

# METHODOLOGY TRENDS AND ROLE OF LEADERS IN INFORMATION AND COMMUNICATION TECHNOLOGY PROJECTS – EXPERIENCES OF USING AGILE PROCESSES

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## Abstract

Nowadays, business environment is extremely dynamic and complex. Growing complexity trends mostly hits information and telecommunication industry and its surroundings. There is constant need for quick response, in order to adapt to new strategies and invent new models, methods and techniques. Surroundings require flexibility and adaptability, while on the other hand different stakeholders such as customers, organizations and its employees strongly demand fulfilment of already defined objectives.

Project management is discipline that enables achievement of business objectives and conducting the overall business strategy of a company. Many successful companies have already accepted and implemented it within their organizations. The crucial element of successful project management is its methodology. Agile methodology is currently one of the widely used and the most popular ways of working in information and communication technology (ICT) projects. There are different processes and techniques within agile framework such as scrum and Kanban, often being complementary to each other. All these trends are necessarily influenced by traditional organization set up's, roles of key factors and lead to different levels of transition and adaptation activities.

The article presents the latest methodology trends, focusing on applications in ICT projects. The best practice analysis has been performed as well as methodologies implementation benefits have been provided as outcome of conducted survey and statistical analysis of obtained data.

**Keywords** - project methodology, agile, scrum, Kanban, leaders, skills

## 1 INTRODUCTION

High complexity, extreme dynamics, strong competition, deadlines ... Is there anyone in any business not facing these elements on a daily basis? Information and communication technology (ICT) environment is characteristic example, since it has been heavily influenced by these factors due to its technology nature and increased needs of individuals, enterprises and entire society for ICT products. Therefore, there is strong push on enhancing ICT projects by adopting flexible and efficient models and practices. Software development outputs had to be optimized, the great efforts were taken in the planning phase of classical projects, while those were faced with poor conversion in a rapid changing environment. The focus was on quantity improvements first starting with "as much as needed" to "no more than necessary" and quality slogan "visible to the next in development in chain" to "visible to customer".

Nowadays, everybody is talking about Agile. Throughout the world, information technology (IT) and software engineering organizations are embracing agile methods to take the advantage of incremental and iterative delivery benefits. Large corporations and government are increasingly directing ICT software products developers to be agile, while on the other hand business practices related to marketing, supply, procurement, project management and systems definition are far from being agile. These organizations considerably outweigh software development, both in budget and in influence. While more software developers are living in an agile world, the business continues to live in a waterfall. This conflict will not be easily resolved, but the results of applying agile in software development clearly show the way forward. It seems to be a natural path to apply agile practices in the whole business chain.

## 2 METHODOLOGY TRENDS IN INFORMATION AND COMMUNICATION TECHNOLOGY

Project management methodology has evolved through the history. It started from the set of processes which had been treated as 'nice to have' up to the fully structured methodology. Implementing project management into daily operations has been considered as necessity just from 1990s. There are six driving forces for project management implementation [5], such as: capital projects, customers' expectations, competitiveness, executive understanding, new project development and efficiency and effectiveness. As a part of the comprehensive research conducted within Croatian companies [9], respondents were asked to rate importance of these drivers using 1-5 Likert scale (1 - not important at all; 5 - highly important). All the drivers have mean value higher than 3.7 what proves the need for project management. The largest mean value related to efficiency and effectiveness is 4.20. However, it is always difficult to measure the actual value of project management. Therefore, Project Management Institute (PMI) initiated extensive field study [8] during 2005-2008. The research was based on 447 interviews, 65 research cases and 418 project summaries. This multi complex analysis showed convincing evidence of project management methodologies added values, identified in cases when those were applied in a proper and structured way. The authors [8] clearly stated that project management delivers value. There are both tangible and intangible values like for example increased stock values due successfully delivered projects (tangible) or increased customer satisfaction level (intangible). Creating operable and functional methodology is a very demanding task. Today, most companies manage their business by projects, so applied methodology and sequence of tools represent crucial elements. It requires adjusted methodology based on the real needs. Also, it can be pointed out that development of standardized project methodology is not a necessity for simple and short projects but it is inevitable for large and complex projects. Organisations applying this methodology must not forget the important prerequisites for its successful application, such as corporate culture and defined processes and tools for managing projects. The key success factors and organizational excellence lie in the proper selection and integration of processes, tools and concepts. The theoretical materials are often idealized and many methodologies remain only in theory. The question is how to embrace theory and make it real in the practice. In order for projects to succeed, it is necessary combination of theory, instinct, leader's experience, practice and team, which seeks to achieve balance between theory and defined processes.

Recently, several theories have been recognised and have become pioneers. Agile development is definitely one of them. It was initially conceived for the purpose of software development. Software projects have been often too slow, late, poor quality and often exceeding budget. Agile development tends to bring closer clients and software designers as executors of the project. The word agile is not selected randomly. It emphasizes flexibility of approach to a subject. Agile development does not directly mean faster delivery, with fewer defects, to deliver with higher quality or to have higher productivity. On the contrary, the meaning of agile development is to be agile, to be able to adapt quickly and accept imposed changes, to adapt more quickly than the surrounding, i.e. competitors. Thus, faster delivery and higher quality will be result of the agility. Agile development is not based on practices, but on a set of values that support agility itself. Table 1 shows four basic principles of agile development [7].

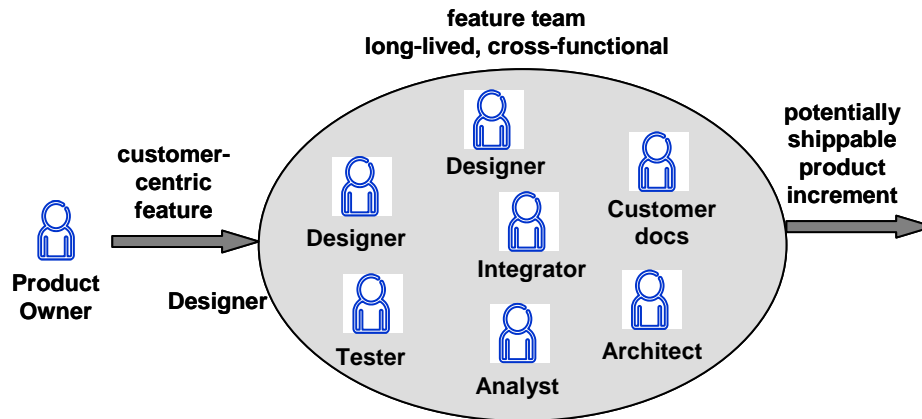
**Table 1. Agile cornerstones**

Individuals and interactions	<b>over</b>	Processes and tools
Working software	<b>over</b>	Comprehensive documentation
Customer collaboration	<b>over</b>	Contract negotiation
Responding to change	<b>over</b>	Following a plan

**Source: Agile manifesto, [7]**

Team is basic organizational tool of agile methodology its central point. The idea is that team should be long-living. In this way, people in the team will get more familiar to each other and they will increase their performance during the time. Also, they should be preferably located at one place working together throughout the project life cycle, being continuously in contact and close collaboration with clients or the orderer of the project. Regarding competences and skills, team should be hybrid, cross-functional (including various specialists), consisting of 5-9 team members.

An example of a feature team is shown on Fig 1.



**Fig. 1. Feature team**

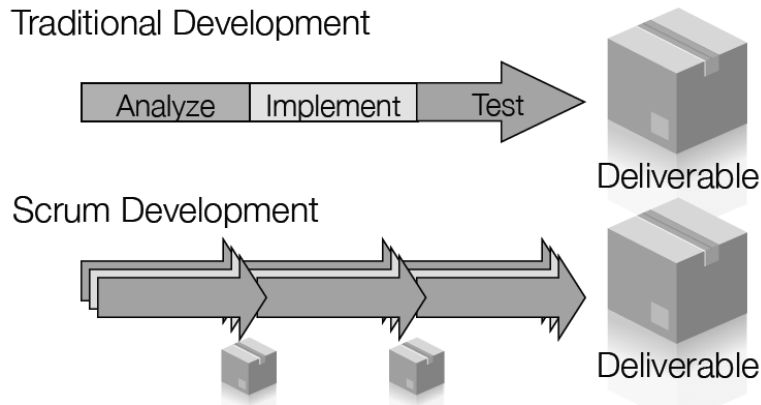
If a person is positioned on one role, it does not mean that it is his/her single role and responsibility, but rather highlights one's primary skills and competences. Fig. 1 implies multi-skilled team, competence diversity and broadness. Teams are self-organized and hybrid versus traditional functional teams with pre-defined and functionally distributed responsibilities. Those have been given the responsibility and the authority in order to allocate themselves. Team members need to communicate to each other on a daily basis, coordinate scope and demonstrate product performance to the client whenever they request it, but as mandatory at the end of the each iteration. The focus is on frequent high-quality deliveries and products in the form of added-valued functionality, from the client's perspective.

Projects based on agile methodology require less planning since teams are transparent and the results are visible at the end of the each iteration. For both agile development and lean thinking it can be stated that they converge and complement each other with considerable similarities. Agile approach is more project-based, while the lean approach is more related to the organization and its culture and behaviour. Many practices that are promoted by agile development have been around for years. However, agile methodologies combine multiple areas, such as project management, engineering practices and quality assurance systems, all guiding agile development teams throughout the process. The most popular agile methodologies are Scrum and Kanban. Additionally, many hybrid approaches have been developed and applied. Each agile method is unique in its approach, but they all share common vision and key principles of the Agile Manifesto. Their core idea is to incorporate iterative development and continuous feedback in order to successively refine and deliver working software. Today, the agile methodologies have spread out from software development and expanded in new (and sometimes unexpected) areas, such as: finance, insurance, telecommunication, pharmaceuticals or manufacturing.

## 2.1 Scrum development

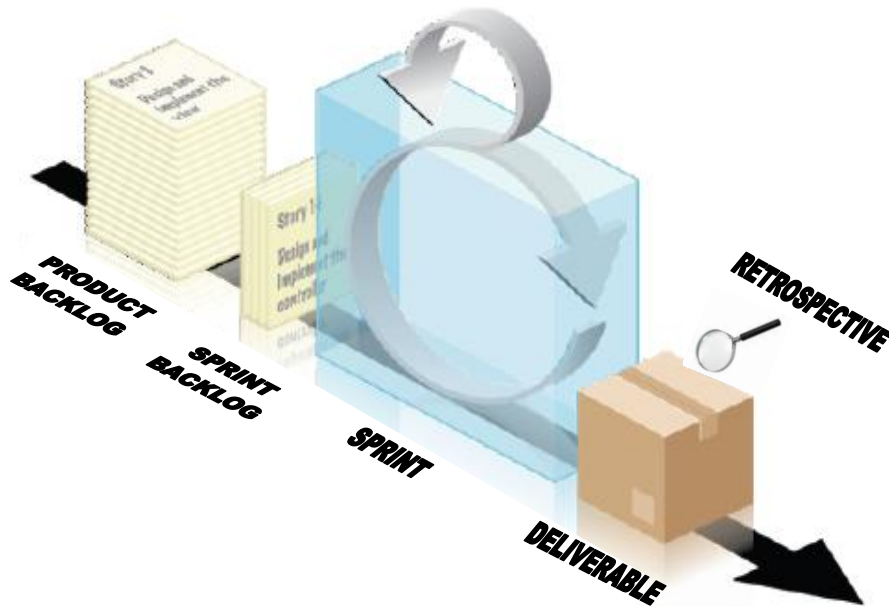
Scrum is a lightweight agile software management framework with broad applicability for managing and controlling iterative projects of all types. Lately, scrum development has gained increasing popularity in the software community, due to its simplicity, proven productivity and ability to work well with various agile software engineering practices. Fig. 2 presents high level comparison between traditional incremental development and development according to scrum methodology. Scrum feature team is cross-functional and cross-disciplined, so team can work on the complete feature, covering end-to-end (E2E) scope of the work being able to accomplish analysis, design and test phases of the scope in parallel. Team works independently and is empowered for the whole deliverable. Considering these approaches, such team constructions should increase individual and team learning, because of E2E responsibility and wide range of skills competences. It should also simplify planning and eliminate waste of handovers between different developmental phases from the traditional development. Besides scrum team, scrum methodology emphasizes roles of product owner and scrum master. Product owner represents the customer. This role ensures that the team is working on the "right stuff"

from a business perspective. Product owner shapes the scope for the team by preparing client-oriented items, so called user stories. Scrum Master ensures efficiency of the team, removes their obstacles and keeps team members focused only on delivering the objectives within each iteration. Scrum master is neither manager nor controller of the team, since teams are self-organized with full responsibility for content of the product and agreed deliveries.



**Fig. 2. Traditional versus scrum development**

Specific scrum terminology is provided to define the processes used to manage activities and the work itself. Major terms are presented on Fig. 3.



**Fig. 3. Scrum outlook**

Those can be briefly described as follows [5]:

- Sprint - a limited period of time, usually 2-4 weeks, during which defined scope of work has been committed and has to be completed
- Product Backlog - a prioritized list of requirements to be fulfilled in a number of sprints
- Backlog Item - a unit of work small enough to be completed in one sprint and is broken down into tasks
- Retrospective – a meeting held at the end of every sprint to discuss what was good and what needs to be improved in the next sprint
- Burndown chart - a report that shows the team's remaining and completed work

- Impediments - anything that prevents a team member from performing work efficiently
- Daily Scrum - 15 minutes meeting of the entire team answering what was done yesterday, what will be done today and if there are any impediments
- Team velocity - rate at which team delivers business value which is calculated by summing up the estimates of backlog items successfully delivered in the sprint.

Approach of introducing scrum into an organization can be simplified on the high level with the following steps [1]:

1. Split organization into small, cross-functional, self-organizing teams.
2. Split work into a list of small, concrete deliverables and sort the list by priority and estimate the relative effort of each item.
3. Split time into short fixed-length iterations with potentially shippable code demonstrated after each iteration.
4. Optimize the release plan and update continuously priorities in collaboration with customer.
5. Optimize the process by having a retrospective after each sprint.

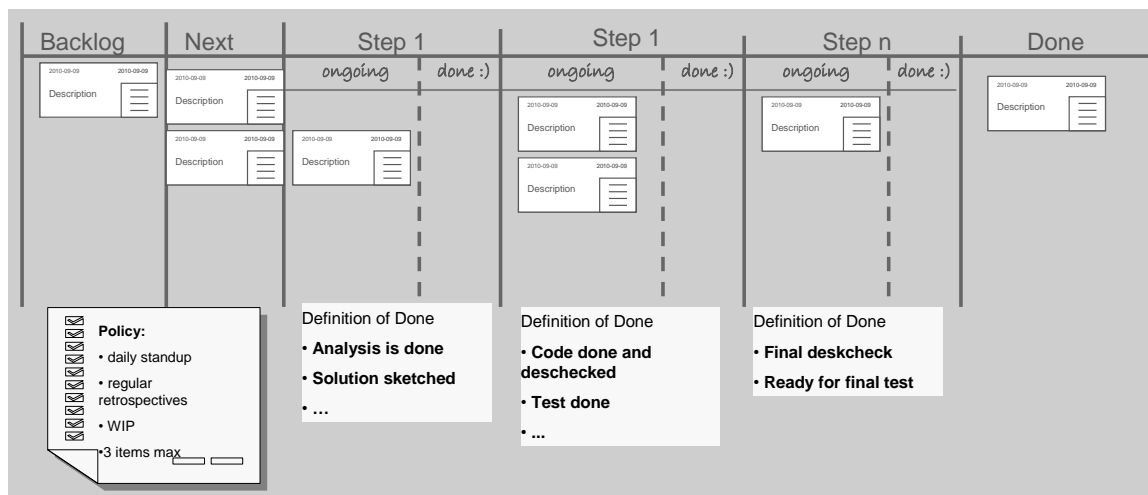
## 2.2 Kanban

Kanban represents more direct implementation of lean product development principles in software development. The word “Kanban” is a Japanese word denoting “Visual Card” [1]. Kanban represents process tool for managing work with an emphasis on continuous delivery, not overburdening the team helping its members to work together more effectively. It focuses on flow of work and it’s less prescriptive approach than Agile. Also it has become a popular extension to traditional methods, such as Scrum and Extreme Programming. This system has been used at Toyota for decades to visually control and balance the production line, which has become almost synonymous with the implementation of Lean principles. Nowadays, the use of Kanban has been spread out in ICT development, maintenance and operations, but as well as out of ICT branch.

Kanban relies on 3 basic principles:

- [I] Visualizing workflow keeping up-to-date
- [II] Limiting the amount of **work-in-progress** (WIP) helping balance the flow-based approach so that teams don’t start and commit too much work at once
- [III] Optimizing leadtime via making explicit policies, measuring flow progress and applying improvements.

Kanban software development promotes continuous collaboration and encourages active, ongoing learning, improved by defining the best possible team workflow. Fig. 4. provides an example of the Kanban board. As seen, the workflow is visualised, workable items are placed on the board and policies are defined. If used properly, Kanban exposes bottlenecks and reduces lead time for individual work items.



**Fig. 4. An example of Kanban board**

The most commonly cited instances where Kanban is extremely successful are software maintenance and software development support activities. This involves fixing production bugs, doing small incremental improvements and completing complex and thorough tasks, non-related to core software development activities like design and test. Both, Scrum and Kanban are process tools helping organizations and their teams to work more effectively giving framework for managing work.

Anyhow, Kanban has to be applied in cases when traditional agile approaches are struggling, more flexibility is required, priority changes on a daily basis (e.g. maintenance and customer support work) or when it is required that transition from traditional ways of execution should be smoother and more gradual. Table 2. provides overview of main differences between Scrum and Kanban [6].

**Table 2. Comparison overview**

Scrum	Kanban
Time boxed iterations are prescribed	Optional, can be event driven instead of time boxed.
Team commits to specific amount of work per iteration	Commitment is optional
Velocity is default metric	Lead time is default metric for planning and process improvement.
Items broken down to the smallest level (selected items shall fit into 1 sprint)	No particular size is prescribed
Cross-function teams are prescribed	Cross-functional teams are optional, specialist teams allowed
WIP limited indirectly (per sprint)	WIP limited directly (per workflow state)
Burn down chart is prescribed	No particular type of diagram
Estimation is prescribed	Estimation is optional
Cannot add items to ongoing iteration	Items can be added any time (if within WIP limit per phase)
Prescribes 3 roles: product owner, scrum master, team)	Doesn't prescribe any roles
Scrum board is reset between iterations	Kanban board is persistent

Source: Kniberg and Scaring, [6]

### 3 ORGANISATIONAL AND LEADERSHIP ASPECTS OF AGILE ENVIRONMENT

Although, application of modern methodology trends within ICT contributes to better project results, any project wouldn't be successful without proper organisation regarding human resources (team members) and choice of good leader, possessing leader's characteristics. Dealing with multiple projects, project leaders are meeting different obstacles, such as constraint budget, limited time or overburden schedules. In the same time they are struggling motivating team members' and managing the organisation in order to provide positive results. Last decades have brought dynamic changes within business in general as well as within ICT, requiring new leading trends and techniques.

Since the manager's leadership role is of the great importance in motivating people and creating an effective working environment, in order for the project team to meet greater challenges in today's economy [12], this was the subject of many research projects and scientific papers. Turner and Muller [12] suggest that different project leadership styles are appropriate in different stages of project life cycle and the project manager has a leadership role in creating an effective working environment for the project team. Vittal [13] continued on work of previous authors, considering that leadership role is crucial to facilitating various project success factors that contribute to project performance. The author also argues that a project manager's leadership roles and responsibilities toward a project team and

stakeholder influence the project outcomes and performances. However, project sometimes fail to meet project targets due to poor morale, lack of motivation, poor human relations, poor productivity and lack of commitment from employees [4]. Additional problems that projects are facing with are the facts that project has to manage teams comprising of different disciplines and the fact that projects are characterised with complexity, uncertainty, risk and unknowns. Nevertheless, it is a common knowledge that all projects by definition have certain common characteristics and processes, such as people-related management and leadership roles and responsibilities of the project manager [13].

Consequently, using literature review and many previous findings and research projects [13] provide the list of the most important people-related factors which drive project performance. These findings are as following: a) create clearly in communication (defining project goals and project outcomes early in the project), b) define roles and responsibilities (imperative for improving performance and manage conflicts), c) communicate expectations (eliminates perceived and actual incidences of not delivering expected results), d) employ consistent process (assists in improving operational efficiency, managing risk and reducing ambiguity), e) establish trust (promotes transparency and openness in the communication), f) facilitate support (willingness of everyone in the organisation to support the project) and g) manage outcomes (clearly defined project mission and objectives would help in developing a formal evaluation of project outcomes to determine project success). Further research showed that all mentioned factors were interrelated.

Moreover certain competences identify successful leader and leadership style. Duelwicz and Higgs [2] suggest three types of competences explaining most managerial performance: intellectual (intelligence and problem solving skills), managerial skills (knowledge and skills of management functions) and emotional (combination of emotions, behavior and motivation). Furthermore, Duelwicz and Higgs [3] have identified 15 leadership competences segmenting them into three previously defined groups. Those are: intellectual (critical analysis and judgment, vision and imagination, strategic perspective), managerial (engaging communication, managing resources, empowering, developing, achieving) and emotional (self-awareness, emotional resilience, motivation, sensitivity, influence, intuitiveness, conscientiousness).

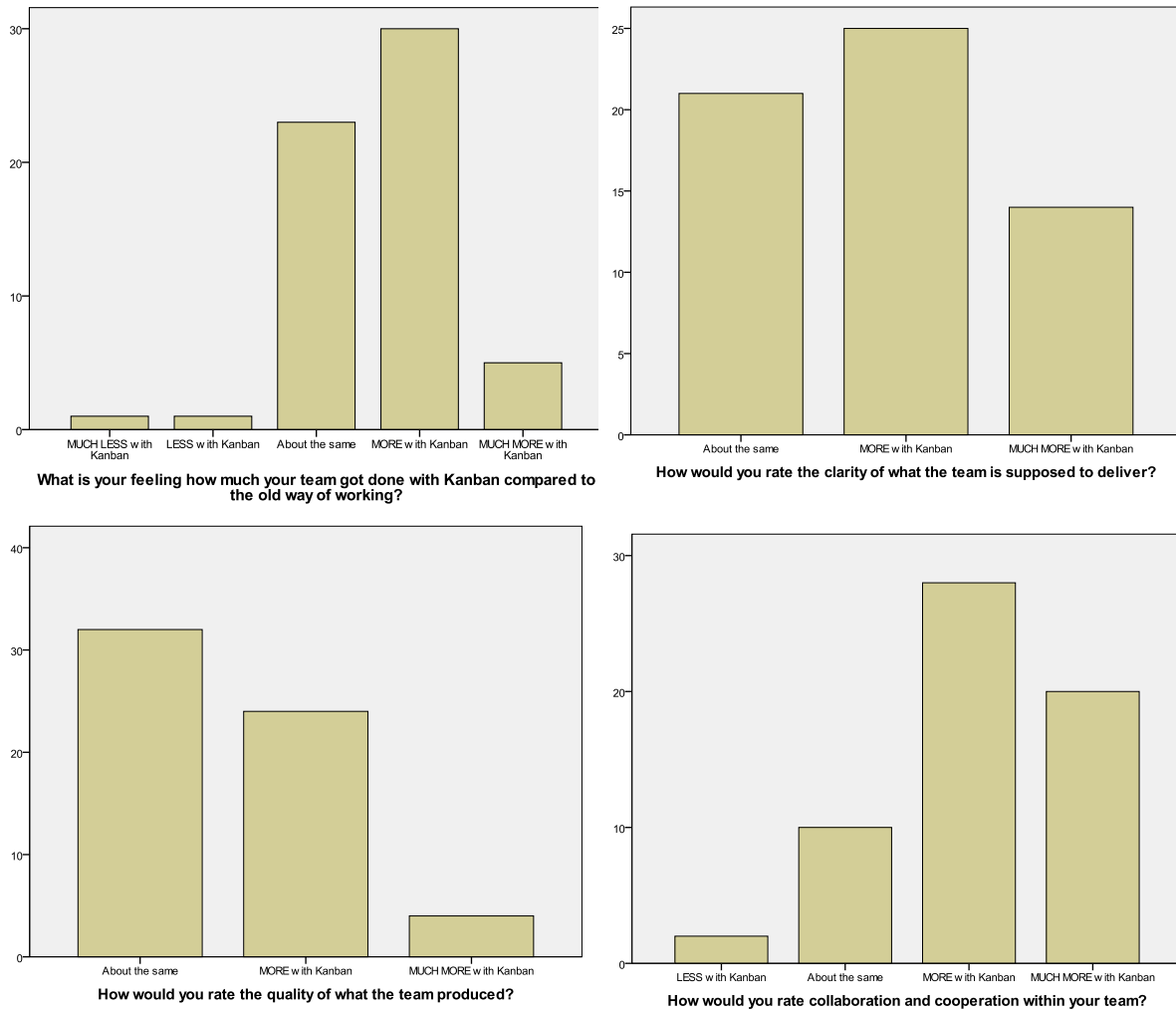
Finally, besides people-related factors that drive project performance and the most important competences explaining managerial performance, in order for the project best performance communication and collaboration are inevitable between owner and project manager. The owner needs confidence and should empower the project manager and strive to have a cooperative working relationship [11]. Authors [11] suggest balance of formal and informal communication, maintaining regular face-to-face meetings and providing quantitative data to analyze performance in order to mutual satisfaction which is a building block for long term business relationship.

#### **4 RESULTS OF THE EMPIRICAL RESEARCH**

As agile and its “derivates” are extremely popular buzzwords today, numerous researches have been conducted, but providing different research results. One of the most comprehensive and detailed results can be found by State of Agile Development Survey Results [10]. Reports are provided on yearly basis including six researches (2011 was the last year included in the survey). The research was focused on software development and was delivered to companies of all sizes. Trends show the increasing number of large companies using more and more projects, while at the same time management is less resistant to adopting agile methodologies for running projects. The most significant recognised benefits are in the area of project transparency (77%), ability to manage changes of priority (84%), increased team output (75%) and faster time to market (71%). The top obstacles have been seen in inability to change organisational structure (52%), missing people with right skills (40%) and overall resistance to change (39%).

Several research tools and sources of information have been used in order to collect and analyze data for the purposes of this paper. The main survey instrument was a questionnaire created to collect feedback from Kanban practitioners taking different roles (leaders, engineers, product owners, scrum masters) and also participating in different assignments (members of leadership teams, maintenance projects, supporting activities). There were 60 respondents from Ericsson as a global company in total. Respondents were from 7 different countries and located on more than 10 different geographic sites. In addition to the questionnaire, information was directly collected from several different software maintenance projects that piloted Kanban introduction as well as outcome of daily observation of

phenomena and processes in the Kanban workplace. Summary of the results of the survey are presented in the Fig. 6. This figure shows how people value benefits of applying Kanban in daily operations. Some statistical tests (Mann-Whitney U test) have been conducted to check if there is statistically significant correlation between different variables, such as type of person's work or role and positive tendency to continuously apply Kanban (p value is 0.457 which is higher than 0.05) and overall feelings about working in cross functional teams, taking into account benefits and obstacles. The top benefits that respondent have rated are increased teamwork and cooperation, following with focusing on right priorities and team empowerment.



**Fig. 6. Summary of survey results of applying Kanban**

On the other side, the major obstacles were seen in immaturity and low experience as well as tendency to stay in comfortable zone and resistance to change. There were also positive reactions arising from pilot introduction projects. Majority of pilot participants expressed opinion that Kanban is easy to deploy and accomplish smaller “do-able” items. Daily meetings are perceived as efficient where on the board workflow allows team to easily perceive project task progress with priorities, delivery date and individual contributions. This decreases the level of misunderstandings and reminds people of any parallel works or work that needs to be started soon giving the right sense of the urgency. The major gain of transparency is quicker issuing of raised problems and obstacles resulting into immediate actions where bottlenecks and needs for external resources are easily visualized. Additionally, it enables team members to see the clearer picture of what they are doing individually, as they are usually familiar with other team members’ actions and inter-linked activities.

As knowledge sharing is improved, continuous learning is another positive outcome. Specific expertise is not just left in one persons head. At the end, majority of piloted teams working in software



maintenance projects improved leadtime. On the other hand, it's natural to appear reluctance by some individuals at least initially, but at the end the critical mass has overcome such situations.

## 5 CONCLUSIONS

Lifelong learning in rapidly changing environment is priority due to its importance in employment, economic success and social integration. Continuous education is highly desired in all industrial areas today, but for information and telecommunication technology professionals is almost mandatory. There is a need to act fast, to adapt quickly to new business strategies and to adopt new business models. Agile methodology is one of such models being able to cope with business reality. It proved to be efficient through metrics, surveys and facts. The major improvements are shown in the area of:

- team and individual empowerment and increased efficiency through teamwork and cooperation
- better addressing of priorities and identification of bottle necks
- better teams dimension
- at the end, it generally increases productivity and reduces waste efforts.

It's needed to stress importance of leaders in organization in the whole change management process and transition to agile ways of workings. The importance refers to the line and project leaders at different levels. Firstly, leaders are recognised as key mediators and enablers of the transition. Thus, they have to accept new concepts, culture and adapt their mindset to be able to drive the transition, but at the same time they have to accept change of their own roles in the future of agile environment, transiting themselves from more direct driven and controlled behaviour to the supportive and coaching one. These have been seen as mandatory prerequisite for successful organizational transformation.

The research results show that people react positively to introduction of agile methodology and adopted processes and tools quickly in daily work. Applying agile methods has increased efficiency and effectiveness in daily operations, but also requires strategic choice of any organization striving to survive on the market in order to be successful and competent in the future.

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