

Teamwork Assessment for Projects in IS Courses

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Abstract. Working on projects is an important part of many courses in the area of Information Systems (IS), where most of projects require extensive team work. To motivate students to work on common team activities and to evaluate adequately their personal contribution to the project different methods are used. This paper presents an approach to teamwork assessment in projects that support teaching several courses in an IS undergraduate program.

Keywords: Information Systems, team work, behavior competencies

1. Introduction

Working on an individual or a team project is a common practice of many courses at undergraduate level in Faculty of Mathematics and Informatics (FMI) – Sofia University “St Kl. Ohridski” [2], [10]. Although all authors emphasize on the benefits of this approach to help students to obtain practical skills needed to work in the software industry, the level of individual contribution of every student for the team project’ success is still difficult to assess.

In this paper we present an approach for assessment of team work in two courses that are an important part of IS undergraduate curricula in FMI – Information Systems Analysis and Design and Project Management courses. A feedback from the students, participating in the courses was required after the finishing of the first course. The received information is analysed and used to help students to improve their team work during the second course.

2. Methodology

The last curriculum for IS undergraduate education – IS 2010 curriculum [3] presents several mandatory courses. Among them, the courses IS Analysis and Design and Project Management require for students not only to learn a variety of theoretical concepts but also to acquire some practical skills, specific for information systems development. For both courses team projects are fully applicable.

2.1 The Courses

IS Analysis and Design is a mandatory course since IS 2010 curriculum [2]. The course introduces concepts, processes, methods and tools needed to analyze business requirements, to specify system requirements and to present high-level design for information systems development.

The students, enrolled in the courses, are encouraged to take a very active role in the learning process, working on team projects. Students teams consist of 6 to 10 members. The projects usually are focused on small information systems. During the last several academic year employees from IT companies have been involved in the course, playing the role of the customer.

Students work on projects performing a set of assignments, that are preliminary defined. At the end of the course every team presents a high-level logical design of the system characteristics – described by use case modelling and UML diagrams, and some preliminary elements of the UI design of the systems. As an intermediate step several models (flow, sequence and artifact models) of the Contextual design are required [6], to help students organize the information from the interviews with stakeholders.

The second course focuses on the organizational side of the software development. The Project Management course introduces basic concepts of the PMI methodology – process groups and knowledge areas, cost estimation, project scheduling, quality management [7], [8].

As most of the assignments are result of extensive team work, it is very important for all team members to work regularly and with full capacity. Moreover, students continue to work in the same teams in the Project management course, so it is important to see what they have gained from their collaboration during the first course and how to improve upon it during the next course.

2.2 The method/approach

To evaluate the team work during the course IS Analysis and Design and to help students understand the importance of their role in the team project we conducted a survey among students that participated in the course IS Analysis and Design during 2017-18 academic year. Our study covers fifty four students across six teams. Forty seven of them continue to work in the next course – Project Management. Forty students filled in the questionnaire.

2.3 The Questionnaire

The questionnaire focused on students perceptions of team work during the IS Analysis and Design course. The questions (based on some ideas of [11]) are listed below.

Questionnaire

Q1. How effectively did your team work together on this project?

Poorly Well Very Well

Q2. What are the main reasons for the difficulties if they were any in your teamwork? (max 3)

Q3. What percentage of your team participated in all team activities of the project?

Q4. What percentage of your team was fully prepared for all team activities of the project?

Q5. Give one example of what went right on this project.

Q6. Give one example of what went wrong on this project.

Q7. Describe a specific practical skill you learned from the team that you probably would not have learned working alone.

Q8. Describe a theoretical concept (definition, model, method, etc.) you learned easier working on common team task.

Q9. Describe something (concept, model, practical skill, etc.) which the members of your team have learned from you and which they probably would not have learned otherwise.

Q10. Which of your individual skills could be improved, so as to improve the overall teamwork during the next project?

Q11. What will you do differently on the next project taking into account the experience gained from this project?

3. Results and Discussion

Overall, students showed positive attitude towards their teamwork during the course. Although the questionnaire could be submitted without answers, most students answered all eleven questions. Below we present the results (for every question) from the interview. A brief assessment of the answers of each question is made.

Q1. How effectively did your team work together on this project?

The Q1 is a structured question about the effectiveness of the teamwork on the project. The students are asked to select one of the three possible answers, evaluating the overall team performance as Poor, Well or Very well. The distribution of answers is shown in the following Table 1:

Table 1. Outcomes of the closed question Q1

Team	Q1 - Poor	Q1 - Well	Q1 - Very well
Team 1.1	-	75%	25%
Team 1.2	-	25%	75%
Team 2.1	-	100%	
Team 2.2	-	71.43%	28.57%
Team 3.1	-		100%
Team 3.2	-	50%	50%

The lack of answer “Poor” shows that students appreciate their efforts and results obtained and consider the projects as successful ones.

In two of the teams the members give the same answer – Well (Team 2.1) and Very well (Team 3.1) for performance of the team. The expressed different opinions in the other four teams can be explained with different level of criticism and precision of self-evaluation of members, which is evident from the diversing answers to the questions Q2, Q3 and Q4.

Q2. What are the main reasons for the difficulties if they were any in your teamwork? (max 3)

The question allows a free response and up to 3 different reasons can be described. The analysis of the answers identifies two main groups of reasons.

The first group of reasons considers the organization of the face- to-face meetings of teams. More than 33% of the respondents share that it is very difficult to find when exactly the team members can meet each other so as to discuss some issues crucial for the project. Other aspects here are: insufficient number of meetings, not clearly defined agenda, lack of enthusiasm and active participation in discussions, disagreement in expressed opinions and inability to take decisions by consensus.

The second group comprises reasons which are related to task management: wrong definition of scope of tasks, inaccurate procedures for task assignment, bad coordination of work, poor estimation of the time, needed for a task, late start of the work on tasks, late submission of individual results with no enough time these results to be further evaluated and incorporated into the final deliverables.

Q3. What percentage of your team participated in all team activities of the project?

The purpose of the questions Q3 is to reveal whether there are free riders among the team members. According to the definition given in [4] the free riders are students that enjoy a benefit acquired from a collective effort, but contribute little or nothing to the effort. The existence of free riders demotivates the rest of the team.

Respondents have to estimate the percentage of members, participating in all team activities. Some students refuse to answer, unable to give a precise and reasonable answer due to the diversity of scope and complexity of the team activities and the context in which they have been accomplished. The average of numerical values of answers given within the team is shown in Table 2 and can be used as an indicator of the team strength. On the base of the results teams must find the free riders and decide how to incorporate them.

Table 2. Results - question Q3

Team	Average Q3
Team 1.1	85%
Team 1.2	86.25%
Team 2.1	66.25%
Team 2.2	85.63%
Team 3.1	100%
Team 3.2	83.75%

Q4. What percentage of your team was fully prepared for all team activities of the project?

The goal of the question Q4 is to assess the percentage of members who are fully prepared for all team activities. This will outline how strong the kernel of the team is, comprising responsible students with appropriate knowledge, skills and experience, who can be considered as a main driving force. The average of numerical values of answers given within the team is shown in Table 3. The calculated values (except for Team 3.2) are too high to be realistic and we have doubts that the question is not understood and interpreted properly by the responders.

Table 3. Outcomes of the question 4

Team	Q4 - Average
Team 1.1	61.87%
Team 1.2	55.62%
Team 2.1	42.5%
Team 2.2	55%
Team 3.1	90%
Team 3.2	10%

Q5. Give one example of what went right on this project.

Q6. Give one example of what went wrong on this project.

These two questions concern overall evaluation on the work during the project.

As is shown in the left part of the Table 2, the most frequent answer is “Keep deadlines”. This reveals not only the fact that students realize its significance for the success of the project, but points also the effectiveness of the approach selected by the lecturer to assign lower grade in case of later submission.

The second top answer is “Successful submission of the project”, showing the satisfaction of the students that at the end ~~and~~ their efforts have been fruitful.

On the next position are two answers – “Good cooperation” and the more general one – “Good teamwork style”. Such recognition of the role of the teamwork can motivate students to try to improve it.

For the question 6 – “Give one example of what went wrong on this project”, the top answers comprise two examples of time management errors and one example for defects in deliverables. The later gives the idea lecturers to define more checks for the quality of deliverables, introducing some new forms, e.g. peer review.

Table 4. Q5 and Q6 answers

5. Give one example of what went right on this project.	# students	# teams	6. Give one example of what went wrong on this project.	# students	# teams
Successful submission of the project	7	5	Wrong task management	3	3
Working in a team	2	2	Last minute submission	6	4
Exchange relevant information and resources.	1	1	Bad tasks definition and assignment	4	4
Analysis of identified requirements	1	1	Working not in project scope	1	1
Peer review of work	1	1	Mistakes in planning	1	1
Keep deadlines	10	6	Defects in project deliverables	5	3
Good teamwork style	6	4	Time management errors	6	5
Good design skills	2	2	Bad communications within the team	2	2
Good communications	5	4	Unclear tasks definition	1	1
Good cooperation	6	5	Tasks reassignment	1	1
Effective meetings	5	5	Too many meetings	1	1
Enthusiasm and high motivation	1	1	Not enough meetings	1	1
Mutual help and support	3	3	Unsatisfied requirements	2	2
Learn from each other	2	2	Lack of help for unfinished tasks	1	1
Good tasks assignment	3	2	Not attending lectures	1	1
Work together to achieve the stated goals	1	1	Not enough control and peer review of the work	1	1
Feedback and listening	1	1	No tolerance in discussions	1	1
Opinion and work recognition	1	1	Not enough initiatives	1	1

Q7. Describe a specific practical skill you learned from the team that you probably would not have learned working alone.

The majority of the responses reveal typical issues of team work – listening to others, tolerance towards colleagues, hearing different viewpoint; agreeing with the groups’ opinion; expressing own opinion even when the group disagrees, distributing teamwork evenly, considering the emgagement of the team members. One student marks the ability to share tasks with others and after that – to merge all parts into one result.

A few students note technical difficulties, concerning specific elements of the assignments -, presenting all system functionality with use cases, domain modeling, diagram modeling.

Q8. Describe a theoretical concept (definition, model, method, etc.) you learned easier working on common team task.

Q9. Describe something (concept, model, practical skill, etc.) which the members of your team have learned from you and which they probably would not have learned otherwise.

Questions Q8 and Q9 identify specific topics, that students learn during the course. Both questions reveal major concepts, that are better understood in team work. Most concepts are noted in both answers – as better explained, and as better understood through team discussions.

Table 5. Q8 and Q9 answers

Q8 Describe a theoretical concept you learned easier working on common team task	# students	# teams	Q9 Describe something which the members of your team have learned from you and which they probably would not have learned otherwise	# students	# teams
Requirements specification for the project	1	1	Interview preparing	2	2
FURPS+	1	1	FURPS+	4	3
Use case model	7	3			
Use case description	2	2	Use case description	6	4
UC- fully dressed	4	4	UC- fully dressed	3	2
Domain model	14	4	Domain model	3	2
CD models	1	1			
Flow model	1	1	Flow model	1	1
Sequence model	1	1	Sequence model	3	2

			Artefact model	1	1
			Mockup structuring	1	1
			Usability defining	1	1
UML diagrams	5	4			
Sequence diagram	2	2			
			Class diagrams	1	1

It is interesting to mention that the most widely discussed concept is the Domain model. In spite of the target group consisting of students in their IS bachelor degree, the concept raises a lot of issues because of its complexity.

Q10. Which of your individual skills could be improved, so as to improve the overall teamwork during the next project?

Q11. What will you do differently on the next project taking into account the experience gained from this project?

The purpose of including the questions Q10 and Q11 in the questionnaire is to give the students a chance to make some suggestions for improvements on the base of their individual experience, gained during the project. We believe that the acquired knowledge will ensure higher motivation and realized ability to change for the better in the future.

The idea behind Q10 and Q11 is to provoke identification and reflection of some soft skills, influencing teamwork [5] [9]. Each student has to think about such skills and select those with great impact on teamwork, which are worth mentioning as significant.

Two students (20%) didn't answer these questions. There are some general answers as "to apply the best practices, mentioned in the answer of the Q5" and/or "to avoid the bad practices, mentioned in the answer of the Q6".

The questions Q10 and Q11 are free-answer questions – the respondents answer in their own words. So we receive a variety of answers, expressing different opinions about some constructive changes to be made in a next project. In order to summarize the answers of Q10 and Q11 in a systematic way, we adopt the classification of the soft skills, proposed in [1]. Together with pure soft skills we also consider many other things (e.g. activities, approaches, stated goals) which are related to the teamwork in projects. In this way all given answers can be described in the following three groups:

Personal:

Self-management, know-how for a particular task, efficiency of the individual work and contribution, preliminary research for each task, optimized performance, regular attendance of lectures, self-confidence, prompt decision making, trust and friendliness towards members of the team.

Situational:

Finishing tasks early enough to be evaluated, time management, an even workload distribution, joint work on tasks, better planning for tasks, ability to analyze the teamwork process so as to improve it, learning of the theoretical concepts necessary for accomplishment of the project tasks, improved performance through structuring data and handouts, asking for help and support in difficult situations, increased impact of the teamwork, proper goal setting, controlled requirements satisfaction, peer review as a part of internal task evaluation, selecting appropriate level of detail in communications, thoughtful evaluation before submission of the project deliverables.

Interpersonal:

More informal meetings to know each other better, responsiveness, listening to opinions of other team members, defending one's ideas and suggestions, better efforts coordination, explanation of the made decisions, clear communication among team members, giving examples to support proposals, conflict resolution, tolerance in disputes, leadership skills, patience and empathy in relationships within the team, open expression of opinions and ideas.

Each team can discuss this generalized version of the answers and decide how many and which of them will be chosen as objects for improvement during the continuation of the project.

4. Conclusion

In this paper an approach to teamwork assessment for projects in IS courses has been presented. A survey has been accomplished as a first step toward achieving the main goal: to teach students to appreciate the collaborative work and be efficient in it.

The survey seems to be useful for both students and lecturers.

Answering questions from the questionnaire, the students have the possibility to look upon teamwork from different points of view. Each student can create the awareness about the significance of the teamwork. The study helps in identification of some individual soft skills, which can be object for the improvement of a student's overall performance.

There are a number of benefits for lecturers, too. For some course topics, pointed out by students as more difficult and unclear, the lecturer could decide to change the content and style of their presentation, e.g. providing more handouts. In the course on project management some techniques for the enhancement of teamwork could be recommended.

We intend to continue tracing and evaluating teamwork and individual students' efforts during the second part of the projects. Each team will discuss the results of the study and decide what is worth being changed. At the end of the

projects the same teamwork assessment will be made in order to find if there are any positive results to be reported.

Acknowledgment. This paper is supported by Sofia University “St. Kliment Ohridski” SRF under Contract 80-10-143/2018.

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