# TEACHING SCRUM METHODOLOGY FOR PROJECT OF CHANGE MANAGEMENT

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## Abstract

During the Summer semester 2018, an innovative educational experiment has been conceived and implemented at the Faculty of Computer Science and Management, Wroclaw University of Science and Technology, Poland (named PWR). It's main goal was to check three hypothesis:

H1 Transparency in educational process is an important factor of students motivation and their work's efficiency

H2 Application of Scrum methodology stimulates students creativity and originality of project management and final product

H3 An agile approach to educational process raises the students and teacher level of life quality during the classes

The participants were master's students of Management, and the study subject was Advanced Project Management, devoted mainly to agile projects management. In eight teams, the students worked managing a project, using Scrum methodology. Scrum is a leading agile methodology, based on empiricism, which one of three pillars is transparency. Scrum, developed initially for IT project management, from few years is perceived as adequate and efficient methodology for managing projects other than IT, particularly in administration and non-governmental organizations. The project selected and managed during the experiment was a change project in social services area. The teacher initialised and lead this experiment, assured a feedback and used lessons learned in order to confirm/reject the hypothesis H1, H2 and H3 and to improve the educational processes in the future.

Apart from checking H1, H2 and H3 hypothesis, the objectives of experiment were:

1. Check Scrum methodology for management of the social change project

2. Check how the transparency of stakeholders management impacts on team project work's quality and the project results

3. Understand better Scrum by students in practise

4. Identify project team activities during two sprints

5. Check the level of stakeholders identification with the change, achieved using Scrum

The observation by active participation of the teacher and ex-post feedback affirm three hypotheses and prove five objectives achievement.

**Keywords**: Teaching, Scrum, Agile, Change Project

## 1. CONTEXT

Nowadays, the most stable element of each organisation is – paradoxically – the change. Changes are results of many factors: social, technological, political, environmental and many others. The changes pertain almost all areas of human activities, including particularly education. Students, to be prepared to manage changes in the future, should be prepared to face up to all challenges resulting from changes.

The interdisciplinary nature of project management (PM) became attractive and significant for the introduction of its project content into the educational environment since second half of 20th century. The purpose of project management teaching consists in giving students project management methodologies, rules and principles enabling them to understand projects complexity and systemic character first. Secondly, show, and use in practice PM tools to manage successfully projects. This means that the methodological basis training of project is design, in its classical and modern versions.

Changes in business pertain not only to "hard" technical technologies, but also software part of IT and management. Among these last, Project Management plays particular role of emanation of all branches of management, being a sophisticated blend of all other. Moreover, the world economy as well as other human activities use more and more projects. Their still grooving presence and variety as well as importance in human life is a cause of permanent elaborating and implementing new methodologies and tools of PM. In project management there are two main representations of the project management concept (Dostatni, Gierulski, Roszkowski, Wirkus):

✓ a classic one, including PMBOK®Guide, PRINCE2, and ICB methods,

✓ an agile one, e.g. Scrum, EX, Crystal.

Classical methods of project management are built on a stage-based approach to executing a task, in which product requirements are defined at the planning stage and are not modified later in the project. In this approach, it is assumed that the conditions of project team operations are stable, which affects prepared plans and schedules in the project. As a result, there is a strong focus on documenting actions, which becomes the main aspect of control in project execution (Dostatni, Gierulski, Roszkowski H, Wirkus, 2014, p.186-188).

In case of agile (adaptive) methods, the main idea is best presented in *Manifesto for Agile Software Development* prepared by a group of developers in 2001 as a *credo* of agile development of software, which values (Manifesto for Agile Software Development, 2001]:

✓ "individuals and interactions over processes and tools,

✓ working software (product) over extensive documentation,

✓ customer collaboration over contract negotiation,

✓ responding to change over following a plan".

*"People and interactions"* means concentrating on people involved in the project and their engagement, as well as on creating a cooperation-friendly environment. It also entails focusing on motivating project team members, ensuring mutual trust, and allowing for freedom in actions of individuals involved in project execution. This idea is confronted with "*processes and tools,*" where attention is paid to the way software is developed and to the tools that are used in this process. Using proper tools in the project is an important aspect in the success of a project, but without knowledge and engagement of people who can use these tools it is not possible to achieve such a success (Labuda, 2015, p. 60). The next idea, *"working software,"* refers to developing software which is valuable from the client's perspective, provides benefits (e.g. financial ones) for the client, and ensures client's satisfaction by frequently publishing software that is ready for potential use. This is the centre of interest, valued over "*comprehensive documentation,*" the concept of which focuses on providing complete project documentation. Agile methods also mean *"customer cooperation,"* achieved by engaging the client in the project as a Product Owner. Cooperation is also valuable in Developer Teams within the project. This idea is contrasted with "*contract negotiation,*" understood as constant negotiation of cooperation conditions, both with the client and between different teams in a given project. The last concept, "*responding to change,*" means constant focus on changes and reacting to them as well as treating change as an opportunity, not a threat. This concept ensures that the team is ready to implement changes even at later stages of software development. Adaptation becomes the centre of interest, as opposed to "*following a plan,*" which means relying on assumptions and accepted procedures [Manifesto for Agile Software Development, 2001), (Chrapko, 2013), (Wyrozebski, 2011), (Stellman, Greene, 2015). The word "*over*" used in the Manifesto does not, however, mean that the concepts

deemed classic have been given up completely. The authors of the Manifesto emphasize that "while there is value in the items on the right, [they] value the items on the left more" (Manifesto for Agile Software Development, 2001). This Manifesto is then to complete the previously applied approach to software development in order to ensure that products delivered to the client will meet their requirements.

Adaptive methods focus on being open and reactive to changes in order to provide the client/sponsor with exactly what they want. The emphasis is on cooperation with the client throughout all project operations and not only at the first stages of the project. What is more, the execution of works is at the centre of attention, whereas the documentation is limited to the minimum and replaced with project meetings, during which the current action plan is established. The core element here is a self-organising team which independently makes all decisions regarding the way of operating, taking into account necessary adaptations for changing conditions of functioning. In such conditions, control can be limited and minimalised thanks to the operations based on engagement, cooperation, a sense of responsibility for the work performed and the product, as well as on mutual trust. Traditional reporting is replaced with a joint summary of iteration, based mostly on direct meetings of all team members providing room for reflection and consideration (Dostatni, Gierulski, Roszkowski, Wirkus, 2014, pp. 186-188).

There are many agile approaches to software development. The most popular one among them is Scrum; research shows that over 56% agile practicing users report that they use this approach in project execution (VersionOne, 2015).

## 2. SCRUM AS EXAMPLE OF AGILE METHODOLOGY

Scrum is presently the most popular and the most frequently used agile approach to product development (Scrum Alliance, 2017-2018). Authors call a "framework" (Schwaber, Sutherland, 2017) the application which enables a quick adaptation to changeable conditions of functioning, what allows to provide a customer with a product that is of high value to them (Schwaber, Sutherland, 2017). The main idea of Scrum consists in iterative product delivery with the simultaneous inclusion of the customer into the process of developing it in order to ensure that the product that will be the result of a project will meet their expectations. Currently, Scrum is used not only for IT projects management. More and more frequently are its use in other fields, like non-governmental, social, manufacturing projects (Betta J., Chlebus T., Kuchta D., Skomra A., 2019)  risk (Betta J., Skomra A., 2018) and crisis (Betta J., Drosio  S, Kuchta D., Stanek. S.,Skomra S., 2018) management also.

**Scrum elements**

Scrum includes three main elements. These are Roles, Events and Artefacts. These elements are connected with a set of Rules which ensure consistency between them (Schwaber, Sutherland, 2017).

***Roles*** define members of the development team and assign specific competence to them. The Scrum Team includes the Scrum Master, Product Owner and Development Team. Scrum Master is a significant role in a team, frequently incorrectly identified with project manager. It is a person that is responsible for making sure that Product Owner and Development Team understand and apply Scrum values and rules. It is emphasized that Scrum Master is a "servant leader" whose main task is to eliminate the impediments for the fulfilment of sprint goal (Overeem, 2017]. Product Owner is a person developing and managing Product Backlog that knows the main business goals of a project. Development Team is the team responsible for the implementation of elements of Product Backlog, delivering Increment at the end of each iteration. It is defined by authors as self-organizing and inter-functional (Schwaber, 2004), (Schwaber, Sutherland, 2017).

***Events*** are regularly taking place enabling adaptation to the changing conditions and requirements, and the inspection of the Increment and the progress of work. The main purpose of their use is to ensure the possibility of fulfilling three Scrum pillars: adaptation, inspection and transparency. Sprint is the essence of Scrum, which is a cyclically repeating permanent time interval during which the Development Team develops and delivers the completed Product. Each sprint includes a few meetings: Sprint Planning, Daily Scrum, Sprint Review and Retrospective. Sprint Planning is an event beginning every Sprint during which Sprint Goal is specified and the elements of Product Backlog are selected that will be implemented in the course of each Sprint. Within each Sprint short, everyday meetings, called Daily Scrum, take place. Daily Scrum is the meeting of members of the Development Team who are responsible for its execution. It is oriented at synchronizing  the work of the Team members and preparing the plan of actions for the next 24 hours. Additionally, two Events are indicated that recapitulate each Sprint. Sprint Review is an event at the end of each Sprint allowing for the inspection of the delivered functionalities, while Sprint Retrospective is an event dedicated to the Development Team that reflects on the completed Sprint. Within the meetings of Sprint Planning and Sprint Review, it is recommended that all members of the Scrum team participated in them

(Schwaber, 2004), (Schwaber, Sutherland, 2017).

***Artefacts*** constitute material and non-material effects of work. Within Artefacts four elements are indicated. Product Backlog specifies the scope of a project and the list of functionalities which will be delivered in the course of the whole project. It is prepared and managed by Product Owner. In each Sprint, elements are selected from the Product Backlog that create Sprint Backlog being the declaration of members of the Scrum Team regarding the functionalities which will be delivered in the curse of a given Sprint. Sprint Goal is an element marking out the path for the Scrum Master and the Development Team in the course of a given Sprint. It is determined in the course of Sprint Planning. Increment specifies all delivered and completed elements of the Product Backlog in the course of a given Sprint and previous Sprints. The last Artifact, i.e. Definition of Done, enables identical understanding when a given element is completed, i.e. When a given functionality from the Product Backlog may be considered ready (Schwaber, 2004), (Schwaber, Sutherland, 2017).

### *Workflow within Scrum*

In Scrum, a project is carried out in most often 30-day iterations (Sprints) where at the end of each iteration a set of completed functionalities (Increment) is issued for a customer, which are defined in the Product Backlog by the Product Owner. Each iteration begins with Sprint Planning – a meeting during which functionalities are selected that will be delivered within a given iteration and will create Sprint Backlog. In the course of iteration, daily, 15-minute meetings (Daily Scrum) of the Development Team take place that enable the control of the progress of work in the Sprint and identify any potential impediments/threats which could disrupt the achievement of the Sprint Goal. At the end of each iteration Sprint Review takes place during which completed work is reviewed and the Product Backlog updated. The last meeting is Sprint Retrospective which is the recapitulation of the whole Sprint in terms of what was good and what requires changes in consecutive iterations. The meeting is dedicated to the members of the Development Team (Fig. 1). In this way it is possible for the members of the Development Team to improve, draw conclusions for the future – and that is the essence of empiricism which is the foundation of Scrum (Schwaber, Sutherland, 2017).
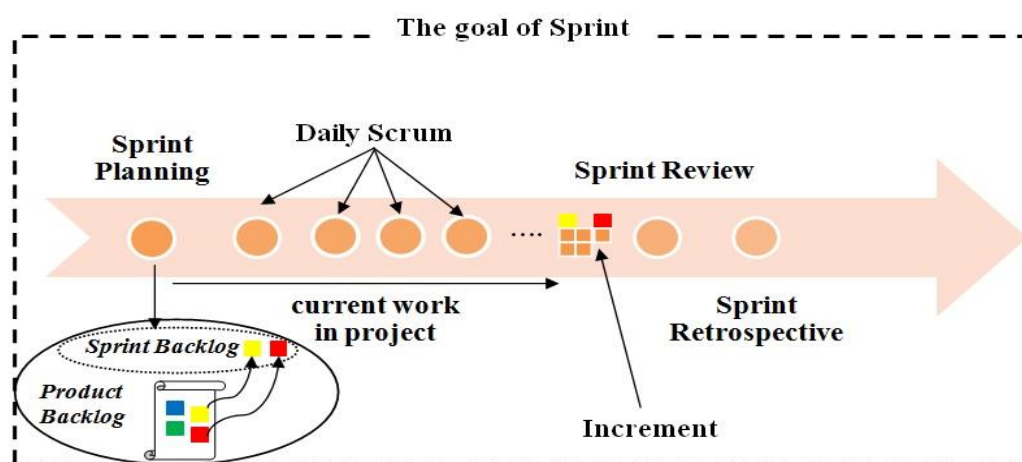


Fig. 1 The Sprint (source: Authors)

## 3. EXPERIMENT DESCRIPTION

During the period February-June 2018, an innovative educational experiment has been conceived and lead at the Faculty of Computer Science and Management, Wroclaw University of Science and Technology. The participants were master's students of Management, the name of the course - Advanced Project Management. In eight teams, they worked on the management the same project, using Scrum methodology. Scrum is a leading agile methodology, based on empiricism, which one of three pillars is transparency (Schwaber, 2004), (Schwaber, Sutherland, 2017). Scrum, developed initially for IT projects management, from few years is perceived as adequate for other projects. This fact inspired the teacher to initialise and lead this experiment and to learn one's lessons from it in order to confirm/reject the hypothesis H1, H2, H3 (sec. 3.2) and to improve the educational processes in the future.

## 3.1 Investigating Project of Change short presentation

As organization, the University Centre of Health and Social Services in Saguenay-Lac-Saint-Jean, in

Québec, Canada, was investigated.

Project's context:

✓    Splice agencies from 184 to 32 in Québec.

•    Reduction from 9 agencies to 1 in Saguenay-Lac-Saint-Jean.

•    Reduction of employment from 500 to 400 in Saguenay-Lac-Saint-Jean.

✓    Transition from agencies management to the central one.

✓    Setting-up of youth programs:

•    200 employees in programs.

•    Jointed teams in each of 6 sectors, one manager in the sector, several departments in sector.

•    2 main missions – centres of communal services, childhood and youth protection centres.

✓    Anxiety sources – misunderstanding of future roles; the employees of different departments working in the same team, fulfilling two missions, under the same manager direction.

✓    A concept of a new permanent youth centre (trainings).

✓    Designation the departments involved in both missions.

✓    Designation the situations in which an employee participates in both missions.

✓    Definition of roles and responsibilities of all employees.

✓    Definition of cooperation modes.

✓    Definition of way of services offering (object of change).

✓    How support the identification of employees with the change? How definitively reach the change of organizational culture?

✓    Promotion of Scrum.

✓    Project product consists of sub-products:

•    Sub-product 1: image of actual state of the organization.

•    Sub-product 2: arrange of practices of Local Centres Communal Services.

•    Sub-product 3: offer of new services.

## 3.2   Educational Objectives

Outside of the main goal of experiment - checking of hypothesis H1, H2 and H3 of experiment:

H1 Transparency in educational process is an important factor of students motivation and their work's efficiency

H2 Application of Scrum methodology stimulates students creativity and originality of project management and final product

H3  An agile approach to educational process raises the students and teacher level of life quality during the classes

the objectives were:

1.    Check Scrum methodology in management of the change project.

2.    Check how the transparency of stakeholders management impacts on team project work's quality and the project results.

3.    Understand better Scrum by students in practise.

4.    Identify project team activities during two sprints.

5.    Check the level of stakeholders identification with the change, achieved using Scrum.

### 3.3 Course Organization

There were twenty-eight students participating in the experiment. Planed (and real) duration of the course were 30 hours per each student. They were divided into eight teams, all working independently on management the same project, using Scrum methodology. First of all, the project was presented as well as the principles of work, including formal and substantives. Basic literature on Scrum was distributed for students. Each team defined the roles, according to Scrum methodology: Scrum Master (teacher), Product Owner (one of students), Development Team (students other than Product Owner). The whole course was composed of two Sprints. The meaning of events [ were explained: Sprint Planning, Weekly Scrum, Sprint Review and Sprint Retrospective. Artefacts were presented also: Stakeholders, Product Backlog, Sprint Backlog, Product Increment. Finally, the rules of the work with Scrum were presented and explained. Summarising this preparation phase of experiment, a big effort was done to insure the application of Scrum methodology at the maximal level, except of two elements. For evident reasons, the students couldn't work directly with project stakeholders. Their work based on the teacher's knowledge and the study of similar cases. Because of academic organization of educational process, the original "Daily Scrum" was substituted by "Weekly Scrum".

According to his role, the Product Owner elaborated, before the course's start, the Project Backlog, for acceptation by Development Team. During the Sprint Planning, the Development Team with Product Owner established the Sprint Backlog, being the prioritised list of tasks which should be done in this Sprint. During Weekly Scrum each member of Development Team answered three questions, (Schwaber, Sutherland, 2017): what did you do during last week, what will you do during the next week, what were the problems you encountered. Sprint Review consisted in define of Product Increment, delivered during the Sprint. During the Sprint, between the Sprint Planning and the Sprint Review and Retrospective, the Development Team fulfils the tasks established during the previous events. The idea of work in Scrum is presented at the Fig. 2.
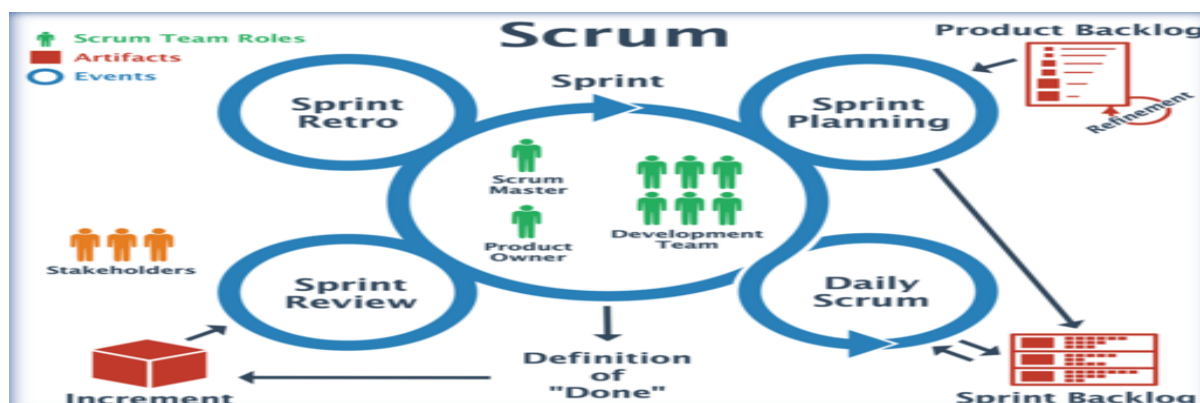


Figure 2. Scrum framework (Source: (Schwaber, Sutherland, 2017))

### 3.4 Innovative elements of classes:

✓ Students managed the project on line, using Scrum Methodology, new for them,

✓ The project is reel, almost simultaneously managed by a team of researchers from "Université de Quebec", Chicoutimi, Canada, but according to co-construction methodology [Quebec].

✓ The project wasn't an IT project.

✓ The teacher accomplished the role of Scrum Master. According to Scrum rules, he wasn't a project manager, so, he couldn't give commands to students. He supported the project team in a correct application of Scrum principles.

✓ Product Owner was a part of team, with one voice like all others. Nevertheless, he could pose some intransgressible limits, which should be respected by the Team. Scrum Master was, in a way, divided between the Product Owner and the Development Team.

✓ Students themselves could define the results of project.

✓ Students documentation was reduced to the absolutely necessary minimum, which is recommended in (Schwaber, Sutherland, 2017).

✓ For the teacher it was a new experience.

## 3.5   Results

At the course termination, the students were asked to respond – voluntarily and anonymously - fifteen questions. The questions pertained to such problems like: usefulness of Scrum methodology for studied project, organisation of workshop, quality of roles of Scrum Master, Product Owner and Development Team, level of knowledge and skills in Scrum before and after the experiment, quality of cooperation among Scrum Master, Product Owner and Development Team, fulfilment of Scrum values by Scrum Team. Six questions on knowledge and skills level self-evaluation before and after the experiment, nine about course planning and realisation. The final part of the questionnaire was dedicated to free student's comments and opinions. The results are shown on the figures 3, 4 and 5, and in the Table 3. below.
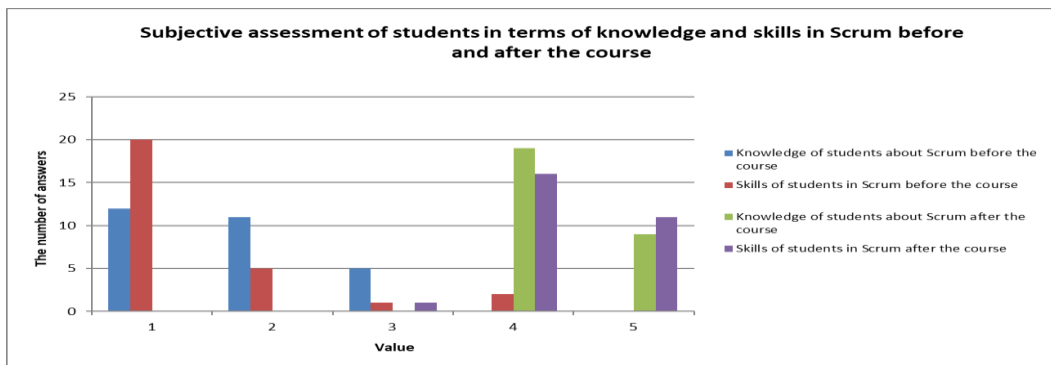


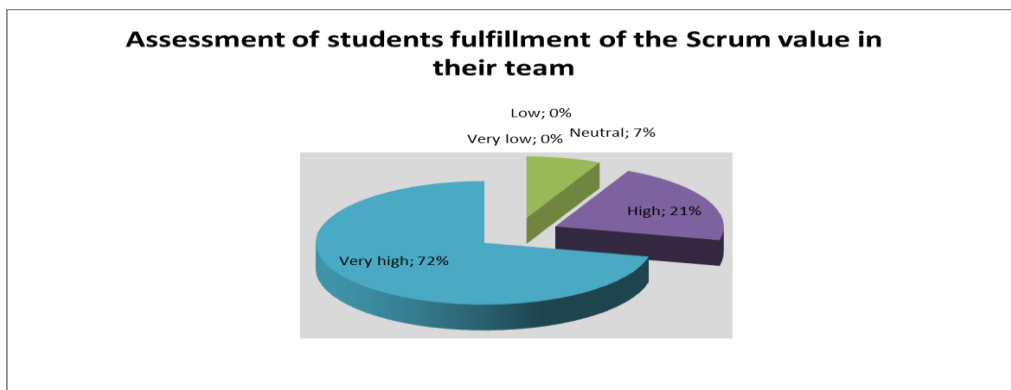Figure 3. Knowledge and skills in Scrum before and after the experiment (Source: Authors)



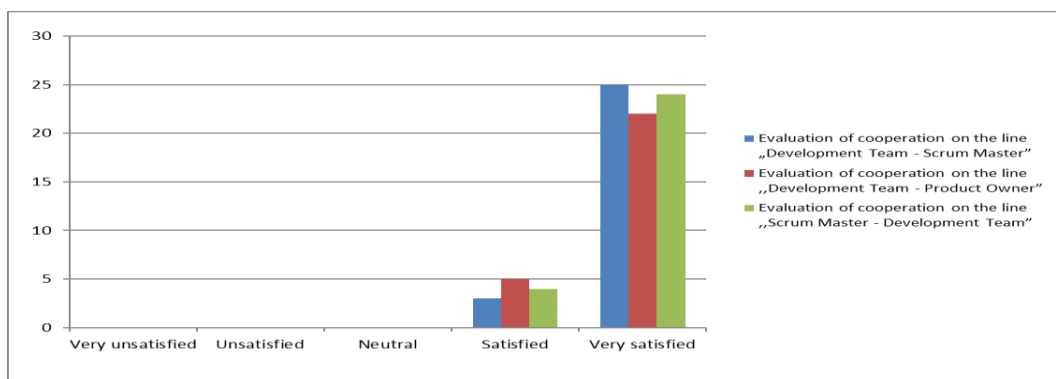Figure 4. Self-assessment of students fulfilment of the Scrum values (Source: Authors)



Figure 5. Evaluation of cooperation among Scrum Master, Product Owner  and Development Team (Source: Authors)

The teacher's continuous participation and observation, as well as the results of further examination, confirm the students evaluations.

The transparency of learning process via this experiment is multidimensional and visible in all aspects:

✓   management of design – by clear presentation to students the educational objectives (s.3.2) and the

course organization (s. 3.3),

✓  process - detailed planning and implementation by students of all Scrum Events,

✓  content – careful elaboration and actualization of Product Backlog, Sprint Backlog and Increment, accessible on-line for the Scrum Team,

✓  communication – direct during Events (Sprint Planning, Sprint Review and Retrospective, Weekly Scrum), and on-line during the Sprints,

✓  results of project learning – presented by all Teams at the end of the course.

After the course termination, the students were asked to respond – voluntarily - the questions of anonymous questionnaire – six of them on knowledge and skills level self-evaluation before and after the experiment, nine about course planning and realisation. The final part of the questionnaire was dedicated to free student's comments and opinions.

From point of view of the hypothesis H1, essential were nine questions on the course planning and realisation. They affected transparency – more or less directly and from different five points of view(dimensions), mentioned above. For these nine evaluations, the assessments "good" or "very good" were given averagely by 97% of respondents.

As to the hypothesis H2, the six questions on knowledge and skills level achieved were essential. Knowledge was evaluated as: any or low before by 80%, high or very high after by 100%. Skills – any or low 90% of students answers, high or very high by 97% of them.

Students free opinions and comments are summarised in the Table 3.

**Table 1. Free opinions and comments. (Source: Authors)**

| General evaluation of the experiment | Very interesting: 22 (79%) |
| | Interesting: 6 (21%) |
| Most frequent comments / recommendations | The best course during my studies". |
| | "Very high level of transparency". |
| | "Should be applied in other courses in our university". |
| | "High involvement of the teacher". |
| | "Something new in my studies". |
| | "I felt my engagement and creativity rising". |
| | "More efficient than traditional training". |
| | "High level of student's empowerment". |
| | "Application of knowledge in practise". |
| | "More such courses". |
| | "Meeting with practise". |
| | "At the university teachers seldom introduce something new in the process of learning". |
| | "Inspiration for other courses". |
| | "I shared successfully this experience acquired with colleagues studying in other universities". |

The results presented in this sub-section justify the full confirmation of hypothesis H1-H3.

## 4. CONCLUSION

It is advisable to carry out project learning for first-level students on the basis of the traditional methodologies, like PMBOK or Prince2 which systematically discloses a set of processes and functions of

project management. Flexible Agile tools could be used for master students with project experience in traditional methodologies in various fields of projects, e.g. projects of changes, crisis, administration, non-governmental or production. Scrum as a methodology for the formation of transparency in the relationship management with project stakeholders seems one of the more effective methods of project management learning.

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