THE USE OF EDUSCRUM METHODOLOGY IN THE SOCIALLY-ORIENTED PROJECTS

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ABSTRACT

For the Bachelor's degree in engineering, field project activities are the key component of the curriculum. Incorporation of project activities facilitates an increase in the effectiveness of mastering the educational program. The Project-Based-Learning (PBL) provides a means for faster adaptation of students to future professional activities. We have discovered, that involving students in the realization of IT-technological socially-oriented projects allows high effectiveness in the realization of all four CDIO initiative provisions – Conceive, Design, Implement, Operate. It was brought to light that when realizing socially-oriented projects, if the project team consists of not only IT-developing students but also humanitarian fields' students, project activity's effectiveness and quality of the final product substantially increase. Approbation of interdisciplinary socially-oriented projects' realization was carried out. Achievable positive effects of their realization were established. The creation of the «PetSearch» system that helps find lost pets was one of the most successful projects. The effectiveness of the influence of project activities on the increase in motivation and academic performance was evaluated.

KEYWORDS

Team project activities, EduScrum, Socially-oriented projects, Standards 1, 3, 5, 7

INTRODUCTION

One of the main provisions of the CDIO initiative is the intensive use of project-based learning (Crawley E. F., Malmqvist J., Östlund S., Brodeur D. R., & Edström K., 2014). The emphasis is put on team project activities. In accordance with Standards 1, 3, 5, and 7 of the CDIO initiative Surgut State University has incorporated intensive use of project-based learning into the educational programs.

The involvement of students in the implementation of socially-oriented projects in the field of IT technologies ensures high effectiveness for the realization of the CDIO initiative's all four stages - Conceive Design Implement Operate. In any average IT project, the first three stages are successfully implemented. The fourth is often poorly implemented. But solving socially-oriented problems significantly increase the motivation of students to operate and maintain the product. Thus, it becomes possible to fully implement the fourth stage.

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ORGANIZATION OF PROJECT-BASED LEARNING

Project-based learning is the core component of the curriculum and is carried out throughout all eight semesters of the Bachelor's degree program. Implementation of project activities promotes an increase in the effectiveness of mastering the educational program. For students, the Project-Based-Learning (PBL) lays the foundation of system approach in Education and further professional activities (Rebrin O, Sholina I., & Berestova S., 2014). Effectiveness of students' motivation to learn the subject field by involvement in the project activities is supported by real experience (Siong, G., & Thow, V. S., 2017), (Nguyen-Xuan, H., & Sato, K., 2018).

In Surgut State University, for students studying in the field of "Software Engineering," the organization of project activities based on the EduScrum methodology is practiced. The provisions of EduScrum are detailed in the literature(Delhij, A., van Solingen, R., & Wijnands, W., 2015), (Wijnands W., & Stolze A., 2019). This methodology is a further development of Scrum (Sutherland, 2014), adapted for the education system. A positive experience of using Scrum and EduScrum in a number of universities - members of the CDIO initiative was noted (Ferreira, E. P, & Martins, A., 2016), (Paul, R., & Behjat, L., 2019).

Independently students organize teams consisting of 3-6 people and set a theme for the project in creating a certain socially valuable software product. Students are not restricted in the choice of theme, but there is a condition, that as the result of the project, there should be working socially beneficial software product. This circumstance provides freedom in choosing the theme and the team members. There is no aim to integrate programming results of various teams into one system. A prerequisite is the completion of the project within one semester. The semester time interval is divided into four sprints. Each sprint corresponds to one of the stages of the CDIO project activity (Standard°1). The duration of sprints varies from 2 weeks to 1.5 months.

Sprint «Conceive»

Within the stage of project activities' initiation, the primary distribution of roles is made. Role - Scrum Master is assigned to a teacher, who is the project supervisor. It was brought to light that when realizing socially-oriented projects, if the project team consists of not only IT-developing students but also humanitarian and socio-economical fields' students, project activity's effectiveness and quality of the final product substantially increase (Standard°7). They are more familiar with areas requiring the support of IT-technologies. They are involved as problem analysts or marketers. At the Conceive stage, this combination allows us to quickly identify urgent tasks for creating socially-oriented IT systems.

Sprint «Design»

At the Design stage, the final formation of Scrum teams takes place. The Product Owner role is assigned to the student leader of the team. As a rule, this is an IT field student. Remaining team members are assigned the necessary functional roles. Teams independently choose the means and technologies for project task implementation. Team members responsible for the "psychological" and communicative component of the project establish requirements and restrictions for the informational and technical parts of the project. IT field students offer options for implementing the set tasks. At the same time, they are focused on the maximum use of advanced IT technologies.

Sprint «Implement»

Within this sprint, the concepts developed at the previous stage are implemented. The coding of the software components is carried out. At weekly team meetings, the effectiveness of the work performed is analyzed. The achieved functionality, usability, and user-friendliness of the interface are evaluated. Assembly of project components is carried out. The assembled components are tested periodically. Significant attention is paid to the implementation of man-machine interaction. The result of this sprint is a fully functional system prototype.

Sprint «Operate»

A significant advantage of socially-oriented IT projects is the possibility of testing them in operation. As part of the Operate phase, at least the test operation of the resulting project solution is performed. The project team has the ability to receive feedback from the real system users. The information collected allows for making adjustments to the project. In some cases, there is a need to critically rethink project decisions or concepts. The task of maintaining an IT system can be set independently.

Projects in the IT industry have an extremely broad focus. Modern industrial enterprises and businesses are implementing a lot of industrially focused IT projects. They allow optimization of technological and information processes. They also allow the creation of analytical and forecasting systems. At the same time, the quantity of another group of projects is large, and it includes socially-oriented IT applications. Due to specific requirements and implementation features, projects of the industrially oriented group are difficult for students. Involving students into socially-oriented projects' implementation allows more efficient construction of the learning process. Projects of this orientation are well limited in time and permit passing through all the CDIO stages.

EXAMPLE OF TESTING OF SOCIALLY-ORIENTED PROJECTS

The above-mentioned approach to the project activities organization was successfully tested. The "PetSearch" Pet Registration, Search, and Tracking System was one of the most successful projects. The problem of finding lost pets is very relevant around the world. The loss of a pet leads to the significant emotional stress of both owners and lost animals.

At the Conceive stage, a project team was formed. It includes five second-year students. One student is enrolled in the "Management" program, and four other students are enrolled in the "Software Engineering" program. At this stage, the team conducts pre-design studies. In the course of the research, analysis of the demand for this system was performed. As a result, the project mission was presented, as shown in Figure 1.

During the Design stage, team members assigned roles. The leader of the team, Product owner, has been assigned the DevOps consultant functionality. Team members received roles:
- Marketer;
- JS developer;
- PHP developer;
- Designer;
- Layout designer.

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Figure 1. The project mission.

The Marketing Specialist role was assigned to the student enrolled in the "Management" program. The remaining roles were distributed among students in the field of "Software Engineering." Students chose approaches and technologies for project implementation. The marketer determined the target consumer. The most friendly format of communication with the consumer was proposed. IT field students considered various options for implementing the system. The team thought through and developed the ideology of the system. A system architecture consisting of four components was proposed:

- Controller - main system component. He is engaged in processing user requests, referring to Model to get data from Database (DB), and to view, for graphical presentation of content to the user.
- Model - is a set of methods that allow you to "communicate" with Database: request and receive the result based on the parameters transmitted by Controller.
- View - based on the data transmitted by Controller and received through Model, it forms a graphical representation of the content that will be presented to the user.
- Database – data storage about the owners and their pets.

Database management system was selected. Formats of interaction between components and applications are presented. Exchange protocols were proposed. User interface was developed. The accepted version of the architecture for the WEB application is presented in Figure 2.
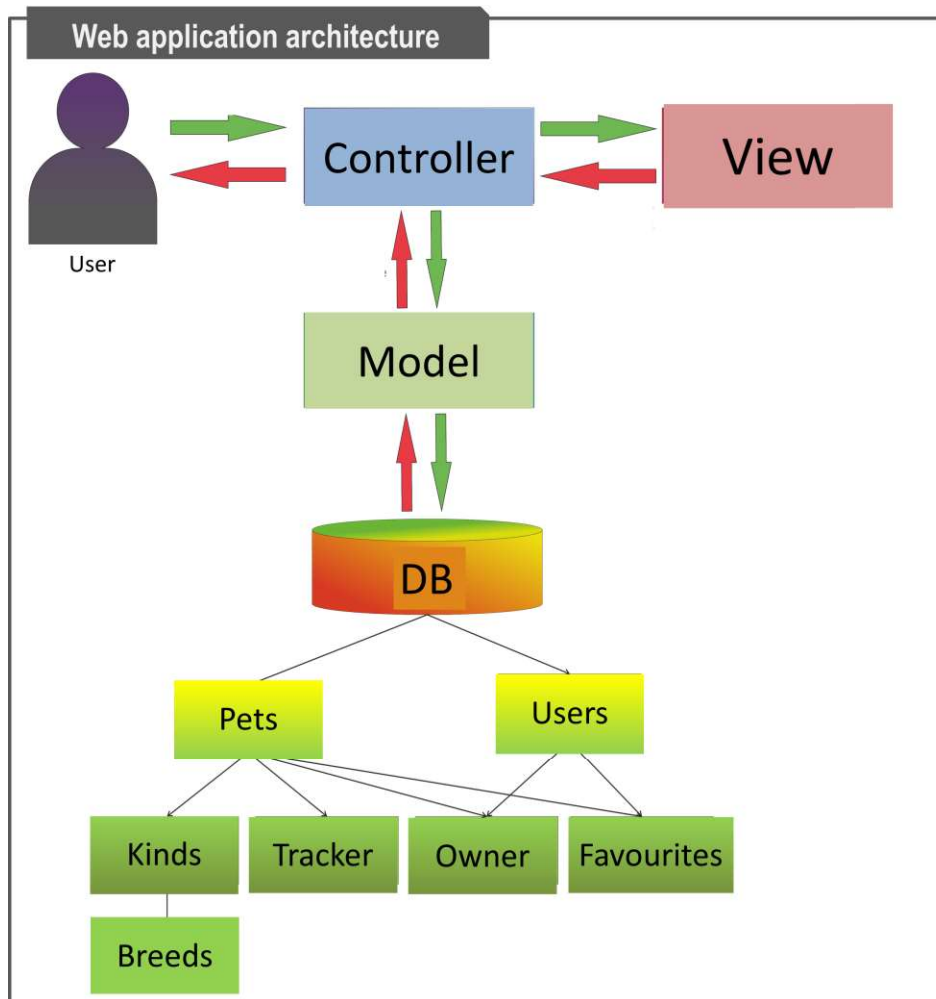
Figure 2. The Web application architecture.

During the **Implement** phase, the code of the software components was written. The installation of the project components was carried out. During the installation, regular testing of components' operational integrity of was held. Fragments of the prototype system's user interface are presented in Figure 3.

As part of the Sprint **Operate**, the whole system was tested. Team members registered 10 test users and their pets in the system. Ten carriers of the QR code were made for them. The QR code tablets were delivered to various areas of the city and scanned. The search engine has successfully discovered all the scanning processes.

The successful testing experience allowed putting the system into test operation mode. Pet owners are encouraged to register with PetSearch and purchase collars with a unique QR code. Currently, more than 20 pets and their owners are registered in the system. Anybody who meets a pet with such a collar just needs to scan a QR code and send it to the system. The project team is able to receive feedback from real system users. The task of maintaining an IT system can be set independently.
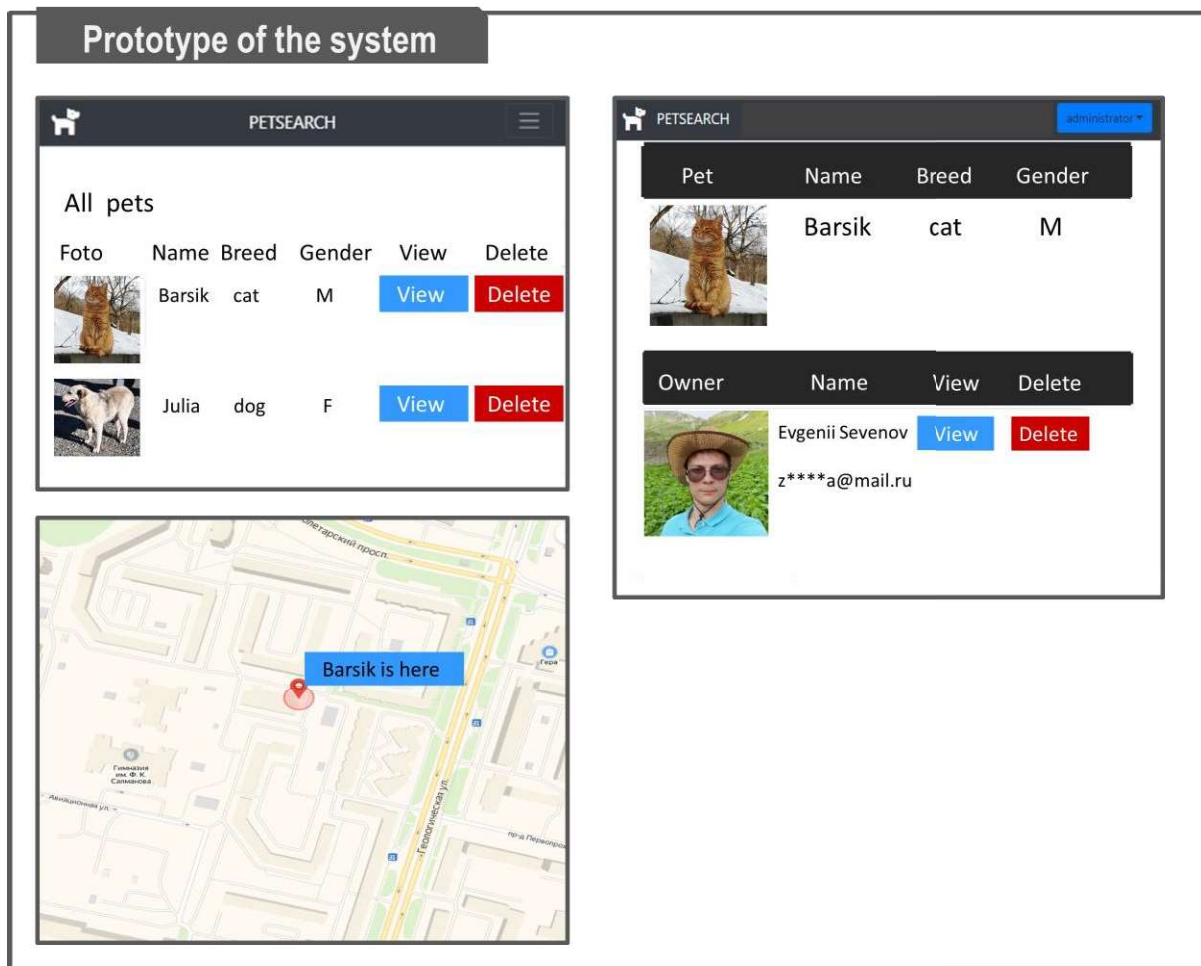
Figure 3. A prototype of the user interface of the pet search system.

It should be noted that the combination of the eduScrum methodology with the ideology of CDIO design activities gives a positive synergistic effect. Most of all, it manifests itself in the Operate stage. When detecting various kinds of malfunctions in the system operation, the source of the error is determined in a short time. A prerequisite for this is the distribution of role competencies that was performed at the Conceive stage. The effect is evaluated in comparison with similar projects completed earlier without the use of eduScrum methodological technology. The project has aroused interest among representatives of student entrepreneurship as a promising business project.

PERSPECTIVE PROJECTS

Successful experience in the implementation of the "PetSearch" project was developed in the following projects. In addition to the described project, there are a number of socially-oriented IT projects in work. Sprint Conceive of the "Psychological Consultant" and "Volunteer" projects have now begun.

Project "Psychological Consultant"

During the pre-project study, it was revealed that in Russia, the level of public awareness of the psychological assistance services' activities and psychologists in general, needs to be improved. Moreover, there are those who do not even know about their existence. It is believed that healthy people do not need help. That this is only a show of weakness - you need to pull yourself together and stop being nervous. Many people are afraid to seek help because of public opinion, some stereotypes, or because of general misunderstanding/ignorance. Attempts at introspection often lead to destructive dependencies. Recently, a big problem is the romanticization of mental disorders or the perception of them as some kind of additional resource (especially by adolescents).

In view of the above-mentioned reasons, came the idea of developing an information system that supports three activity areas:
1. Development of psychological services within the university.
2. Improving public awareness about the work of psychologists, psychological services (about what they work with) and psychological problems *
3. Informing the public about emergency help methods (for example, during panic attacks).
The project also intends to focus on the problems of autism spectrum disorders.

Currently, at the Conceive stage, a team consisting of third-year students is formed. Two students are enrolled in the "Clinical psychology" program and two students in the "Software engineering" program. A survey of students was conducted, and a bundle of the most relevant, for them, topics of psychological consultations were identified.

Project "Volunteer"

The project is dedicated to the development of a mobile service. There are many people who sometimes need help. For example, elderly and disabled, people with limited mobility, etc. They often encounter restrictions of the urban environment to special needs, especially in winter, and experience difficulties in resolving everyday issues. The service uses geolocation data to quickly find volunteers nearby who are ready to help. It is enough for a person who needs help to click the icon on the screen of his smartphone, and the volunteers who are nearby will receive a signal. If necessary, the call may be accompanied by an explanatory text, image, video, or voice message.

CONCLUSIONS

This paper presents the practical results of the socially-oriented IT project implementation. The need to solve social problems using modern IT technologies stimulates the necessity for a combination of interdisciplinary competencies. The objectives of such projects make it appropriate and effective to include students of various study areas in the project team. Involving students of humanitarian and IT fields in the project team allows the creation of software products demanded by our society. Students of the humanitarian field effectively conduct surveys of society demands. They have knowledge of psychology and rules of interpersonal interaction. They can form information presentation formats. IT field students get the opportunity to apply their competencies in the field of modern technologies to solve socially important problems. The implementation of a specific project necessitates the search for the best solution. In this case, students are not limited to the first solution received. They learn

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how to optimize design decisions, taking into account the experience of the actual operation of the product.

The use of the eduScrum methodology allows students to efficiently build project implementation paths. The experience of limiting sprints to CDIO stages allowed us to improve the structuring of project processes. It lets students understand more fully the purpose and features of the stages. It has been confirmed that involving students in the implementation of socially-oriented projects in the field of IT technologies allows the implementation of all four stages (Conceive Design Implement Operate) of the CDIO initiative with a high degree of efficiency. In any average IT project, the first three stages are successfully implemented. The fourth is often poorly implemented. But solving socially-oriented problems significantly increase the motivation of students to operate and maintain the product. Compared to abstract educational projects, solving real socially-oriented problems significantly increases students' motivation to operate and maintain the product. The role distribution at the Conceive stage in accordance with the eduScrum methodology, made it possible to effectively separate competencies and problem areas. This approach has been beneficial in the Operate stage. When problems in operation are detected, role differentiation makes it possible to eliminate the root cause of the error in a short time. Thus, it becomes possible to fully implement the fourth stage.

Gained positive experience in implementing socially-oriented IT projects allows us to expand the scope of such projects. Teachers, together with students, compiled a pool of topics, the implementation of which is planned in the near future.

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