

Opportunities and Challenges in Designing a Blended International Student Project Activity: Experiences from the EPIC Project

Mehmet Şükrü Kuran¹, Jens Myrup Pedersen², Natascha van Hattum-Janssen³, Josep Solé Pareta⁴

¹Department of Computer Engineering, Abdullah Gul University, Kayseri, Turkey

²Aalborg University, Aalborg, Denmark

³Saxion University of Applied Sciences, Enschede, Netherlands

⁴Universitat Politècnica de Catalunya, Barcelona, Spain

E-mails: sukru.kuran@agu.edu.tr, jens@es.aau.dk, n.vanhattum@saxion.nl, pareta@ac.upc.edu

Abstract—In this paper we explain our experiences and observations on a blended international teaching/training student project activity designed for students of different academic levels and programs at different universities working together on a project given by an industrial partner. This project activity is designed based on the EPIC project, funded by the Erasmus+ programme of the European Commission, which aims to provide a framework for carrying out multi-cultural and multi-disciplinary student projects for increasing employability in an international job market.

I. INTRODUCTION

In most bachelor and masters level programs, there is a student project (or problem based student project) course in which the students are asked to work on a project for an extended period of time (e.g., a thesis course). To increase student employability at the end of the program in the relevant field of industry, universities prefer to collaborate with companies on these student project courses (including thesis courses) and offer projects given by industry partners. In the last couple of decades, with the increasing internationalization and multi-disciplinary aspects of the industry, companies require their employees to be able to work efficiently in multi-cultural and multi-disciplinary teams. Also, in the recent years collaboration increasingly become more based on online platforms and physical distance is becoming less relevant. To address these new requirements, universities seek new methods on how to integrate these new opportunities and challenges to their student projects.

The EPIC project, funded by the Erasmus+ programme of the European Commission, aims to design and implement a joint student project activity framework, with both classical and online teaching components, that addresses this question on how to design a course that helps students experience a multi-cultural and multi-disciplinary environment in a project work [1]. The resulting framework will be publicly available that can be replicated by other institutions or consortiums. The project consortium is composed of eight partner universities each from a different country in Europe and two industry partners. The project is inspired by the COLIBRI project,

which demonstrated that both students, teachers, and companies find the international and cross-disciplinary collaboration on project work very crucial [2]. EPIC is offered based on existing curricula, thus not requiring hand-held solutions, dispensations or dedicated study regulations.

In the project, students from different countries, studying at different levels (either bachelor or master) on different programs are given a project from a company having different components (e.g., technical and business components). Each project is mainly supervised by one industry supervisor and one overall academic supervisor. Additionally, local academic supervisors from each participating university also assist the supervision task. Based on the initial requirements, the students are expected to learn how to work together throughout a semester in such a multi-cultural and multi-disciplinary environment while delivering the requirements given by the company as well as their respective universities.

Our course is mainly divided in three parts: project selection, project seminar, and online project work (Fig. 1). In the project selection part, projects are designed based on the requirements of the companies and the learning objectives of the potential participating students. Each project must require a team consisting of students from at least two universities preferably from at least two fields. Then, based on their technical expertise one instructor from the academic partners in the consortium is selected as the academical supervisor of the projects. Next, students are offered these projects and shortlist a couple of them based on their preferences and aptitudes. Finally, based on these preferences and aptitudes, each student is assigned to a project.

The second part of the course is a physical seminar which is hosted by one of the university partners in which students get together with their team members and supervisors and work on their project as well as learn how to effectively collaborate with each other via workshops and lectures for one week. Here, they are expected to address both the technical aspects of their given project topic as well as the requirements of their respective local student projects. In most cases, each university has its own formal requirements, ECTS values,

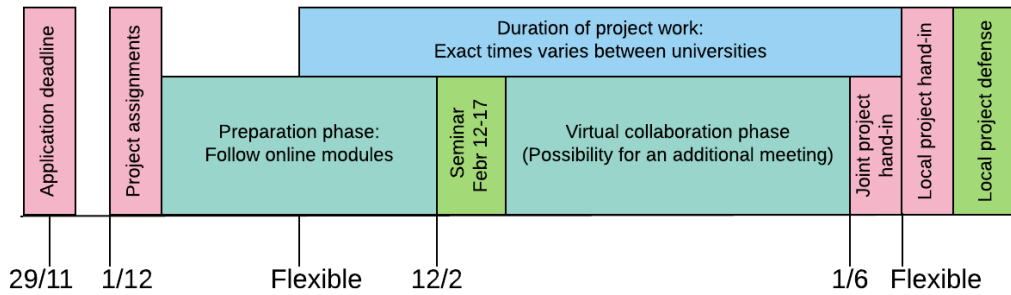


Fig. 1. Diagram of the yearly EPIC cycle consisting of the three parts: project selection, project seminar, and online project work

TABLE I
PROJECTS AND PROJECT TEAMS IN EPIC, CYCLE 1

Project Name	Category	Team Size	Member Programs	Member Levels
E-commerce	Academic	3	BA	M.S.
Facility Management	Industry	3	IT, BA	Mixed
Logistics 4.0	Industry	2	IT, BA	Mixed
Energy Dashboard	Industry	3	IT	B.Sc.
HoneyJar	Industry	9	IT, BA	B.Sc.
App for Funding Research	Industry	2	IT	B.Sc.
Security in IoT	Academic	3	BA	M.S.

project selection deadlines, project submission deadlines, and grading policies. Students and supervisors are expected to lay out all these requirements and design a work plan that is suitable for all institutions involved in the project. For the collaboration component of the student projects, they define some metrics for evaluating their collaboration at the end of the online project work as online collaboration metrics and international collaboration metrics.

After the project seminar, each student returns to his/her local institution and carry out the project in the online project work part of the course based on the work plan and collaboration metrics decided upon during the project seminar. They are required to have at least three milestones in which they show their progress both to the business and academic supervisors of their project.

In 2018, as the first year of the EPIC project, the project seminar took place in Riga, Latvia hosted by Riga Technical University. We worked with a total of 25 students coming from partner universities working in 10 different projects. In most of these 10 projects, the students and supervisors worked with very different challenges. In this paper, we will explain the various challenges we have faced throughout the project seminar and the methods we have used to accommodate these differences as a framework for carrying out such international student projects.

II. OFFERED PROJECTS AND THE COMPOSITION OF THE STUDENT BODY

In the beginning of the first cycle of the EPIC project, a total of 18 projects have been proposed, mostly by companies while

some are proposed by the academic partners. Each project has some position definitions for required program of the student and academic level (e.g., one B.Sc. level computer scientist and two M.S. level business administrators). By checking the project description and positions, the students prioritized their choices and turn in their priorities. Afterwards, we allocate students based on their priorities so that each selected project has at least two students working for it regardless of the total number of positions expected in each project. This year, based on this information only 7 out of 18 potential projects are chosen. Among these seven projects, three of them are composed of all B.Sc. level students, two of them are composed of all M.S. students, and two of them composed of a mixture of B.Sc. and M.S. level students. As for the programs of the students we have mainly two groups of students: IT students (e.g., students from Computer Science, Information Technologies, or similar programs) and Business students (e.g., students from Business Administration, Business Informatics, Innovation, or similar programs). Two groups are composed of only IT students and one group is composed of only BA students. The remaining four groups are composed of students from both IT and BA groups.

In terms of topics, all potential projects are grouped into three main themes: Security, Data Management, and Industry 4.0. Based on the students' options, two projects in the Security category, two projects in the Data Management category, and three projects in the Industry 4.0 category have been selected to be worked on this year.

As for the size of the project groups, eight groups are composed of two to three students. On the other hand, the seventh



Fig. 2. Main steps of developing the on-line project work plan during the project seminar

project group is composed of nine students from four different universities. This seventh group, the HoneyJar project, is one of the most challenging groups in the first cycle of the EPIC project mainly due to its size. Based on the discussions among the team members during the project seminar in Riga, the group is divided into four subgroups having distinct goals, clear dependency relations, and responsibilities.

III. CHALLENGES OF AND OBSERVATIONS FROM THE PROJECT SEMINAR PART

After the first part of the EPIC cycle, in the second part students and the advisors convened at a single physical location (i.e., Riga, Latvia) to kick-off the project work. In this step, the students worked on understanding the project as a whole, learning the skill sets of each other, exchanging their individual takes on the project, and develop a single work plan which is agreed upon by all the parties involved. Additionally, they defined metrics to evaluate their collaboration at the end of the project work, both the international and the on-line aspect.

The first task was to understand the subject of the project. In most cases, the project groups had extended open discussions with the industrial and academic advisors of the project in which they try to understand the concrete components required from them in the project. Note that in the EPIC project, the responsibility of the advisors are not limited to the technical aspects of the project but also facilitating the collaboration process in the project. Initially, they look at the project from their own perspectives and try to form up well-defined steps. Then, they talk over these steps as a group in which students from different programs and backgrounds gave specialized inputs on steps related to their topics (e.g., IT students talk about the technical aspects and BA students talk about business aspects). Here we also observe that due to different curriculum and education traditions, students from the same technical field coming from different universities may also have differing opinions on how to approach a given problem. In the project seminar, students have the opportunity to observe these differences and understand the strengths and weaknesses of their local education methodologies as well as how to work with people having different education traditions (Fig. 2).

After laying out the project as a whole, students have some team building activities, workshops, and open discussions to help them explain their past courses, project works, work experiences, and research activities to each other. By these activities they learn the skill set of each individual team member as well as the total skill set of the whole project group. We observe that understanding such individual skill

sets of each other happens much easier if the team members have a physical meeting together. They also experience the potential conflict sources that can arise during a joint work by observing the physical gestures, body language, timeliness, discussion behavior of each other.

Although the EPIC project activity is a singular joint project work, to accommodate different curriculum, rules, and regulations of each institution and programs; it is linked to a learning activity (i.e., usually a project based course) in each local institution. After talking about the skill sets and see the project as a whole, the students are asked to lay out their local requirements and expectations from the joint project work such as the ECTS credits, start/end dates, and technical requirements of the linked local learning activity. In some project groups, ECTS values have been used to quantify the comparative required amount of contribution from each team member (e.g., considering a two-person team a student having a 8 ECTS local linked learning activity should be responsible from 1/3 more work from a team member whose local learning activity only worths 6 ECTS). In groups composed of only M.S. students the local thesis defense requirements are also discussed at this step. Based on this requirements, projects can be extended to accommodate additional components while not straying far from the initial project requirement.

In the next step, the students combine the overall look, individual skill sets, and local expectations to form a well-defined work plan. To this end, we conducted a workshop on Agile development methodology which is a very common project development methodology used in various fields of industries as an example methodology that they can follow in forming their work plans. In our previous project, the COLIBRI project, we observe that web-based collaboration tools are especially important to manage a project developed via virtual collaboration. To standardize the tools used by the project groups we also provide two on-line collaboration tools to the students: a private Git-based repository manager (i.e., a GitLab page) and a private messaging system linked to the repository manager (i.e., Mattermost) and suggest students to utilize these tools when necessary. As part of the work plan, the students are asked to define at least three milestones in which they will present some parts of the project to the advisors.

Lastly, students are asked to come up with several metrics to evaluate their collaboration in the project in two dimensions: the on-line dimension and the international dimension. These metrics will be used at the end of the project to judge these two dimensions of the on-line project work. Since each project have different requirements and technical/business aspects, we

decided to set up different metrics for each project. Moreover, having personalized metrics for each group let the groups internalize these metrics which will in turn increase their motivation in achieving a high level of collaboration during the project work.

The selected on-line collaboration metrics of each project can be aggregated as:

- Tasks completion
- Delivering of tasks on time
- Utilization of the on-line collaboration tools (i.e., GitLab and Mattermost)
- Proactivity in contribution
- Participation and punctuality at meetings
- Git commit counts
- Informing team members on unexpected issues on time
- Having an open-connection mentality about problems
- Reviewing/Commenting on teammates' contributions

These metrics show that students mainly consider utilization of collaboration tools, proper meeting ethics, reviewing each other's work, and proactivity as key on-line collaboration metrics.

On the other hand, the selected international collaboration metrics of each project can be aggregated as:

- Proper use of English (written and oral)
- Identification and respecting cultural differences
- Using the available expertise at EPIC partners
- Ability to manage conflicts and having a resolution-oriented mentality
- Keeping individual deadlines in line with the overall project timetable
- Overall reliability
- Scheduling and organization
- Sharing resources to complement members

Here we see that students greatly value a proper use of the common language, identification and respect towards cultural differences, and utilization of the knowledge at each EPIC partner institution. Additionally, in handling conflicts students tend to prefer a resolution-oriented mentality than having exhaustive discussions on each conflict. Last but not least, a high perceived reliability is also considered to be a very important aspect in evaluating the international collaboration.

IV. CONCLUSION

In this paper, we explained the course structure of the EPIC project (funded by the Erasmus+ programme of the European Commission), underline some key challenges, and our observations on resolving these challenges in such an multi-disciplinary international student project activity. According to our observations, correct selection of on-line collaboration tools and having a clear system in developing a work plan are crucial components in setting-up a successful on-line project with both multi-disciplinary and international elements. We will continue to systematically evaluate the different components of both the physical and virtual collaboration based on both the student-selected metrics and our own metrics.

Based on these evaluations, we will continue the EPIC student project activity in the upcoming two years by improving upon the methodology and coming up with an easy-to-follow and easy-to-replicate framework for such project-based student activities.

REFERENCES

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- [2] COLIBRI project, colibri.rz.tuhh.de. 2017