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EVALUATION OF COMPUTER SCIENCE STUDENTS' WORK ON IT PROJECTS BASED ON QUANTIZATION OF PROFESSIONAL ACTIVITY

Abstract. The article examines the process of evaluating work on IT projects, which is presented systematically and multidimensionally, as a reflective and analytical toolkit. The research was conducted on the basis of the application of a system of humanitarian, psychophysiological, anthropological and informational methods and approaches, where the application of the theory of functional systems and

through methodological and value understanding of pedagogical and production experiences and practices are decisive.

This work updates the methodological potential of the idea of professionalization, in particular, a specialist in computer specialties, pedagogical anthropology and the theory of functional systems, including the concept of quantization of mental activity, which is interpreted as quantization of professional activity. A decisive methodological and practical-technological factor, which is a prerequisite for considering the evaluation process as a reflective and analytical toolkit, is the systematic quantization of professional activity, which is implemented on the basis of the use of the methodologies of Kanban, Agile methodologies, in particular, Scrum, "Manifesto for Agile Software Development". The research used Information technologies: Jira Software, in particular the Kanban template, Agile tools for Kanban, Agile tools for Scrum. Current strategies for quantifying professional activity when working on IT projects are: Epic; Story; Task; Sub-Task; part of the Story/Task; Bug; Sprint.

Students were divided into small groups that worked on IT projects. In the process of project activity, they performed the following roles: Engineer, Scrum Master, Product Owner, Tech Lead.

The evaluation presented in the specified system format is a significant component of the result-target basis of work on IT projects, and is also considered as a tool of innovative activity and a prerequisite for personal and professional development and professional communication.

In further research, it is planned to develop the problems of professional activity for work on IT projects, which includes the study of motivational, value, cognitive, operational, reflective, components, as well as the use of quantization in pedagogical research on the professional training of students of computer specialties. The results of this study are planned to be applied to improve the qualifications of information technology specialists in the conditions of postgraduate education.

Key words: methodology, pedagogy, quantization of professional activity, information technology specialists, students of computer specialties, computer science students, IT projects, Jira Software, Kanban, Agile, Scrum.

1. INTRODUCTION

Statement of the problem. The currently existing practical and technological difficulties in working on IT projects determine the possibility of considering it as a special professional-intellectual and social-intellectual practice with a high level of its technology [1; 2; 3; 4]. Among the professional and personal-professional factors that determine the indicated difficulties as significant, there is the need to:

- in the synchronization and coordination of tasks;
- in effective problematization and definition, specification and adjustment of tasks in the process of their implementation;
- in calculating and understanding the importance of time resources;
- in the ability of specialists to holistic and integrative visions of the problem being solved.

In order to solve the specified difficulties in the implementation of work on IT projects through the above-mentioned professional-activity and personal-professional factors, the application of the Scrum methodology is relevant.

A decisive systemic aspect of work on IT projects is the need for effective evaluation of both the final development result and intermediate stages and the activity itself as a whole, including its innovative focus. The process of evaluating students' work on IT projects is traditionally understood as a formal and relatively simple procedure for analyzing the results obtained. With a systematic and detailed understanding of the phenomenology of evaluating the results (including intermediate) of students' work on IT projects, it is determined that the indicated process is complex and multidimensional, as well as pedagogically, organizationally, and system-organizingly significant. In this way, we consider the effective assessment of work on IT projects systematically and functionally, namely as a professional-active, organizational-reflective and pedagogical condition, which largely determines: the effectiveness of the work; the possibility of its modifications, adaptation and improvement; typical and exclusive ways of identifying errors and their correction; approaches and understanding to algorithmization and technologization of activity; effective time management; actualization of creative and intellectual and social-communicative potential of project participants; development of professional reflection.

With a system-oriented consideration of the assessment procedure, it can be presented not only as a special production stage, but also, as noted above, in the format of a pedagogical environment and as a reflexive-analytical toolkit (or technology). Accordingly, evaluation, in addition to the implementation of the project's immediate goals, can be aimed at improving the professional, educational, communicative and innovative components of work on IT projects, as well as at the relative personal and professional development of their participants.

In the scientific pedagogical literature, the problem of considering evaluation as a specific reflective and analytical toolkit (or technology) when working on IT projects is insufficiently covered. The specified problem is insufficiently disclosed on the basis of the application of modern neuropedagogical and psychophysiological teachings, in particular the theory of functional systems, which holistically and systematically reveals the nature of human activity as such, which can be presented and, to a certain extent, formalized and constructed in the format of quanta of actions, quanta of behavior, quanta "motivations and needs", relative to autonomous professionally oriented cognitive systems. The specified problematization, together with a pedagogical and valuable understanding of the significance of this problem for the development of IT competences, as well as for the optimization and improvement of work on IT projects, including educational, production and innovative components, determines the possibility of presenting the specified problem as relevant.

Analysis of the latest studies and publications. Project-based learning in modern conditions of the formation and development of information technologies is the object of research by many scientists.

Authors Rahman T., Nwokeji J., Matovu R. and Frezza S. investigated Project-Based Learning (PjBL) from the perspective of active learning [5]. Their search vector was directed specifically at Industry Standard Tools and Practices (IST&Ps) [5]. To this end, they used industry standard tools and practices (IST&Ps) such as SQL, Atlassian Jira, GitHub, Jenkins and planning poker [5]. Based on the preliminary results of qualitative and quantitative data analysis, it was concluded that IST&P significantly positively affects the effectiveness of teaching and student engagement [5].

Havazik O. and Pavlickova P. studied the issue of creating a flexible game to teach students about IT project management in Jira [6]. The game was created primarily for computer science students, as it is important for them to learn a flexible approach to IT project management and work with appropriate software tools [6]. The authors proved that a better version of the game based on the flexible approach is the version using the Scrum framework [6].

In order to effectively manage postgraduate students' theses in the general field of engineering, scientists Sarhadi P., Naeem W., Fraser K. and Wilson D. developed a V-shaped model for effective thesis creation [7]. They used the Scrum methodology and team software development tools Jira, Microsoft Teams and Git version control (Github website) [7]. The scientists proved that the approach developed by them contributed to more effective management of student scientific works [7].

The focus of research of many scientists is aimed at studying the possibilities of managing the educational process of students of IT specialties, in particular, using Atlassian Jira. These questions were considered by Boye T., Cheng E., Gan W., Miluniec A., Szmidi T., Białczyk K., Miciuła I., Kauppinen R., Lagstedt A. Lindstedt J. Rainio O., Hamer S., Quesada-Lopez C. and Jenkins M. [8; 9; 10; 11]. In the process of research, scientists made conclusions that this approach contributes to [8; 9; 10; 11]: effective remote project management; development of students' skills in IT project management; development of students' skills in using Atlassian Jira; more flexible and effective management of information communications and/or requests in large groups of students.

Babič F., Gašpar V. and Satala, P. new trends in mobile technology education in Slovakia are identified [12]. They developed the concept of teaching mobile technology development based on the application of the software development life cycle [12]. Students of the "Business Informatics" study program of the Technical University of Košice were taught software development life cycle methods such as waterfall and Scrum as an Agile methodology [12]. Researchers taught students the main stages of IT project development [12]: design with user experience; development based on modern trends; testing; deployment based on tracking system; monetization; licensing. The researchers improved the level of readiness of students to implement IT projects by simulating the working environment in IT companies using YouTrack, JIRA, Slack or Sli.do tools.

Despite the existing achievements of Project-based learning using Atlassian Jira based on Kanban, Agile, in particular, Scrum methods, many issues remain unexplored. In particular, the issue of evaluating the work of computer science students on IT projects based on the quantization of professional activity.

The purpose of the study. On the basis of the methodological and value understanding of the process of evaluation and analysis of relevant production and educational experiences of computer science students working on IT projects, represent it as a system reflective and analytical toolkit.

2. THEORETICAL BASIS OF THE STUDY

The methodological basis of this study is represented by a system of theories, ideas and concepts, among which the competence paradigm and ideas are decisive: goal setting, professional reflection, professionalization, humanization, anthropologization by K. Ushinsky [13], development of professional subjectivity, pedagogical integration, systematicity, self-actualization, self-realization, knowledge transfer (Nonaka) [14], Aristotle's telos [15]. As system-organizing disciplinary directions, the methodological potential of the innovative paradigm, pedagogical psychophysiology, neuropedagogy, neuropsychology, pedagogical anthropology and the theory of functional systems has been updated [4]. As a methodological and conceptual toolkit, the concept of quantization of mental activity, developed within the framework of the theory of functional systems and presented in this work in the format of quantization of professional activity, is applied.

The research uses a system of specific concepts and methods that are used when working with IT projects: Kanban, Agile methodologies, in particular, Scrum, "Manifesto for Agile Software Development" [16; 17]: Epic; Story; Task; Sub-Task; part of the Story/Task; Bug; Sprint.

Mathematical and informatic methods of intelligent data analysis were applied.

3. RESEARCH METHODS

The research used a system of humanitarian and general scientific methods and approaches, among which the main ones are: competence, system, target, teleological, functional, resource, temporal, neuropedagogical, psychophysiological, axiological, transdisciplinary, anthropological, humanistic, communicative, reflective, innovative.

In this work, the methodological potential of the idea of professionalization, in particular of a specialist in computer specialties, pedagogical anthropology and the theory of functional systems, is updated, including the concept of quantization of mental activity, which is interpreted as quantization of professional activity.

The leading IT methods in this study are the Kanban method, Agile method [16], in particular, Scrum.

Among the Information technologies and mathematical methods used in the study: Atlassian Jira Software [17], in particular the Kanban template, Agile tools for Kanban, Agile tools for Scrum; statistical methods, methods of system analysis, methods of mathematical modeling, analysis and synthesis; data visualization methods.

For the research, we used Issue type data that the team members had in the process of working on projects, obtained from the Jira Software (Table 1).

Table 1

Issue type data

№	Issue Type	Priority	Estimate (Story Points)	Key	Status	Created	Resolved	Updated
1	Story	Medium	5	STP-341	Closed	01.03.2022 11:15	22.03.2022 12:01	22.03.2022 12:01
2	Story	Medium	1	STP-333	Closed	17.01.2022 15:16	12.02.2022 9:36	12.02.2022 9:36
3	Story	Medium	5	STP-355	Closed	22.01.2022 13:50	13.02.2022 9:33	13.02.2022 9:33
4	Story	Medium	8	STP-325	Closed	23.01.2022 12:08	25.02.2022 8:08	25.02.2022 8:08
5	Story	Medium	3	STP-344	Closed	16.02.2022 12:16	02.03.2022 16:04	02.03.2022 16:04
6	Story	Medium	5	STP-336	Closed	04.01.2022 12:22	09.01.2022 12:14	09.01.2022 12:14
...	...	...	...	...	...	...	...	...

Issue type data	
№	Sprint
1	STPS11, STPS12
2	STPS08, STPS09
3	STPS08, STPS09
4	STPS08, STPS09, STPS10
5	STPS09, STPS10
6	STPS07
...	...

4. RESULTS OF THE STUDY

Applying the theory of functional systems (physiological and psychophysiological theory) to the analysis of work on IT projects, we emphasize the practical importance of the concept of quantization of mental activity, which is present in this theory. To clarify, let us point out that functional systems are relatively autonomous, dynamic (in the sense that they are formed over a period of time on the basis of learning), need-based and motivationally oriented integration of certain structures and functions of the body and psyche based on goal setting and a positive adaptive result. Implementation of functional systems, as components of professional activity, can be presented in the format of action quanta, which are analyzed to some extent, and purposeful influence and "construction" in the process of learning and professional activity. The quantization of mental activity, including professional activity, is determined by a certain need, the satisfaction of which determines the motivational, behavioral, emotional and cognitive "volume" and the specificity and direction of a certain quantum of action, which is a complete systemic formation in which the functional system and activity are integrated and revealed. Pedagogical understanding of the idea of quantization of mental activity reveals possibilities for its purposeful application for education, communication, and organization of production. The quantum of mental activity is a relatively integral and systematic entity, for the implementation of which resources are optimally spent. Therefore, purposeful quantization of educational and production activity can be a relevant innovative factor in its improvement, as well as a natural way of professionalizing a specialist. Currently, quantization is implemented mainly intuitively, as well as due to the requirements set by the specifics of the activity. Each quantum of activity is formed on the basis of the actualization of a certain system, which is represented by specific needs, motivations, intentions, values, meanings, and also contains a specific cognitive component. Currently, quantization is quite common when working with texts, in which the text is structured into certain fragments optimal for learning for educational purposes. Let's analyze the current production and educational tradition of working on IT projects, in which the ideas of quantization are largely implemented.

Scrum methodology is actively used to work on IT projects. The basis of the Scrum methodology, aimed at improving and effective both individual and team work on projects, is a technologically oriented structuring of activities. The specified structuring is a professional, organizational and technological prerequisite for effective management of work on IT projects, including optimal implementation of evaluation and determining effectiveness. The decisive component of structuring work on IT projects is the quantization of activities, thanks to which effective practically and innovatively oriented actualization of systems of values, meanings, intentions, communications, principles, reflections and practices is realized. The tradition of quantifying work on IT projects is an important organizational and technological asset, which is also a significant strategy for both professional activity and professionalization of a specialist. Quantization is implemented on the basis of: allocation and structuring of tasks by complexity and volume, which includes operations of problematization, analysis, classification, and hierarchization; actualization of resource, temporal, communicative and target approaches; through the effective distribution of tasks between members of the development team and through their active interaction.

Traditionally, in the development of IT projects, the following established methods of quantifying professional activity are used [16; 17]: "Epic – a large Task, the solution of which

requires several Sprints for the team; A Story is a part of a big Epic task that a team can solve in 1 sprint; A Task is a technical task performed by one of the team members; Sub-Task – a part of the Story / Task that describes the minimum amount of work of a team member; A Bug is a task that describes an error in the system; a Sprint is a short time interval during which the scrum team performs a given amount of work". Sprints are the basis of Agile methodology, in particular, Scrum.

As indicated above, the quantization of work on IT projects systematically affects the evaluation of results, qualitatively changing the indicated managerial and educational function, revealing its potential, which can be directed to improving activities. Thanks to quantization, the evaluation function ceases to be "global", "static" and dominant as a right/wrong style evaluation. The evaluation function becomes motivationally oriented, dynamic, variable with elements of stochastic components, it is transformed into a continuum of values from "inefficient" to "effective" and to "innovative", which determines the prerequisites for the formation of qualitatively new product functions and opens perspectives for error correction and improvement. Accordingly, the evaluation function becomes a teleological, motivational and reflective factor in the development of professional activity, and is also operationalized, which determines the possibility of its quick and effective application not only for correcting errors. The evaluation function also becomes aimed both at the development of the project as a whole and at the effective organization of solving specific individual tasks, it is individualized, psychologized and acquires the characteristics of a result-motivational factor, becoming a component of the result-target basis of activity. In this case, the evaluation function contributes to the implementation of the intentions, values and principles defined in the "Manifesto for Agile Software Development", namely [13]: "People and interaction are more important than processes and tools; A working product is more important than comprehensive documentation; Cooperation with the client is more important than agreeing to the terms of the contract "Readiness for change is more important than execution of the plan".

The quantization of work on IT projects in this way creates prerequisites for the systematic and multidimensional implementation of the evaluation function. Accordingly, the evaluation function "expands", acquires system-organizing connotations and is presented in the format of a flexible, reflective-analytical, operational-reflexive and reflective-motivational tool for both production and educational activities. Evaluation thus becomes a tool of innovative activity and contributes to personal and professional development and professional communication.

Using the example of task performance analysis when working on IT projects, we will consider the features of the evaluation function and its effectiveness and systemic orientation.

Students of the Vinnytsia National Technical University and the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" participated in the study of evaluating the work of computer science students on information projects based on the quantization of professional activity.

Students were divided into small groups that worked on IT projects. In the process of project activity, they performed the following roles: Engineer, Scrum Master, Product Owner, Tech Lead. Projects in which students participated were managed using the Jira system [17]. This system provides ample opportunities for development team members to interact and track their possible errors, and with its help, the development team can communicate with other users of the Jira system [17].

Let's consider some directions for identifying problems in the work of teams on projects based on the flow of tasks and some directions for evaluating the performance of teams.

In the study of the process of students' work on projects, we identified 5 types of problems related to: Analysis, Story, Epic, Defect, Technical Improvement (see Table 1 and Table 2).

According to Table 1 and Table 2, we have 5 Issue Types, which were given 3 priorities: Low, Medium, High. We will analyze the received data regarding the 3 priorities. Issue Analysis was given a Medium priority with Story Points 5. After the submission of this task, which was performed for approximately 49 days, its correction was needed. Considering the turnaround time, the update was quick. Also, issue analysis lasted two sprints. Analysis is an important part of the project, Story and Epic Story depends on it, therefore, it should be given High priority.

Table 2

Issue Type summary data			
Issue Type	Priority		
	Low	Medium	High
Analysis	-	1	-
Story	-	27	1
Epic	-	1	-
Defect	1	11	1
Technical Improvement	-	1	-
Count/Sum:	1	41	2
Average:	-	-	-

Low priority was given to one Issue Type – Defect, its implementation was rated 5 Estimate (Story Points). High priority was given to 2 Issue Types – Story and Defect. These two tasks were given an Estimate (Story Points) of 1 and 5 respectively.

On the Figure 1, built on the basis of the data in Table 1, we can see a tendency to decrease the time of completing tasks. The execution time of the Story, except for 6 cases (which is 13.64 % of the planned tasks), coincides with the Total time. One reason may be that, over time, the team is likely to work more cohesively and have more experience with the tasks. In 6 cases it was necessary to finalize completed tasks, in 4 cases it took relatively little time from 1 hour to 1 day to finalize, the duration of finalizing tasks in two cases was approximately 14 and 11 days. In general, the percentage of tasks completed without revision is 86.36 %, which is close to a high value.

Let's consider the Total time of Story execution in the section Estimate (Story Points) (see Figure 2). As we can see from the figure, more time was spent on some Stories with Estimate (Story Points) 1 and 5 than on individual Stories with Estimate (Story Points) 8 and 13. Which may indicate the high level of student training as Story performers with Estimate (Story Points) 8 and 13. Regarding Estimate (Story Points), the largest number of 18 Stories had an Estimate value of 5, one Story had an Estimate value of 13 (Figure 3).

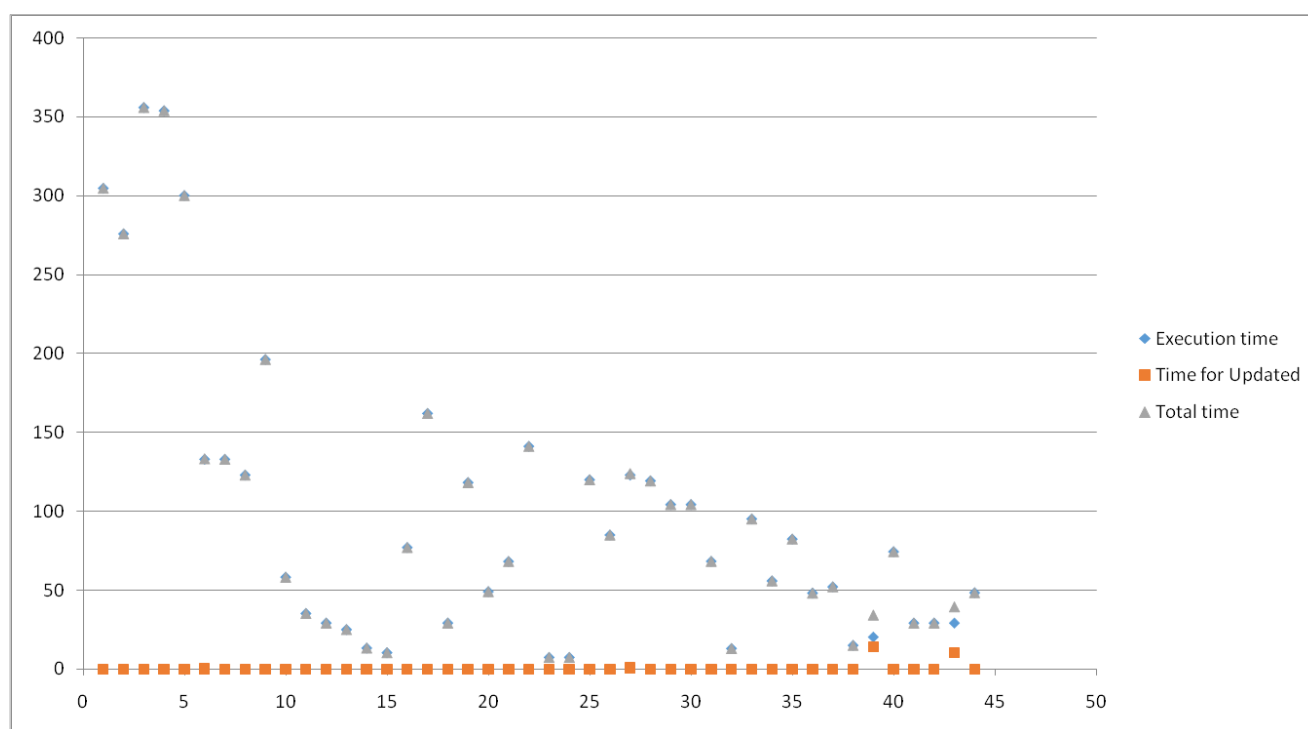


Figure 1. The Implementation time of the team tasks

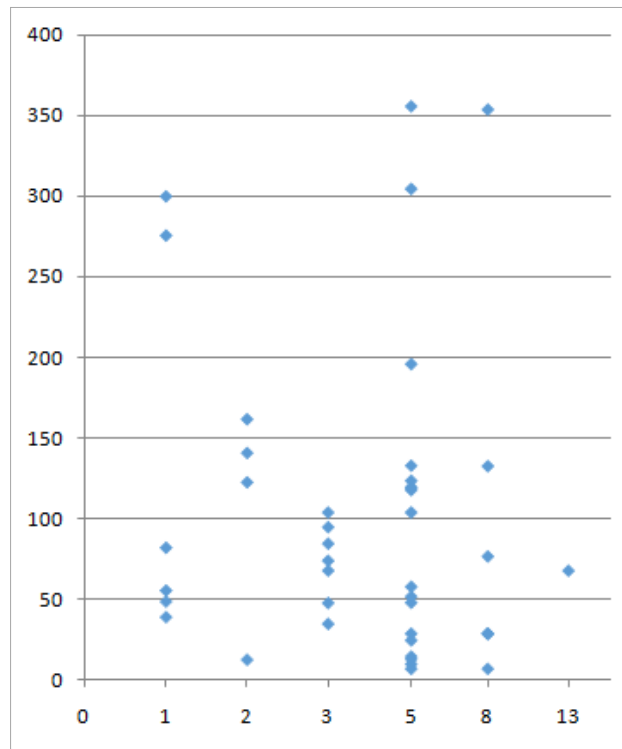


Figure 2. Total Story execution time, ordered by Estimate (Story Points)

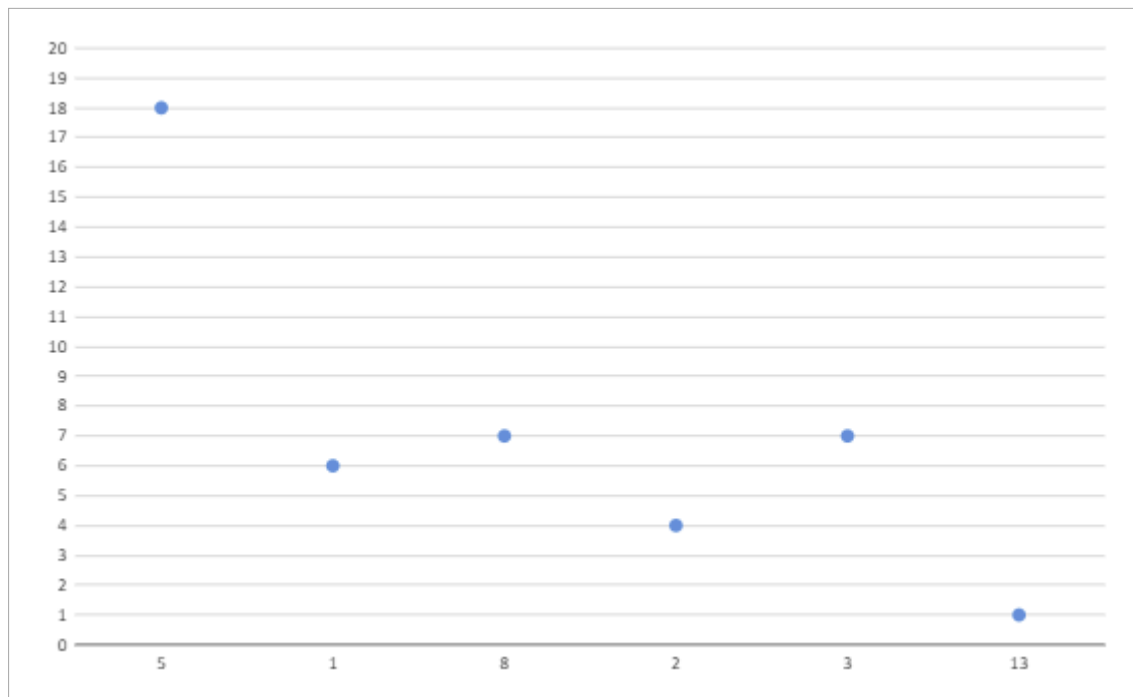


Figure 3. Number of completed Stories according to Estimate (Story Points)

According to the Time in status summary data (see Table 3), the median for Indicator In development, In Peer review, In Testing, In User Acceptance, Ready for Release is less than the average value. An analysis of the mean and median shows that if the median is less than the mean, it indicates variation in task time and that half of the tasks took longer, also as previous studies have shown, outliers are present. Therefore, it is better to use the median as the central tendency, which is more resistant to the outliers in the sample, compared to the mean value.

Table 3

Issue Type summary data					
Indicator	In development	In Peer review	In Testing	In User Acceptance	Ready for Release
Average	2w 1d 20h	3d 12h	1d 7h	2d 4h	3w 6d 2h
Median	4d 23min	2h 13min	1min	1min	1w 2d 5h

According to Table 3, the total execution time of the Issue was 7w 0d 21h (approximately 49 days), using the median values – 1w 6d 7h 38min (approximately 13 days).

Consider the charts in (see Figure 4, 5, 6, 7, 8). At the stage of In development (see Figure 4), there is no tendency to decrease the rolling average, so the productivity of In development does not increase. At the stages of In Peer review, In Testing, In User Acceptance (Ready for UAT, In UAT), Ready for Release the productivity of the team is increasing: indicated by the downward trend of the rolling average (see Figure 5, 6, 7, 8). All charts show outliers.

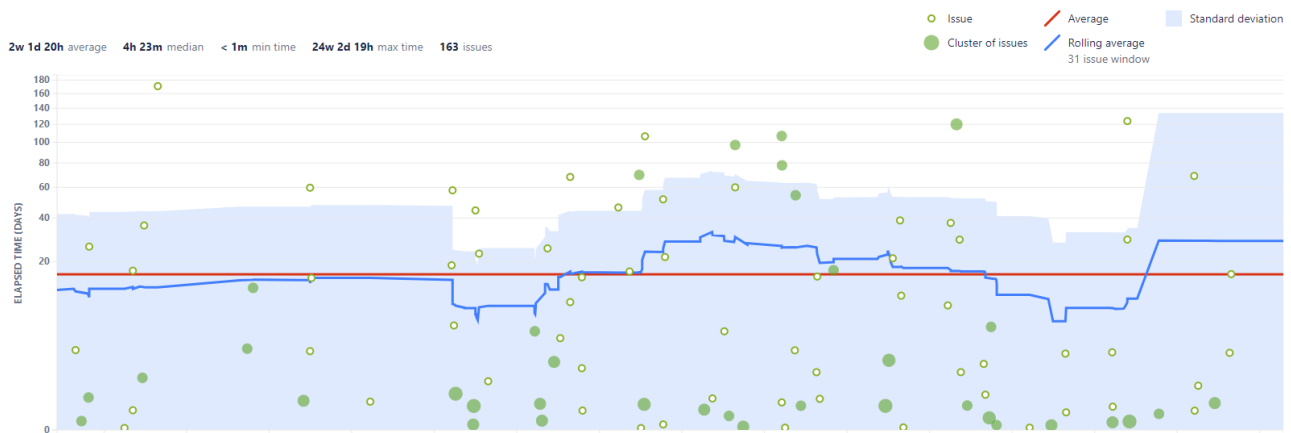


Figure 4. In development



Figure 5. In Peer review

An analysis of tasks flow / team performance of the team, which consists of 8 employees: 5 engineers and Scrum Master from outsourcing company, Product Owner and Tech Lead, was carried out. There is a significant number of Sprints for one Issue Type (ideally, one story should be completed in one Sprint). Such indicators indicate the need to improve the Story planning process by optimizing the estimation of the execution time of one Story, and, if possible, by dividing it into several Stories that can be executed in one Sprint.

The means that the team can be expected to complete around 4,5≈5 story points worth of work in the next Sprint.

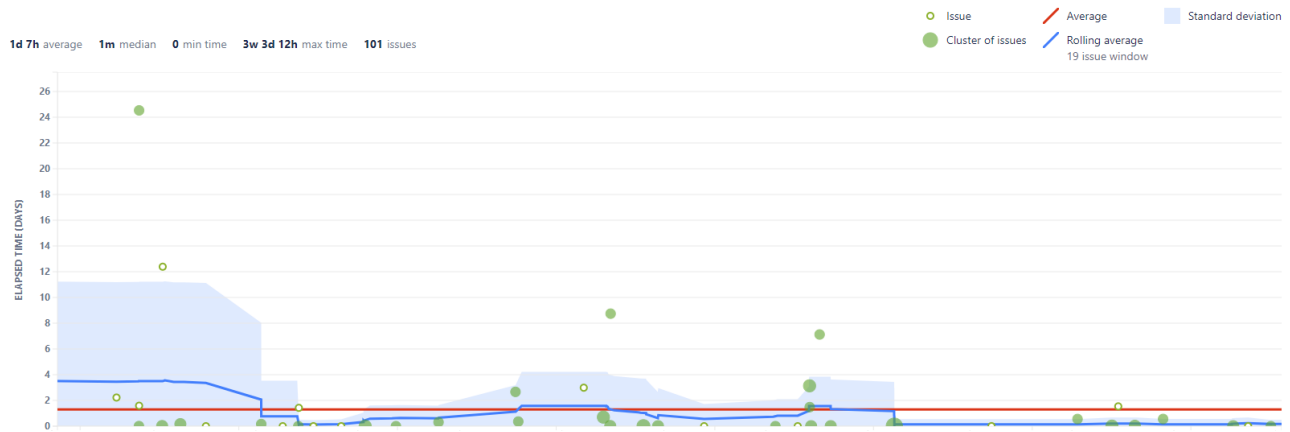


Figure 6. In Testing

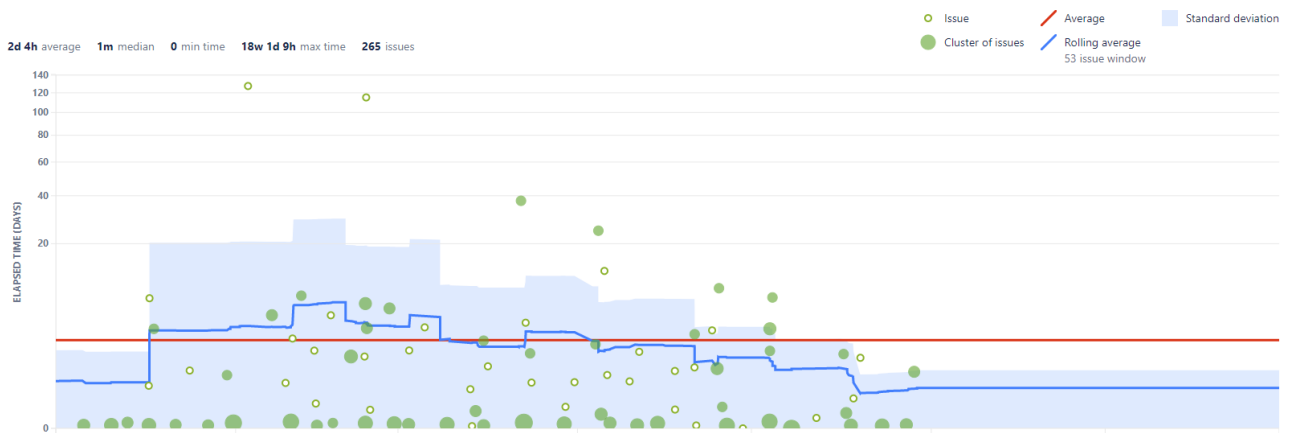


Figure 7. In User Acceptance (Ready for UAT, In UAT)

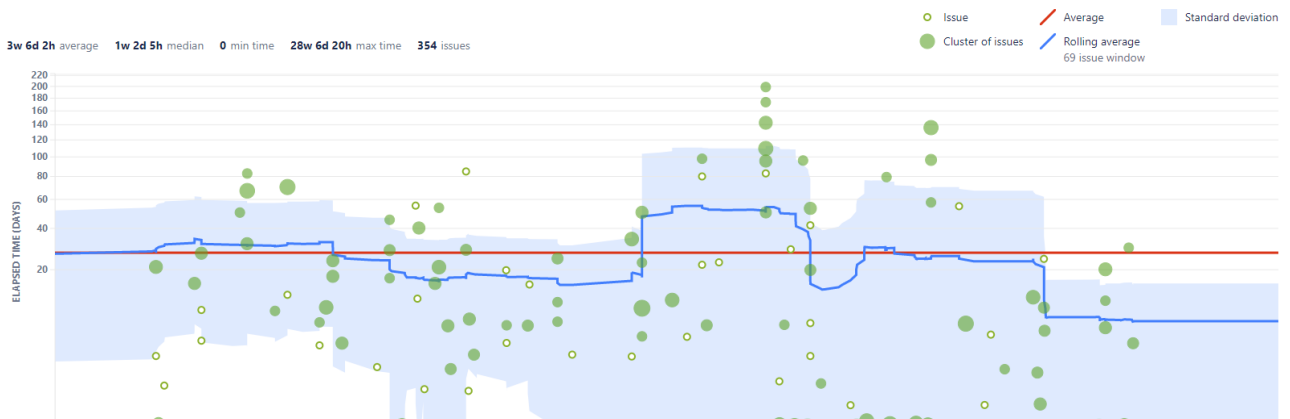


Figure 8. Ready for Release

Consider the charts in Figure 4. Figure 4 – In development – at the end of the cycle, a high value of the standard deviation is observed (the blue band is wide), that is, the cycle time of future releases will not be close to the rolling average. The data at the end of the cycle becomes less predictable. As a predicted value, it is probably better to choose an average of 2w 1d 20h (or less). The data at the end of the cycle becomes less predictable.

Figure 5 – In Peer review – at the end of the cycle, a relatively low value of the standard deviation is observed (the blue band is narrowed), that is, the cycle time of future issues will probably be close to the rolling average, that the cycle time of future issues will be close to the rolling average, approximately, 2h 13min (or less).

Figure 6 – In Testing – at the end of the cycle, the standard deviation is narrowed, at the very end it is minimal (judging from the graph, it is probably equal to zero), as a predictive value, we choose the value of the rolling average, approximately 1min (or less).

Figure 7 – In User Acceptance (Ready for UAT, In UAT) – at the end of the cycle, the standard deviation is narrowed, as a forecast we choose the rolling average value, roughly 1min (or less).

Figure 8 – Ready for Release – during the cycle, intervals of a narrowed blue band are observed, at the end of the cycle the standard deviation is relatively narrowed, as a predictive value we choose the value of the rolling average, approximately 1w 2d 5h (or less).

According to the situation of no issue exist, flow / performance remains the same, it can be predicted that, probably, the total time of tasks will be approximately 1w 6d 7h 38min, the number of completed tasks will be approximately 43. The means that the team can be expected to complete around 4.5~5 Story Points worth of work in the next Sprint, possibly higher.

5. CONCLUSIONS AND PROSPECTS FOR FUTURE RESEARCH

1. Based on the application of the theory of functional systems for the analysis of work on IT projects, as well as by means of a methodological and valuable understanding of the results of the specified professional activity, it is possible to consider the evaluation process as a reflective and analytical toolkit. One of the main methodological and practical-technological factors, which is a prerequisite for the mentioned representation of the assessment process as a reflexive-analytical toolkit, is the systematic quantization of professional activity. Students were divided into small groups that worked on IT projects. In the process of project activity, they performed the following roles: Engineer, Scrum Master, Product Owner, Tech Lead.

2. The specified quantization was implemented based on the application of: Kanban, Agile methodologies, in particular, Scrum, "Agile Manifestos"; information technology Jira Software, in particular the Kanban template, Agile tools for Kanban, Agile tools for scrum. Such quanta of professional activity were highlighted as: Epic; Story; Task; Sub-Task; part of the Story/Task; Bug; Sprint.

3. As indicated above, the quantization of work on IT projects systematically affects the evaluation of results, qualitatively changing the indicated managerial and educational function, revealing its potentials, which can be aimed at improving professional activity. Thanks to the quantization of professional activity, the evaluation function of work on IT projects is transformed into a reflective and analytical toolkit, in which motivational, teleological, reflective, operational, psychological, and innovative dimensions (components) are determined.

4. The evaluation presented in the specified system format is a significant component of the result-target basis of work on IT projects, and is also considered as a tool of innovative activity and a prerequisite for personal and professional development and professional communication.

5. In further research, it is planned to develop the problems of professional activity for work on IT projects, which includes the study of motivational, value, cognitive, operational, reflective, components, as well as the use of quantization in pedagogical research on the professional training of computer science students. The results of this study are planned to be applied to improve the qualifications of information technology specialists in the conditions of postgraduate education.

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ОЦІНЮВАННЯ РОБОТИ СТУДЕНТІВ КОМП'ЮТЕРНИХ СПЕЦІАЛЬНОСТЕЙ НАД ІТ ПРОЕКТАМИ НА ОСНОВІ КВАНТУВАННЯ ПРОФЕСІЙНОЇ ДІЯЛЬНОСТІ

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Анотація. В статті розглядається процес оцінювання роботи над ІТ-проектами, який представляється системно і багатомірно, як рефлексивно-аналітичний інструментарій. Дослідження проводилося на основі застосування системи гуманітарних, психофізіологічних, антропологічних та інформаційних методів і підходів, де визначальними є застосування теорії функціональних систем та шляхом методологічно-ціннісного осмислення педагогічних та виробничих досвідів і практик.

В даній роботі актуалізований методологічний потенціал ідеї професіоналізації, зокрема фахівця комп'ютерних спеціальностей, педагогічної антропології та теорії функціональних систем, включаючи концепцію квантування психічної діяльності, яка інтерпретується як квантування професійної діяльності. Визначальним методологічним і практико-технологічним чинником, який є передумовою розгляду процесу оцінювання як рефлексивно-аналітичного інструментарію є системне квантування професійної діяльності, яке реалізується на основі використання методологій Kanban, Agile, зокрема, Scrum, "Manifesto for Agile Software Development". В дослідженні використовувались Інформаційні технології: Jira Software, зокрема шаблон Kanban, Agile-інструменти для Kanban, Agile-інструменти для Scrum. Актуальними стратегіями квантування професійної діяльності при роботі над ІТ-проектами є: Epic; Story; Task; Sub-Task; part of the Story/Task; Bug; Sprint.

Студентів було розподілено на невеликі групи для роботи над ІТ-проектами. У процесі проектної діяльності вони виконували такі ролі: Engineer, Scrum Master, Product Owner, Tech Lead.

Оцінювання, представлене у вказаному системному форматі, є значимою складовою результативно-цільової основи роботи над ІТ-проектами, а також розглядається як інструмент інноваційної діяльності та передумова особистісно-професійного розвитку і професійної комунікації.

В подальших дослідженнях планується розробка проблематики професійної діяльності для роботи над ІТ-проектами, що включає вивчення мотиваційних, ціннісних, когнітивних, операціональних, рефлексивних, складових, а також застосування квантування в педагогічних дослідженнях з професійної підготовки студентів комп'ютерних спеціальностей. Результати даного дослідження планується застосувати для підвищення кваліфікації фахівців інформаційних технологій в умовах післядипломної освіти.

Ключові слова: методологія, педагогіка, квантування професійної діяльності, фахівці інформаційних технологій, студенти комп'ютерних спеціальностей, ІТ-проекти, Jira Software, Kanban, Agile, Scrum.

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