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ENHANCING AGILE TEAM PRODUCTIVITY WITH METRICS

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Summary. *Article explores the significance of Agile methodologies and their role in enhancing the efficiency of Agile teams through the utilization of metrics. It underscores the importance of visualizing the workflow, establishing Work in Progress (WIP) limits, and promoting a culture of ongoing improvement within Agile settings. The fundamental principles of Kanban, which encompass the visualization of work, WIP limitation, focus on flow, and continuous improvement, form the foundation of the approach discussed in the article. The concept of «Flow» is highlighted as a core element of Agile methodologies, signifying the uninterrupted progression of work items through the development pipeline. Flow metrics provide valuable insights into the well-being and progress of Agile teams. The article also delves into practical strategies for implementing these metrics, addressing common challenges such as bottlenecks and distractions. Additionally, it introduces Cumulative Flow Diagrams (CFDs) as visual tools for comprehending work distribution and identifying workflow inefficiencies. In the dynamic landscape of Agile, this article serves as a roadmap for harnessing the potential of metrics to continually enhance the effectiveness of Agile teams, enabling the precise and consistent delivery of value.*

Key words: *agile methodologies, metrics, visualizing workflow, continuous improvement, software development, project management, transparency, collaboration, team effectiveness.*

Statement of the problem. Agile methodologies have revolutionized the landscape of project management and software development, emphasizing flexibility, collaboration, and rapid adaptation. In the dynamic world of software development, where there is constant change and ever-evolving customer expectations, Agile practices provide a solid framework for teams to thrive [1]. However, the path to success in the methodology is not without challenges, and organizations are often faced with the need for continuous improvement to improve the effectiveness of teams.

One of the powerful catalysts for this improvement is the intelligent use of metrics. Metrics provide a means to quantify, analyze, and optimize Agile processes, thereby facilitating smarter decision-making and more accurate course correction. In this article, the field of «Improving Agile Teams with Metrics» is studied.

We explore the important role metrics play in agile environments, offering insight into how they can be used to improve workflows, increase transparency, and ultimately improve the efficiency and productivity of Agile teams. By studying such basic principles as work visualization, setting limits on work tasks (WIP) and fostering a culture of continuous improvement, we unravel the intricacies of the effective use of metrics [2].

In this study, the concept of «Flow», a fundamental principle of agile methodologies, is emphasized. It embodies the continuous movement of work items through the development pipeline, a phenomenon that underlies Agile for faster and more consistent delivery [3]. Flow

metrics provide a window into the health of agile teams, helping stakeholders measure progress and identify areas ripe for improvement.

As we navigate the landscape of Agile metrics, we also look at practical strategies for implementing these measures, from introducing new workflow states to setting realistic WIP limits [3, 4]. These strategies enable Agile teams to overcome common challenges such as bottlenecks and distractions, resulting in shorter cycle times and faster value delivery.

In addition, the value of cumulative flow charts as visual aids that illuminate the distribution of work in Agile teams is studied. By deciphering these diagrams, teams can pinpoint bottlenecks, diagnose workflow inefficiencies, and adjust their processes for optimal results.

In a world where Agile adaptability and agility reign supreme, this article serves as a guide to harnessing the power of metrics to continually improve the performance of Agile teams [4]. This suggests that with the right metrics, Agile teams can not only navigate the ever-changing landscape of software development, but thrive in it, delivering value to stakeholders with precision and consistency [5].

The objective of the work is to research and emphasize the importance of using metrics to improve the effectiveness of Agile teams. The work is aimed at highlighting the principles of Agile and the role of metrics in improving the efficiency of teams, with the main emphasis on the concept of «Flow» and the principles of Kanban. The text examines the importance of workflow visualization, setting work-in-process (WIP) limits, and fostering a culture of continuous improvement in an Agile environment. In addition, the paper explores practical strategies for implementing metrics and solving common problems such as congestion and distractions. The work also introduces, for the first time, Cumulative Flow Charts (CFCs) as useful tools for tracking the progress of work items, identifying bottlenecks, and supporting transparency and collaboration across teams. In general, the purpose of the work is to emphasize the importance of metrics and CFC in improving Agile practices and achieving higher efficiency and effectiveness of projects.

Formulation of the problem. Setting the task for this work includes the following stages and tasks:

1. To considere modern Agile methodologies and their importance in the context of project management and software development.

2. To determine how metrics can be used to improve the work of Agile teams.

3. To analyze the main principles of Kanban and their role in ensuring the stability and efficiency of the work process.

4. To emphasize the importance of the concept of «Flow» in Agile methodologies and its influence on the speed and sequence of project delivery.

5. To consider the role of workflow metrics in evaluating the effectiveness of Agile teams and identifying areas for improvement.

6. To develop practical strategies for implementing metrics and Kanban principles in the workflow of Agile teams to collect data and improve results.

7. To introduce the concept and importance of Cumulative Flow Charts (CFCs) as a tool for analyzing progress and identifying bottlenecks in the workflow.

8. To demonstrate the importance of metrics and CFC in optimizing Agile practices and achieving better efficiency and effectiveness of projects.

The tasks of the work are to research, analyze and explain the role of metrics, Kanban principles and Cumulative Flow Charts (CFC) in improving the work practices of Agile teams

and in achieving greater efficiency and effectiveness in the field of project management and software development.

The importance of flow in software development. What is a Flow? Flow means to move in a uniform continuous flow (current) [6]. For information-based work such as software development, the ability to visualize and control flow is essential for achieving faster and more consistent delivery.

There are four main principles of Kanban:
• Visualization of work;
• Limitation of work tasks (Limit WIP – Work in Progress);
• Focus on Flow;
• Continuous improvement.

A consistent workflow is essential for faster and more reliable delivery. On the one hand, we can say that Kanban is a Japanese word that means «visual sign» and the work items visually represented on the Kanban board. Based on incremental iterative development, we can say that teams focus on reducing the time needed to develop a story from start to finish and focus on continuous delivery [7–9]. In Kanban, the goal is to limit the work flow (set WIP limits) and get the whole team working together to remove blockers.

The concept of «Flow» is important because it gives the team a great opportunity to:
• Evaluate ALL types of work
• Allow the team to add value (shipping working software) earlier;
• Provide greater transparency;
• Understand where the team's problems arise (backlist items), whether there is any part of the process that is always blocked;
• For the Scrum Master, provide a better indication of «sprint smells» and whether the team is meeting their sprint commitments;
• Direct attention to the right aspects;
• The more states available, the more we gain from tracking Cumulative Flow.

One important way to improve the way the team works is to sit with the Agile team and identify additional columns that team members want to add to the Kanban board (User Stories) and then add them directly to the software tool (Jira, Azure DevOps, etc.) [10–13]. For example, if the team currently has one active column on the board, they need to find ways to break it up. The board may include the elements:
• Under development;
• Awaits verification;
• Under consideration;
• Awaits testing;
• In testing;
• Locked.

Having multiple states allows the team to gain greater transparency about the progress of each individual work and facilitates better team direction and collaboration.

WIP allows us to set realistic limits on the amount of work that can be done at any given time. Instead of starting something new, the team will work together to resolve obstacles in the flow (for example, if a lot of work needs review or testing). This, in turn, leads to shorter and more efficient cycle times and allows the team to release value earlier [14].

By limiting not only the amount of work we start, but also the work we take on, we can improve team flow and achieve better quality, productivity, and predictability [15]. The team can also direct efforts to measure Lead Times, Cycle Times, and use Cumulative Flow Charts as a visual aid.

Cumulative flow chart. A cumulative flow chart is a graph that shows the number of backlog tasks (user stories, features, tasks, etc.) at each stage of a workflow over a period of time. The chart displays all the states used by the individual commands until the work item is closed. By reading the schedule for a specific day, you can understand the distribution of work at any given time. In addition, it helps to identify bottlenecks after the work has begun.
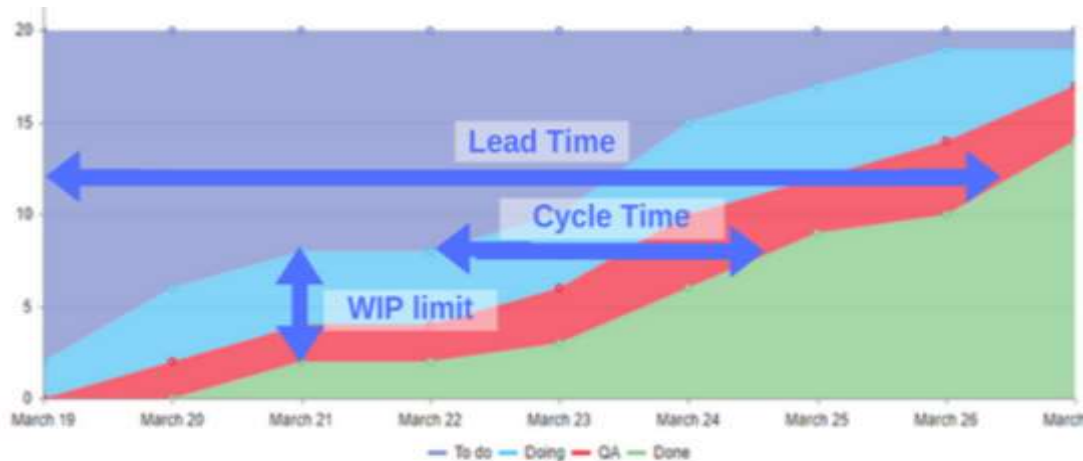

Figure 1. Cumulative Flow Chart

Let's take a deeper look at the importance and benefits of Cumulative Flow Charts:

1. Work Process Stages and Work Elements: Cumulative Flow Charts (CFCs) provide a detailed breakdown of the work process stages involved in a project. Typically, these stages reflect the steps a work item goes through from start to finish [16]. For example, in software development, these stages might include Backlist, To execution, In Progress, Testing, and Completed. Each work item goes through these stages, moving toward completion.

2. Real-Time Tracking: CFCs are constantly updated and reflect the current status of work items. They show how the number of work items changes at each stage, allowing you to view the current progress of the work. This is especially useful for Agile teams working in short iterations or sprints, as it allows for quick changes based on changing priorities.

3. Historical Data: Beyond direct viewing, CFCs also accumulate historical data. This historical view is valuable for identifying trends, evaluating the completion of future work, and evaluating the impact of process improvements over time.

4. Work Breakdown Analysis: By looking at the Cumulative Flow Chart for a particular day or time period, teams and stakeholders can easily assess the work breakdown at any given moment [17]. For example, it can help answer the question of how many items are in the «In Progress» stage compared to the «Testing» stage, providing a snapshot of the team's workload.

5. Identification of Bottlenecks: CFCs are instrumental in identifying bottlenecks in the workflow. Such places are displayed at stages where work elements accumulate or where a slowdown occurs [18]. Timely identification of these locations is essential to optimize workflow, reallocate resources, or adjust priorities to maintain project effectiveness.

6. Team cooperation and transparency: CFCs promote transparency and cooperation in teams and in the organization as a whole [18, 19]. Team members, project managers, and

stakeholders can refer to the diagram to understand the status of work items, facilitating better communication and shared focus on project goals.

7. Scalability: Cumulative flow charts are universal tools that can be used at different levels of the organization [20]. Individual teams can use charts to manage their specific workflows, while high-level KDPs can aggregate data from multiple teams or departments, providing a holistic view of a larger project or initiative.

Cumulative flow charts are an important component of Agile and Lean, providing information on the progress of work items, work distribution, historical trends, and identifying potential bottlenecks. With Cumulative Flow Charts, teams and organizations can make data-driven decisions, streamline workflows, and improve overall project efficiency and effectiveness.

Conclusions. The importance of Agile methodologies and the role of metrics in improving the performance of Agile teams is highlighted in this article, as well as the importance of flow in software development. The Kanban principles, such as work visualization and Work in Progress (WIP) limits, which contribute to faster and more consistent delivery, are considered. The text also introduces Cumulative Flow Charts (CFCs) as valuable tools for tracking the progress of work items, identifying bottlenecks, and promoting transparency and collaboration within teams. Overall, the importance of metrics and CFCs in improving Agile practices and achieving better project efficiency and effectiveness is emphasized.

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ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ AGILE-КОМАНД ЗА ДОПОМОГОЮ МЕТРИК

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Резюме. Досліджено важливість Agile-методологій та їх роль у покращенні ефективності Agile-команд завдяки використанню метрик. Вона підкреслює важливість візуалізації робочого процесу, встановлення обмежень на роботу в процесі (WIP) та популяризації культури постійного вдосконалення в умовах Agile. Фундаментальні принципи Kanban, які включають в себе візуалізацію роботи, обмеження

WIP, акцент на потоку й постійне вдосконалення, становлять основу підходу, що розглядається в статті. Поняття «Потік» відзначається як основний елемент Agile-методологій, що позначає неперервний рух робочих елементів через процес розроблення. Метрики потоку надають цінні уявлення про стан і прогрес Agile-команд. Розглянуто практичні стратегії впровадження цих метрик, вирішення поширених проблем, таких, як затори та відволікання. Крім того, вона вводить Кумулятивні діаграми потоку (КДП) як візуальні інструменти для розуміння розподілу роботи та виявлення недоліків у робочому процесі. В динамічному світі Agile ця стаття служить як дорожня карта для використання потенціалу метрик для постійного підвищення ефективності Agile-команд і точної та послідовної доставки цінності. Також стаття стає незамінною дорожньою картою для організацій, які прагнуть вдосконалити свої Agile-процеси. Вона висвітлює потенціал використання метрик як ключового інструменту для досягнення високої ефективності Agile-команд. Використання метрик дозволяє командам систематично вдосконалювати свої процеси та підвищувати продуктивність. Шляхом збирання та аналізування даних про робочий процес, команди можуть ідентифікувати й вирішувати проблеми, виявляти недоліки та вдосконалювати шляхи співпраці. Точні та послідовні в доставці цінності – це ключові аспекти Agile-методологій. Використання метрик допомагає забезпечити цю точність та послідовність, роблячи процес доставки передбачуванішим та ефективнішим. Команди, які активно використовують метрики, можуть швидше реагувати на зміни в середовищі та ринку, а також вчасно адаптуватися до нових вимог і викликів. Запропоновано чітку стратегію для використання метрик як інструменту для постійного підвищення ефективності Agile-команд. Вона надає організаціям важливі настанови та керівництво для впровадження метрик у їхніх проектах та процесах розроблення. А це, в свою чергу, допомагає компаніям залишатися конкурентоспроможними та успішними в умовах постійних змін та викликів у сфері розроблення програмного забезпечення.

Ключові слова: Agile-методології, метрики, візуалізація робочого процесу, постійне вдосконалення, розроблення програмного забезпечення, управління проектами, прозорість, співпраця, ефективність команди.