomings. This audit was badly received but served as a trigger. The group eventually reacted to this by banding together. They became aware of their deficiencies and organized themselves better. This was the first time that a "group operating charter" was established and signed by all members. This event then led to a new start and consolidated the leader. Confidence was restored, team spirit strengthened. Finally, even if the technical project had mitigated results, it was a great success for people relationship and management. It is this group that made the most progress.

Case 4: In the following group the project manager stepped forward essentially because no other candidate volunteered. He did the work but did not facilitate the tasks for the team members. He was quickly seconded by a more experienced student. The transition was smooth and accepted with great relief by the whole group. The very slow start limited the technical success of the project. However, efficient cooperation tools, chosen by the group, compensated for the lack of leadership.

Case 5: In this fifth story, the project manager was a rather good manager and leader. The project was a success. But, an event prior to the project disrupted the evaluation phase. A student wished to "give a lesson" to another by taking advantage of the freedom to individualize the marks, in order to sanction her. He managed to federate a majority of the group around him and organized a meeting "as a court". He took advantages of some late deliverables to justify the penalty. The project leader saw the problem coming, came to seek advice, but could not prevent the split in the group. He reduced the punishment by secretly giving some of his own points to the sanctioned student.

Case 6: In this group the project manager was again the only (reluctant) candidate. He already practiced project management in his company. However, while running this project he did not adapt and sometimes opposed the requests of the Steering Committee because "he did not practice them at work". He said and showed that his role did not really interest him but nevertheless persevered. The group was much divided. The project manager was isolated and only one out of the other fourteen members willingly accepted to help him in

1 https://fr.wikipedia.org/wiki/Management_équitable, last view 4/2017.

carrying out the tasks that he considered unnecessary. The management part was felt as a constraint. The technical sub-group almost became autonomous by doing the technical tasks and ignoring the management work. Finally, the project was a success from a technical point of view, but the management and the coaching of the group were a failure. The members of the technical sub-group criticised him for obtaining a mediocre score. We have tried to classify the different cases according to the typology of the leader at the beginning of the project and the degree of success of the project: Table 1.

Table 1. Position of different cases

Choice of the leader	Natural leader	Accompanied leader	Leader by default
Project result			
Successful management	Case 1	Case 2	
Hampered by the leader		Case 3	Case 4 Case 6
Hampered by the team	Case 5		

4.2 Analysis

Our first question is about whether such project management experimentation allows students to build on leadership skills. We complete our analysis with a quantitative study based on the students' perception of their skills in a technical approach to project management. We study skills evolution between the beginning and the end of this students' final year project course unit [7]. One question was: at what level do you consider your ability to lead a project?

In Figure 2, we can see the results for 4 student year groups (about 120 students). The graphs show a rise in self-assessed competency in the notion of leadership, with even some of students considering themselves experts in the question.

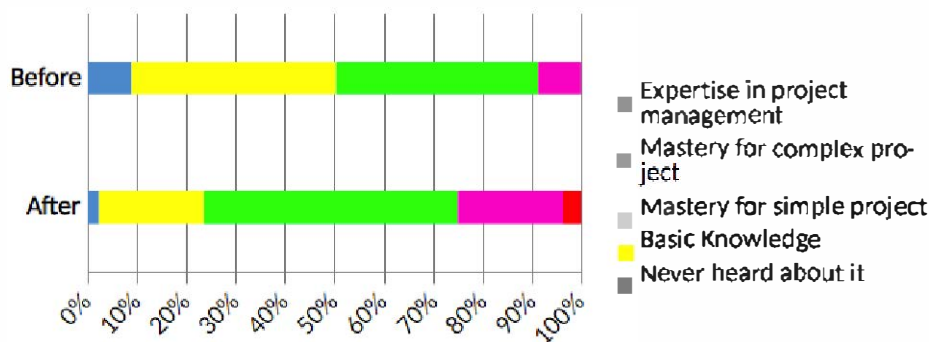
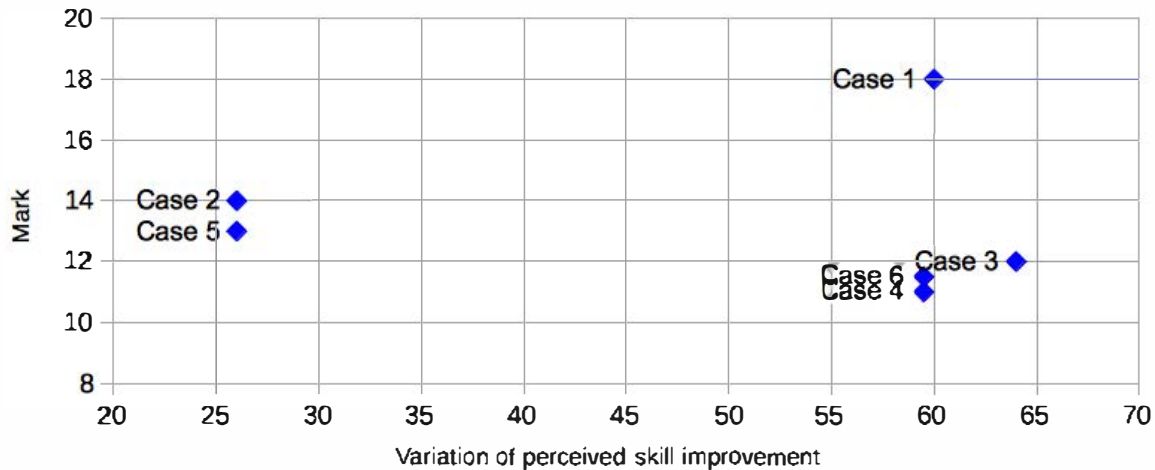


Fig. 2. Ability to hold the position of project manager (all cases 2013-2016)

In the appendix, we present these results, year by year, which make it possible to identify the different cases of study. We find that no student in the 2014 year group felt he was an expert in leadership, whereas for other year groups, the two leaders often replied that they had acquired expertise. In case 2, the steering committee considers that the leader took this role in order to test his competency in a learning situation but does not yet consider himself ready to do so in a professional situation. In case 5, the setting up of a court and the displayed support of the project leader to the "accused" person surely created a loss of confidence in his managerial skills.

Our second question considered the link between the group's results and the availability of a good leader. One way to consider the result is to look at the mark obtained during the

course. We do not have an objective criterion for what constitutes a good leader, so we have based our analysis on the evolution perceived by the students of their leadership competency. To do this we create a score that assigns an increasing number of points to the level of competency as perceived by the student. We have taken into account the difference in score before and after the project, case by case. We then evaluate the correlation between this score (which measures perceived improvement in leadership competence) and the final mark (Figure 3).



Case 1: the survey was not created at this time, so it is an approximation of skills variation.

Fig. 3. Comparing marks with perceived competency variation

We find that we cannot correlate the mark with the improvement in leadership competency. To start with, all the cases are different and also the mark considers competencies broader than the simply leadership, even if the starting hypothesis was that a project can't succeed without a good leader.

Other results, more qualitative, emerge from the individual student feedback, observations by the steering committee or debriefing sessions at the end of the course.

We had 6 different cases whereas the pedagogical framework was the same from year to year. Those who were project leaders undeniably learned more than those who were team members. Some project leaders made the effort to give regular feedback of their experience to members (case 3). Only one case had the curiosity to perform a bibliographic search on management methods and to share them with others (case 1).

It is then observed that managers use different strategies according to their personality and according to their experience. A certain project manager voluntarily delegated decision making power to the work package leaders while another decided for the group (Case 6).

We also found that project manager did not necessarily mean leader. Some team members were leaders in their behaviour, in their relationship to others. In such an exercise, it became clear that the peer-to-peer relationship prevented the project manager from implementing of the complete set of managerial incentive tools available in a company, due in particular to the absence of a hierarchical means of pressure.

5 CONCLUSION

The various stories that we, teachers, have observed over six years require several comments. First, taking into account initial parameters such as project group composition and project topic, project developments and group dynamics have continually surprised us. Hence, the Steering Committee has to react wisely and with humility as no predefined

scenario was flexible enough to remain unchanged for more than a few weeks. Second, this project experience and the deliberate pressure that the steering committee puts on student groups often lead to the feeling that the project has partially or totally failed, leaving both teachers and students with the bitter feeling that results and achievements were small compared to the efforts made. Hence a debriefing session is mandatory but several weeks after: students realize with hindsight how much they have learned in terms of organization, behaviour, vision, reporting, etc. Third, the leader designation process is somewhat particular (group of classmates, many possible leaders, collective process to make a leader emerge) and does not correspond to what occurs in an industrial context. Leadership is then approached in a different way that is maybe more general, so the outcome is different.

This project course was designed primarily to teach project management methods in a practical way. There was no deep reflection on leadership and relations between leadership and management. After six years, it appears that this kind of project cannot be completed from a pedagogical point of view without a clear vision of what we intend in terms of leadership training. If we all agree on teaching good management methods and techniques, teaching leadership, if possible, poses the fundamental question: do we first train leaders, managers, contributors or all profiles at the same time?

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