# Re-engineering Academic Teams towards a Network Organizational Structure

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ABSTRACT

This paper examines student teamwork in the academic field from a structural perspective. Student teams are often prearranged and then left organize themselves and get with the work, without any further structural support; this can present students with negative experience on team work. Varying contribution amongst team members occurs and leads unavoidably to friction and reduced performance.

The aim of this work is to explore the main problems in academic team work and investigate tools that provide relevant solutions. We present the concept of network organizational structure and discuss how this can improve collaboration and communication. The main tools for achieving a structural transformation from the more traditional form of teams' organization to the fairer network form, and their implications are discussed.

***Subject Areas: Academic teamwork, team performance, network organizational structure, peer evaluation, groupware, team structure, project management***

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## INTRODUCTION

Team working has recently gained unprecedented attention, as it is indisputable that teams outperform individual performance in most cases (Benders et al. 2002). Yet, teams consist of human beings with different personalities, roles and background, so conflicts and problems are to be expected. Despite the non-linear nature of team working, team management is complex but not chaotic" (Hayes 1997).

Several methods have emerged in order to tackle the complex nature of team working. The goal of this work is to explore how recent trends in the area of teamwork can further improve academic team working. This paper discusses groupware tools that support team collaboration, as well as the use of peer-evaluation techniques. These two methods have become very popular in business environments, and adopted solely or jointly, they could improve academic team working environment.

Furthermore, this work aims at providing a structural view of academic teamwork. It explores different types of structure and introduces the concept of network organizational structure in academic teams. It explores how network structures can address common problems of teamwork and guide teams towards a successful, rewarding experience.

We set up an experiment where 2nd year undergraduate students were asked to nominate groups of 6, to work on a practical project on software analysis and design. Work was to be carried out over one academic semester under the supervision of an academic tutor. Eventually their work would be marked by their tutor; this group mark contributed towards 80% of their total mark. The remaining 20% of the total mark was an individual mark component for each student. Half of the individual mark was assigned by

the academic tutor and the rest (i.e. 10% of the total mark) would come from students assessing themselves as well as their team mates, in terms of a number of factors.

Our findings showed that formation of a network structure can be facilitated through the use of IT and peer-evaluation techniques. Although this was shown not to significantly affect the team's final result, a network structure can reduce the most common sources of conflicts and problems within the group thus bringing about a more cooperative and transparent environment and increased efficiency.

Other interesting findings from this experiment include that groups consisting of "good" students do not necessarily perform better than groups of less "good" students and that students with high performance tend to work in a network structured team. It was also shown that the teams that are randomly allocated normally perform worse than teams which have formed their own group by self-nomination. Finally, we confirmed that academic teamwork can present students with a variety of negative experiences.

The remaining of this paper discusses at first the importance, problems and existing solutions for academic teamwork and the implications of peer evaluation. Various forms of team structure and the advantages of the network organisational structure follow. Our basic hypotheses and the approach we took for validating these are then introduced, while experimental results are presented and discussed. Finally, conclusions and directions for further work conclude the paper.

## BACKGROUND

### A. The importance of academic teamwork

Although job advertisements increasingly require graduates with good team working skills, two of the three skill deficiencies in graduates most commonly cited by employers, include the lack of communication skills and the lack of interpersonal skills (DETYA 2000).

Another survey conducted on graduates from a variety of Australian universities found that the ability to contribute positively to team-based projects is the skill that is most prized in the workplace, whereas technical knowledge is ranked at only 29 out of 38 attributes (Scott G., Yates W. 2002).

According to Murray (2003), team experience provides students with opportunities for improved interpersonal skills, effective communication, assertiveness, listening skills, ability to negotiate and compromise, utilization of diversity, conflict resolution and other social skills. Colwell and Jenks (2004) state that "new technology available at the modern workplace may mean that today's student will be working on a virtual team tomorrow, thus these skills should be acquired by students before arriving in the workplace".

Universities around the globe recognize the need to train students in teamwork skills; however often there is neither special focus on development of these skills nor significant support during such assignments. Hart et al. (2001) used focus groups and found that, although almost all students had opportunities to practice group work, few felt there was sufficient preparation for the experience.

Buckenmyer (2000) issued an important warning to universities by saying that these negative experiences can sour students' attitudes toward all team participation and may affect their performance in teams later in employment.

Hart et al. (2001) also commented that, "While they [the students] are given criteria for

success they are not given techniques to overcome difficulties. In particular, they feel that they are not well equipped to handle conflict within the group and deal with group members who were not contributing appropriately".

B. The main problems in academic teamwork

There are several problems and issues that arise during a group project. We have classified the main problems of academic teamwork in three main categories: communication and consistency problems, unfair contribution and lack of a clear structure, and personality conflicts. This section briefly discusses these three categories.

*1) Communication and consistency problems*

Such problems include difficulties in effective communication and coordination, due to the increased complexity of interaction, especially when the size of a group is large, and issues related to timeliness, availability, lack of commitment, responsibility and bad task allocation.

*2) Unfair contribution and lack of clear structure*

Group work assessment is often considered to be unfair because team members who contributed more get rewarded equally with those who contributed less; there are rarely any negative consequences for the "loafer"—the one who does not contribute effectively to the group. Contrary to the workplace, the lack of hierarchy in a team does not permit someone to impose themselves on other team members to get them to work more effectively.

The term "Social Loafing" (i.e. hiding in the crowd in a group: Why should I contribute conscientiously when I believe others are withholding effort) was introduces to describe such phenomena (McKenna 2000). In social loafing, the average productivity of each

member decreases. In other words, the productivity of a group as a whole is not at least equal to the sum of the productivity of each group member, because individuals show a tendency to spend less effort when working collectively than when working individually (Comer 1995).

*3) Personality conflicts and diversity*

Personality conflicts and disagreements are usually related to human nature and arise from the fact that everyone is different and that there can be no real objectivity. A lot of problems in this category often occur during the phase of appointing the group leader. Problems in this category are not in the scope of this work. We plan to address these in the future.

C. Existing solutions

A large number of problems that fall under categories (1) and (2) can be addressed partly by using certain techniques and the new possibilities offered by IT in particular. This section briefly discusses some solutions to these problems.

*1. Facilitating communication and organization*

The first category of problems includes communication difficulties and can be improved considerably with the use of IT. The aspect of facilitating teaching with the use of new technologies has been examined quite extensively in the past. Stephenson (2001) stated that "the potential for using the Internet and the multimedia capabilities of technology for learning is great". Benefits may include provisions for disadvantaged students as well as cost savings through economies of scale or automation of the teaching processes. Laurillard (1993) concluded that "technology has the potential to change the

ways in which we teach and support students in the traditional university beyond recognition".

In relation to teams of students, Whatley (2004) stated that among the advantages of using software agents for supporting online students are that agents can bridge the division between time and place. Students may be dispersed and work at times that suit them, however the agents can keep track of their progress and enable them to be aware of the project's status.

The Internet made it possible for collaborative learning to be conducted in cyberspace through the use of Web-based collaborative systems. Research has shown that students are positive in collaborating online, as they find it more convenient (Beng 2000).

Software tools that support teamwork are usually termed Groupware. There is a great variety of Groupware tools. According to Brinck (1998), groupware technologies are typically categorized into two dimensions which depend on:

i) whether users of the groupware are working together at the same time ("real-time" or "synchronous" groupware) or different times ("asynchronous" groupware)

ii) whether users are working together in the same place ("collocated" or "face-to-face") or in different places ("non-collocated" or "distance").

Typical features for synchronous communications are shared whiteboards, video communications, chat systems, decision support systems and multi-player games. These features allow the communication and cooperation between the team members to take place instantly, regardless of their geographical location. Typical features for asynchronous communication are newsgroups and discussion forums, group calendars or workflow diagrams.

Both the synchronous and asynchronous tools can facilitate the communication and help teams get organized more effectively towards achieving their goals.

*2. Increased fairness and motivation*

The problems related to unfair contribution and lack of a clear structure have been discussed extensively in the literature. The method of evaluating a student's effort in a teamwork project can be considered as an important structural issue. Usually, all team members are given the same grade and no individual accountability exists. The issue has been analyzed by Feigenbaum and Holland (1998); "There can clearly be arguments for not evaluating individual members on the team. First, the concept that a team is a unit and that they should share equally in the rewards as well as the punishments. However, in the academic arena there is a need for equity and fairness". According to Michaelson and Black (1994) the grading system must be responsive to students concerns for fairness and equity. This concern for equity on group projects can be alleviated by using peer assessments and evaluations.

Michaelson and Black (1994) go on to point out that peer evaluation solves two important motivational problems: it is providing an incentive for participating in group discussion, and it tends to remove students' fear that they will have to choose between getting a low grade on the group assignment or having to "carry group work".

Thus, an important technique for providing a more effective structure in a team is the peer evaluation method. Peer evaluation resembles to the 360 Degree Feedback, "the systematic collection and feedback of performance data on an individual or group, derived from a number of stakeholders, in their performance", used in the workplace (Ward 1997).

## PEER-EVALUATION IN ACADEMIC TEAMS

Introducing Groupware facilities that can support student teamwork is straightforward. An example is the WebCT platform which incorporates some useful facilities. Furthermore, various group systems exist and provide a large variety of tools for team working. However, when arriving to the point of applying the Peer-Evaluation technique on student teams, one realises that it is not a simple matter. Different peer-evaluation techniques are used to design the most effective structure by taking into account the individual performance of each member. We have classified different peer-evaluation techniques into three categories: the ranking method, the rating method with percentages and the rating method using different criteria.

In the ranking method, all team members are asked to rank their team-mates according to their individual performance. Ettaro (2000) who first introduced the term "Total Quality Management Student Teams" (TQMST) is in favour of this method, despite the warnings by Deming (1986), the father of Total Quality Management (TQM) in relation to ranking techniques. In the rating method with percentages, team members rate each others' performance and contribution, with figures (percentages) that would add up to 100%. In the rating method using different criteria, team members are requested to evaluate themselves in a set of criteria that are specified by the lecturer. The evaluation procedure usually differs from lecturer to lecturer in relation to the evaluation criteria and rating scale used.

No matter which method is used, the peer evaluation technique is not a panacea and deficiencies will always exist. Nevertheless, the benefits derived from peer evaluation

cannot be ignored. It is interesting to note that in the workplace, peer evaluation-360 degree feedback was used by 90% of Fortune 500 companies in 2002 and its popularity as a strategy is undeniable (Carruthers 2003).

More recent literature on using peer evaluation in both the workplace and in education appears to confirm these findings. Linman (2004) who studied the consequences of the strategy in the workplace, states that the perceived benefits will help the personal development of the employees only in the right organizational climate, and that the decision to employ this strategy should be made carefully.

Finally, in research specifically related to student teams assigned with a group project, Feigenbaum and Holland (1998) concluded that when properly designed and administered, peer evaluations can become a motivator for enhancing involvement and lead to the further development of team skills by students. They also suggested that "whatever shortcomings exist in the peer evaluation process the concern for equity and the motivation that they provide compensate for whatever lack of reliability that exists".

## A STRUCTURAL PERSPECTIVE ON ACADEMIC TEAMS

Meyer (1993) defined structure as "a stable guiding force that transcends on time and on the issues of the day". He suggests that structure is often the starting point in order to construct a high-performance organization. When well designed, structure allows people to act independently while automatically coordinating their activities. He added that "Good people in a poor organizational structure would fail, while average people in a healthy structure can succeed".

Structure is also related with the wider meaning of the term organization. Wheatley and Kellner-Rogers (1998) define organization as “the shape things will take to come forth in”. If this shape is well designed, then things will unfold with order. Thus, if the team’s structure is well designed, the team’s collaboration is expected to unfold with order.

*A. Types of team structure*

Cummings and Cross (2003) have analyzed thoroughly the main types of structure that tend to develop in teams. They have identified three main organizational structures:

*1) Hierarchical structure*

The concept of a hierarchical structure characterizes the extent to which relations are ordered, such as those determined by status of prestige (see Fig. 1) (Krackhardt 1994).

*2) Core-periphery structure*

In this type of structure there exists a dense, cohesive core, with a sparse, unconnected periphery (see Fig. 2) (Borgatti and Everett 1999). Here, it is often the case that a smaller subset of the total population participates more actively than the rest. A core-periphery structure may limit the contribution of members who have valuable input by marginalizing information or opinions coming from peripheral members.

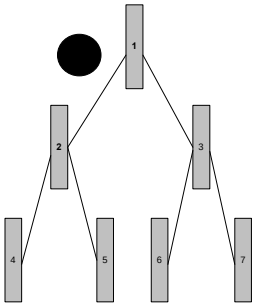



*Figure 1:*
*Hierarchical structure*
(Team with 7 members)

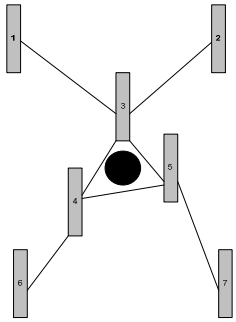



*Figure 2:*
*Core-periphery structure*

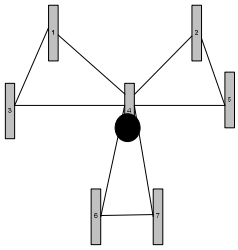


*Figure 3:*

*Structural holes*

*3) Structural holes*

In such a structure, one will usually find an ego-centric character and few ties among team members (see Fig. 3) (Burt 1992). Usually, team members will rely greatly on a group leader, whose attitude and performance constitutes an important determinant of collaboration within a group.

Cummings and Cross (2003) conclude that "groups constrained by structural properties such as hierarchy, core-periphery and leader structural holes will perform worse than groups with a more integrative structure".

In the three structural types, we have added a black circle which symbolizes the *focus on the achievement* of the final goal of the team members (see Fig. 1-3). Usually, in all three types, the leader or the core-periphery is more concerned about the final goal in relation to the rest of the team members.

Academic teams, without the provision of a clear and effective structure, tend to obtain the above types of organization which delimit their potential. However, the application of the two proposed methods (Groupware systems and Peer Evaluation) could lead to

important structural consequences. The structure of a team tends to transform into a dynamic and decentralised form, which closely resembles to the characteristics of a network organizational structure.

*B. A network team structure*

A network organizational structure is defined by Lipnack and Stamps (2000) as one "where independent people act as independent nodes to work together for a common purpose". A network comprises of nodes and connections-links. The nodes in the case of an academic team are the team members. The links correspond to the various interactions between them.

According to Skyrme (1999) some of the characteristics of a network which also apply to an academic team are:

- Improved performance when the task is complex and demands innovativeness.
- Easier adaptation to changing circumstances from the members.
- Increased cooperation and a sense of mutual responsibility.
- Freedom of exploring ways to work effectively instead of following pre-defined processes.
- Authority gained not from a hierarchy but from the individual's recognized knowledge and skills.

In a network organizational structure all team members tend to be more concerned about the final outcome, since there are more involved in the process and there is a much more integrative environment.

In the following diagrams, we have attempted to "capture" the impact of a network organizational structure. The rectangular boxes represent team members; while the black and grey circles represent the goal of the team and the existence of a groupware system respectively (see Fig.4-7).

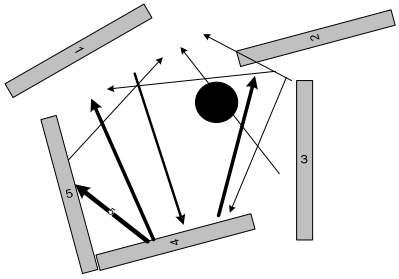
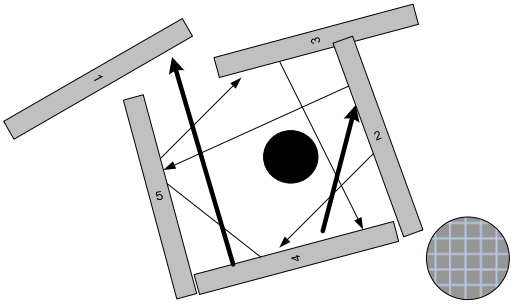



*Figure 4: Typical behaviour of a team without structure (Stage 1).*

After the team's creation (e.g. a team of 5), the members start to interact (see arrows). Sooner or later, some members realize that there will be no consequence if they do not work sufficiently and are moving away. As the arrows indicate, a lot of communication problems may exist. The team might lose considerable time until it appoints a leader. The leader may unconsciously make the shape of the team more centralized and hierarchical towards him/her. At the same time, unavoidably, attention towards the teams' final goal gets secondary priority.



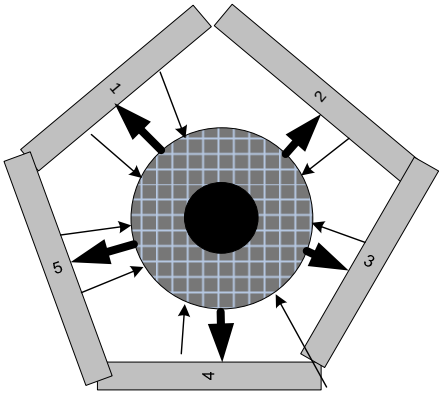
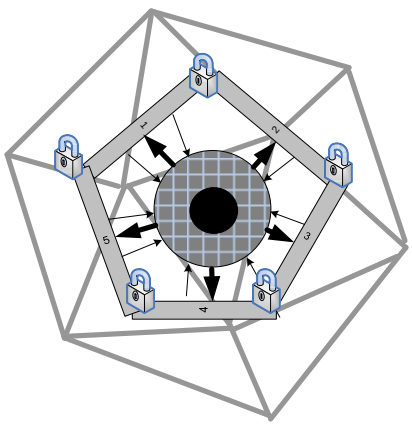



*Figure 6: Towards a network organizational structure (Stage 3).*

The members find their most effective roles. Communication is taking mainly place through the system. All members have the possibility to express their ideas and it is more difficult for someone to impose themselves. The team's environment is much more cooperative.



## APPROACH - BASIC HYPOTHESES

In order to observe the impact of peer evaluation in academic group dynamics and performance, as well as the adoption of various organisational structures in practice, we designed an experiment with a large class of 2nd year undergraduate IT students. Part of their assessment was based on a large practical group project on software analysis and design taking place during one academic semester under the supervision of an academic tutor. 80% of their total mark would be a mark assigned by their tutor, based on group performance. The remaining 20% was assigned partly (10%) by their tutor based on individual performance and partly (10%) by the students themselves based on peer evaluation. Students were allowed to nominate their own group of 6; failing that they were randomly assigned to groups. All students knew in advance that they would be participating in peer evaluation.

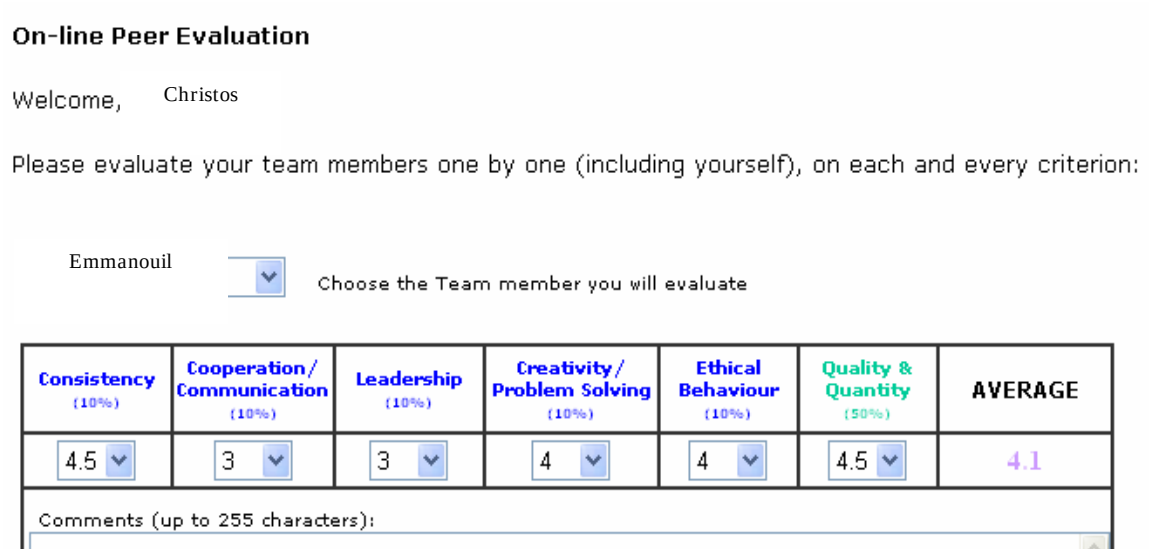


*Figure 8: Web-based peer evaluation*

Our experiment was set up to observe all forty two student teams, comprising of four to six members and analyse the results from peer-evaluation as well as their comments on the performance of their peers during the project. Thirty three of the teams were nominated by the students themselves, while the other nine were randomly selected.

Peer-evaluation took place anonymously among the members of each group after the end of the project. All team members were asked to evaluate everyone in their group on six criteria, each having a weight: Quality & Quantity of Work 50%, Consistency 10%, Cooperation/Communication 10%, Leadership 10%, Creativity/Problem Solving 10%, and Ethical Behaviour 10%. The rating scale used for the evaluations ranged from 0 for no contribution up to 5 for exceptional contribution. It must be pointed out that the marks each student was giving to themselves did not contribute to their final mark; it was only used to assess their self-awareness. Students were given the option to input free style comments for each one of their team mates.

A web-based system aiming at supporting the peer evaluation was designed for the purpose of this experiment. Each student was given appropriate login details and then proceeded to evaluate one by one their peers on the six criteria mentioned above. A

screenshot of the web-based peer-evaluation system is shown in Fig. 8. The system provided detailed analysis on all the scores for each team and for each member's individual performance after the end of the peer-evaluations. Results were also provided to the lecturer to be used for student grading. Student comments were not made public as these could easily identify the authors and cause grievances.

Using the data gathered by the web based system we conducted an exploratory analysis, in order to examine team performance. For the purposes of this analysis we define here some key terms and concepts we used.

We define *team structure* using the variance in leadership for each team. Leadership is one of the criteria included in peer-evaluation. Low leadership variance indicates a network structure, while the opposite indicates a hierarchical structure, as one can safely presume that groups with one or two strong leaders are expected to operate in a more hierarchical manner.

*Student quality* depends on the individual mark each student received for the project while *team quality* is the mean of the individual mark for each student in a team. *Group performance* is defined as the group mark the team received for the project. Also, given that groups may comprise of only "good" quality students or "bad" quality students only, but they can also comprise of a mix of students of varying quality, we define the extent to which a group is *mixed* or not as the variance of the individual student marks within the same group.

Having defined the main concepts of our exploratory analysis, we now present its main objective, which is to get insights into which are the most widespread student teamwork problems and to validate the following basic hypotheses:

i) Individual differences in contribution among team members are significant

ii) The formation of a network structure can influence positively a team's performance.

iii) Team member performance is correlated with the team's structure.

iv) Groups of "good" students perform better than mixed groups or groups of "mediocre" students.

v) Team self-nomination affects team performance positively.

## RESULTS

In this section we explore the information gathered in the form of free style comments, in search for insights into student team problems. We also discuss experimental results from peer evaluations and argue how these support or otherwise our basic hypotheses.

### *A. Finding on student team problem*

We used free style comments to explore some of the problems in student teamwork. These comments confirmed several of the most frequent reported academic team problems, as discussed in the literature. We present here excerpts from real comments we recorded, related to each of the three categories of problems: communication and consistency, unfair contribution and lack of a clear structure, and personality conflicts. Clearly our findings here are of qualitative nature but surely deserve further investigation on causes, effects and solutions.

#### *1. Communication and consistency problems*

- "I often found that his communication was bad … after having had numerous excuses as to why an email didn't arrive or a phone call wasn't made I became frustrated".

- “Very inflexible and uncooperative. And as such, failed to attend many meetings and produce much written work. Didn't really take the work seriously”.
- “No communication, no work, failed to attend presentation. Waste of time”.

*2. Unfair contribution and lack of clear structure*

- “I completed the project by myself without the aid of the group”
- “Poor effort. Didn’t meet deadlines. Did not volunteer for extra work. No contributions in meetings and did not provide much useful work. Sadly disappointing”.
- “This member didn’t really contribute anything to the group”.

*3. Personality conflicts and diversity*

- “He was a very difficult person to work with”.
- “Bit too forceful with his opinion, doesn't listen to others' opinions and wanders off topic”.
- “Tries to take control but doesn’t succeed and doesn’t listen to the group”.

It became apparent that lack of adequate communication and structure, students failing to pull their weight or wasting time in counter productive arguments eventually lead to team de-motivation, frustration and reduced performance.

### *B. Validating the basic hypotheses*

We used the data gathered by the system to conduct an exploratory analysis, in order to validate our five basic hypotheses we formulated earlier.

The final results from the web-based peer-evaluation showed that there were individual performance differences that should not be ignored. The standard deviation of the results within each team was calculated to be on average 0.9. There were some teams that had a very small or even zero standard deviation of their members’ performance. However,

there were also teams having certain members whose contribution was very limited; the highest standard deviation of performance in a team was found to be 1.86. All in all, our hypothesis that "individual differences in contribution among team members are significant" was shown to be right in many cases, as expected. This confirms that assigning all students in a group the same mark is inherently unfair.

According to the second hypothesis, one would expect teams that tend towards a network organization structure to achieve higher grades in their group project compared to other teams with more hierarchical structures. Nevertheless, the results showed that there is nearly zero correlation between group performance and variance of leadership among team members. To do that, we calculated the average variance of team member performance for the best 20% of the teams and we did the same for the worst 20% of the teams. We applied a Mann-Whitney test to determine if the differences in the mean leadership variance of the best and worst subset of teams are significant. The results showed no significant differences in the mean variances of the two subsets. As a result our hypothesis that: "the formation of a network structure can influence positively a team's performance" was rejected. It would be interesting to further explore whether, despite not increasing group performance, network organisational structures produce other benefits such as higher efficiency or better job satisfaction.

Our third hypothesis was that team structure is correlated to student performance. A significant correlation here could mean that students with high performance tend to work in a network structured team, while lower performance students tend to use a hierarchical model. A strong correlation here could also imply that students who work in a networked structure get a better grasp of the project's objectives, because of the networked structure.

The Spearman correlation coefficient (non-parametric test) between team structure and student quality was calculated to be -0.398 and is statistically significant at the 1% level. This confirms that students of high quality tend to work in a network structure and their teams exhibit low leadership variance, while the opposite holds for low performance students. However it is not unlikely that other external unidentified factors could influence both student performance and team structure. Given the confirmation of this hypothesis one could further presume that using network structures may not suit teaching leadership skills for example.

The fourth hypothesis was that groups of good students perform better than mixed groups or groups of mediocre students. We identified a subset of groups with the highest group performance (top 20%) and a subset of groups with the lowest group performance (bottom 20%). A Mann-Whitney test showed that indeed the mean performance of the students in the group project in each subset is significantly different. However, the mean of individual student marks in each subset is not significantly different. A Mann-Whitney test also revealed that the difference in the mean individual performance variance within a team of each subset is not significant. Therefore we cannot accept the hypothesis that groups of good students perform better than mixed groups or groups of mediocre students. To be precise groups of good students performed on average better as a group than other groups, without however maximising individual performance. This may imply that good students who belong to a good group may feel less compelled to do their best, given the group is doing well anyway.

Finally, by analysing our data we tested our last hypothesis that team nomination affects the performance. Using a non parametric one-tailed Mann-Whitney Test (2

conditions, unrelated designs) we can reject the null hypothesis that team nomination affects team performance negatively, at a significance level of 5%. Results are similar for the Spearman correlation coefficient, giving a correlation of 0.269 at a significance level of 5% (one tailed test), revealing that team nomination is one of the factors that affect the performance of a team. We can conclude therefore that when the students are allowed to choose their team members, their team will perform better. We could therefore say that allowing students to nominate their team members solves some of the teamwork problems we have already discussed.

## CONCLUSION AND FURTHER WORK

Universities around the globe have realized the importance of teamwork and group projects have become a widespread practice for teaching and learning. However, there is still great potential for providing student teams with an improved environment and organization.

In this paper, we presented some tools for overcoming the main problems occurring in academic teams. We proposed a network form of organization that can aid reducing inequalities and conflicts. We have also proposed the introduction of the peer-evaluation technique which permits the lecturer to obtain further insight into each team member's performance.

One of the biggest disadvantages of the peer evaluation as a technique is that it can be labour intensive for the instructor and can involve an increased administrative workload. When peer evaluation takes place in a paper-based form, the instructor needs to take into account the ratings and comments made from all the team members for the rest members

and then derive conclusions about the individual performance of every team member. For example, in a team which comprises of seven members, the instructor will need to take into account 49 ratings (peer and self-evaluation). However, Colwell and Jenks (2004) conclude that the benefits from such a technique for students far outweigh the burdens of additional tasks for the instructor.

In addition, technology nowadays can greatly facilitate peer evaluation. Web-based forms can assist academics to assess easier and more accurately team performance. Such applications can also provide further insight into a team's performance. It is possible to automatically calculate the average rating given to every student by their peers and provide graphical representation of the results. An advanced system could also provide anonymous feedback to every team member's performance and thus increase their self-awareness and strengthen their emotional intelligence. Despite the fact that feedback is vital for improvement, this is something that rarely occurs for the individual performance of an academic team member, due to the large amount of time and calculations it requires.

As part of this research, we designed a web-based system that incorporated a peer-evaluation. From the scores-evaluations by the team members, we showed that there are differences in contribution/performance between the members of teams that should not be ignored. This may mean that academic teams should be directed to collaborate under a form of organization that motivates all team members to contribute equally. In order to achieve such a form which corresponds to the network structure, we have suggested the introduction of groupware tools and the use of peer-evaluation technique, on the

condition that it is carefully designed. Alternatively some means for accounting for individual contributions should be provide.

Furthermore, we have seen that group self nomination boosts performance while grouping good students together does not improve individual performance. From a pedagogic point of view it is debatable whether encouraging good students to form their own groups is better than allowing for a better mix of skills and abilities.

All the above conclusions are based on the peer-evaluation method which can never be totally reliable, as several factors such as favouring friends in a team and generally the lack of objectivity and maturity may sometimes affect the evaluations. Nevertheless, as Saaverda and Kwun (1993) mention in their studies which focus on self-managing work groups, "on the whole, both field and laboratory studies indicate that peer assessment is a valid and reliable evaluation procedure".

Although network structures did not prove to improve performance in the short run, they might bring about other benefits. A network organizational structure promises to bring improved timeliness, decision-making, coordination, transparency, knowledge distribution and in general greater decentralization, coherence, and handling of complexity. One more important characteristic of a network structure is the removal of status distinctions. Factors such as age, race, gender and external appearance do not interfere to the group’s operations. On the contrary, power and influence derive from real core competences of the team members. However, one should be aware of possible trade offs when using network structures, as the potential benefits may indeed have hidden costs.

IT is a major enabler for the provision of a network organizational structure in academic teams. Contemporary advances in IT can offer new possibilities supporting academic teamwork that did not exist before, and therefore re-engineer academic teamwork towards a more successful experience.

Further research and new approaches are necessary to capture more effectively the performance and the consequences of the various team structures in the academic field. Further insights could be provided into the impact of Groupware facilities and peer-evaluation techniques on team performance, when implemented separately or jointly.

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