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Scrum as the Method Supporting the Implementation of Knowledge Management in an Organization

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***Abstract*—**Many companies have switched their processes to project-oriented in the last years. This brings new possibilities and effectiveness not only in the field of external processes connected with the product delivery but also the internal processes as well. However centralized project organization which is based on the role of project manager in the team has proved insufficient in some cases. Agile methods of project organization are trying to solve this problem by bringing new view on the project organization, roles, processes and competences. Scrum is one of these methods which builds on the principles of knowledge management to drive the project to effectiveness from all view angles. Using this method to organize internal and delivery projects helps the organization to create and share knowledge throughout the company. It also supports forming unique competences of individuals and project teams and drives innovations in the company.

***Keywords*—**agile software development, knowledge management, knowledge dissemination, project management, SCRUM

I. Introduction

MANY software development companies have tried one or more agile software development methods to develop and deliver the product. This initiative came sometimes from inside of the company but mostly is initiated by the intensive competitiveness in the field. These methods aim on raising the effectiveness of the development and optimizing the project output at the same time. There are various feedbacks from the people that have tried them. The first project realization typically does not run smoothly and initial problems tend to occur. However if the company maintained to continue with the new processes in the following projects, the positive results appeared. There are more methods in the group of agile methods. In this article we have chosen Scrum as the method which is closely connected to the knowledge management principles and has great potential to drive companies to a higher level when implementing knowledge management in the company. The implications and usability of this method is wide and there is no limitation to applying it to the software development projects solely. This makes it very interesting also for other project-oriented companies who are searching for a new better way of realizing their projects.

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II. Agile initiatives

Several initiatives were realized in the past years that have helped in creating publicity, methodological patterns and general awareness of the methods to the relevant subjects. The event with the highest impact is definitely the Agile Manifesto. In February, 2001, seventeen independent 'lightweight' software methodologists and thinkers met to talk and find common ground. Amongst them were Scrum cofounders Jeff Sutherland and Ken Schwaber, together with Mike Beedle, who worked on the initial Scrum patterns and co-authored the first book on Scrum. The group named themselves 'The Agile Alliance' and agreed on a Manifesto for Agile Software Development. They further defined a set of twelve principles behind the manifesto [7].

The principles of agile development as stated in the Agile Manifesto are [5]:

1) Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2) Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3) Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4) Business people and developers must work together daily throughout the project.
5) Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6) The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7) Working software is the primary measure of progress.
8) Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9) Continuous attention to technical excellence and good design enhances agility.
10) Simplicity—the art of maximizing the amount of work not done—is essential.
11) The best architectures, requirements, and designs emerge from self-organizing teams.
12) At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

At the moment there are many individuals, teams, formal and informal groups, companies and other subjects that are dealing with agile methodology and agile methods consultations.

III. Origins and Basic Principles of Scrum

Scrum originated as a new approached within the agile methods group. The Agile family of development methodologies was born out of a belief that an approach more grounded in human reality would yield better results. Agile emphasizes building working software that people can get hands on with quickly, versus spending a lot of time writing specifications up front. Agile focuses on small, cross-functional teams empowered to make decisions, versus big hierarchies and compartmentalization by function, and Agile focuses on rapid iteration, with as much customer input along the way as possible [4].

From the agile methods family Scrum is one of the fastest growing methodologies. It is based on the principles formulated in 1986 by Takeuchi and Nonaka and was formalized by Ken Schwaber and Dr. Jeff Sutherland in the late 1990´s. In the last 15 years it has been further developed by many adopters in theory and also in praxis. Many successful companies adopted Scrum and started to build Scrum teams including Yahoo!, Google, Microsoft, Motorola, Cisco and many others.

Scrum has been formed to dismantle the lurking weaknesses of the traditional project organization methods. These include project manager enormous responsibility for the project outcome, low project team members commitment, long development cycles, diminishing team member motivation, etc. The traditional project organization seems perfect in theory. It follows a defined order of steps to come from the idea to the final results. These include targets setting, features identification, project phase planning, deep analysis, step-by-step development, testing and deployment, all repeating in a cycle until the project is finished. However this approach failed to perform in praxis due to its nature – it is complicated, lasts longer and uses people.

In Scrum all the responsibility is taken from the project manager. Also in the classical project organization methodologies there is a team who is delivering the project outcomes. In Scrum the principles of team organization changed. There is no centric organization present and all goal settings, motivation and coutput delivery responsibility is transferred on the shoulders of the whole team. This does not means there is no team leader present in the team. The team consists of more people with various competences and roles, however the leader is formed only naturally not formally. All members have the same position, rights and responsibilities no matter if they are senior managers, developers, testers etc. This situation allows team members to be creative, responsible and finding solutions to emerging problems [16].

The main principles of Scrum have been stipulated many times, the most comprehensive regarding the team organization and competences is this list [7]:

- the team is given clear goals,
- the team organizes itself around the work,
- the team regularly delivers the most valuable features,
- the team receives feedback from people outside it,
- the team reflects on its way of working in order to improve,
- the entire organisation has visibility into the team's progress,
- the team and management honestly communicate about progress and risks.

IV. Scrum Process

In the centre of Scrum there is the team, however, also other important roles occur in the Scrum project. The Scrum Master is the person who is responsible for monitoring the process and managing its correct methodology and smooth run. Although the role of project manager is eliminated in this scenario, there is a operating space for the project managers to become a member of the team. Also, the Scrum Master can be compared to the project manager. Deemer in his paper defines his role very clearly: In simplest terms, the manager in Scrum is less of a "nanny" for the Team and more of a mentor or "guru," helping them learn, grow and perform. This is the shift from "Manager 1.0" to "Manager 2.0. [3]. The Product Owner is the person who has clear vision of the project outcome (product features, software features etc.) and is responsible for forming them and communicating them to the team. At the following figure the Scrum process is visualized [4].

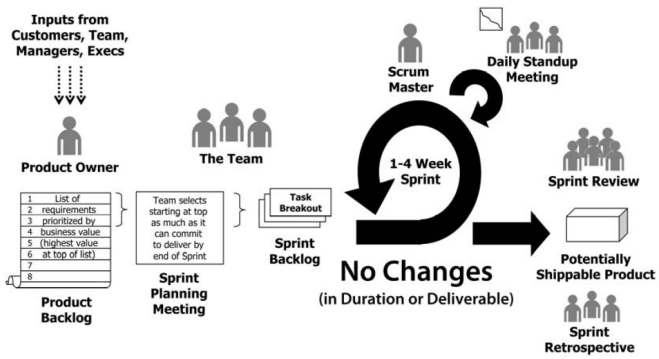

Fig. 1 Scrum process visualization

At the project start the product backlog is created. Is consists of all requirements on the product. They are formed by the product owner and presented to the team on the first meeting. After that the team organizes its internal meeting (sprint planning meeting), where they analyze the requirements deeply and find the possibilities how to fulfill the requirement. They decide which of the requirements will be dealt with in the first sprint. A sprint is a time lapse which is fixed and usually lasts 1-4 weeks. In this period the team meets periodically (each morning) and works on the project. At the end of each sprint a functional product has to be delivered to the product owner with all necessary components (hardware, software, documentation, packaging and marketing materials).

As mentioned before, the project manager is transformed to the scrum manager in this methodology. Many of his responsibilities are cut off and his role is transformed more to the consultation than the management level. We are listing the competencies of the project manager that are needed in the traditional project organization schemes and those which are no more needed in Scrum [3].

TABLE I
PROJECT MANAGER COMPETENCES TRANSITION IN SCRUM

Project manager tasks	Not needed in Scrum
Help remove blocks that the Team is not able to resolve by themselves	Decide what work needs to be done
Provide advice and input to the Team on Technical difficulties that come up	Assign the work to Team members
Do regular 1:1 meetings with Team-members, to provide coaching and mentoring	Keep track of what everyone on the Team is doing
Give input on how to make features better	Make sure the Team gets their work done
Stay abreast of developments in tools and Technologies Team is using	Make commitments to mgt about how much Team can do by a certain date
Plan training and other skills development or Team-members	Be responsible for the Team meeting the commitments I've made to management
Stay up to date on industry news and developments	Do weekly status update report for management
Anticipate tools, skills and other future needs	Do weekly Team staff meeting
Plan and manage budgets and financials	
Give input on what features / functionality the Team should build	
Do performance evaluations and provide feedback to Team-members	
Do career development and career planning with Team members	
Recruit, interview and hire new Team members	
Remove Team members who are not able to perform well within the Team	

When looking at the list of project manager tasks we can argue that in various companies some of the activities is covered rather by other roles or department including Human Resources, Technical Department or Operations.

V. SCRUM AND KNOWLEDGE MANAGEMENT

Scrum is a methodology or tool that is based on the personal responsibility of each member of the team. The team with its self-organization learns very quickly and the knowledge sharing is much more intense than in traditional project organization schemes [6]. If a organization thinks of or is implementing knowledge management and at the same time the organization is project-oriented, it should think of applying Scrum principles in its projects. We have prepared a combination matrix which defines the relationship between the fundamental principles of knowledge management regarding to the Scrum methodology [15].

TABLE II
KNOWLEDGE MANAGEMENT PRINCIPLES AND SCRUM PRINCIPLES COMBINATION MATRIX

Knowledge management principle	How is this principle handled in / supported by Scrum
People will focus and work more effectively through a shared vision and values, and the knowledge management strategy must be aligned to this	There is a clear vision of the project defined and communicated by the product owner to the team members. They have direct access to this vision and can participate on its modification. They have also direct impact on the vision fulfillment.
What have we learned today, as a 'learning organization', is sometimes more important than what tasks we performed today	The self-learning is strongly supported in the teams, as the organization is built by teams, they form the learning organization
Practice competitive collaboration	Active cooperation inside the team is essential. The members know each other closely, meet on regular basis, communicate informally. The collaboration is also realized besides the team when participating on the product vision in close cooperation with the product owner.
For effective organizational knowledge management to occur, work plans, work processes and systems must be improved to include more collective, systematic and continuous learning and knowledge processes.	The planning gets reasonably improved with Scrum. The plans are binding to the team and thus the product is delivered on time. The processes work fine based on the day-to-day close cooperation. As the features and their implementation is discussed throughout the team, each member is aware of the way how to realize the feature. Thus the processes are smooth and the work lasts shorter.
Knowledge naturally resides, thrives, and grows in knowledge ecologies	The team is a ecosystem enabling the knowledge creation and growth.
Knowledge systems and tools are implements for knowledge working. They should be to support knowledge asset driven strategies, processes, methods and techniques. Be knowledge asset driven, not tools driven.	Simple but functional methods are used to capture and share the knowledge. There are no sophisticated time consuming tools used to plan and realize the knowledge distribution. Tacit knowledge is being discovered by the team confrontations.
Partners, customers, stakeholders don't know what they need to know until they need to know it.	The product owner and in some cases the team directly gets in touch with the customers, partners and stakeholders. They are communicated the ideas on the various improvements and innovations which have been discovered while working on the product.
If only we knew what we know, we would be three times more effective tomorrow.	The ambition is to keep the team stable in time and work on the projects together. This helps them to preserve and reuse the gained knowledge. This is way more effective than simple transformation of the knowledge to explicit and storing it in the knowledge information system.

VI. Conclusion

A key aspect of the present in all markets has become the trend of the best possible satisfaction of the needs of customers whose requirements keep growing. Firms that want to succeed in the global market competition must be able to newly capture the role of customers in the whole process of development, production, sale, implementation and use of product [17]. In this fast changing environment and highly competitive markets it is a must for the companies to dynamically change its processes and work methods.

Knowledge is becoming the basis of wealth growing, successful companies produce new knowledge, they spread it through the whole company and quickly transform into new technologies and products. In the global world, competition is growing very intensively, distances play almost no role. Network orientation with changeable and quite open borders (limits) is putting through in the management on the contrary to the tough hierarchic structure. New market environment is influenced by the use of technological progress. Thanks to a permanent up-to-dating of information databases a company is able quickly to react to customers' wishes and adapt itself to changing market conditions [11].

The switch to project oriented approach is only the first step towards the ability to deliver the products and services on time and with an extra added value. Scrum is a innovative but proved methodology that will help the organization transform to the learning organization and boost up the process of knowledge management principles successful implementation.

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