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TOWARDS THE DEVELOPMENT OF A METHOD FOR MANAGING TIME LOSS RISKS IN IT PROJECTS BASED ON MODELING THE TEAM'S COGNITIVE PROFILE

V. Ziuziun
Taras Shevchenko National University of Kyiv, Kyiv

The current state of the software development industry is characterized by a rapid shift toward Agile methodologies which, despite their flexibility, introduce specific challenges to professionals' intellectual productivity. One of the most acute contradictions lies in the conflict between the high intensity of team communications and the need for developers to remain in a state of deep, sustained concentration for extended periods of time. Traditional project management approaches often overlook the fact that each interruption of the workflow triggers complex cognitive recovery mechanisms that require substantial time resources. This paper is devoted to substantiating a method that enables these losses to be quantitatively assessed through the lens of the team's cognitive profile as a dynamic project resource.

The central idea of the study is the introduction and formalization of the concept of cognitive viscosity, which was examined in detail in [1] in the context of optimizing Agile team management. Cognitive viscosity is defined as a characteristic that describes the difficulty of returning a specialist to the execution of a complex intellectual task after an external distraction. This metric serves as the foundation for calculating the so-called cognitive debt – the accumulated risk of time losses arising from the continuous fragmentation of the working day. This debt is not a static quantity; it grows dynamically depending on the frequency of interruptions and the depth of task immersion, creating a hidden time deficit that cannot be detected by standard task-tracking tools.

The method is grounded in the understanding that every interruption – whether a message in a messenger or an unplanned meeting – disrupts the current mental model of the task. Restoring this model requires a «warm-up» period of approximately 10 to 15 minutes; however, this duration is not fixed. It depends directly on individual cognitive viscosity and the current complexity of the context. The mathematical core of the proposed approach makes it possible to transform these delays into concrete metrics that can be integrated into the overall graph of project dependencies. This enables a shift from subjective observations of team fatigue to precise forecasting of the risk of missed deadlines, while accounting for the probabilistic nature of intellectual labor.

The distinctive scientific contribution of this work lies in the analysis of cascade effects arising from cognitive losses. When a developer involved in implementing a mission-critical module is subject to frequent external interruptions, their individual cognitive debt increases, leading to shifts in the completion timeline of the associated task. Due to the presence of structural dependencies within the project graph, such delays propagate to related tasks, causing enforced idle time for other team members awaiting the results of that work. As a consequence, the cost of a single interruption becomes multiplicative, creating a systemic threat to the successful execution of the

sprint. The application of the concept of cognitive viscosity enables the early identification of such «bottlenecks» at the moment they emerge, thereby shifting risk management from a reactive to a preventive mode.

An important aspect of the modeling process is the consideration of secondary or derivative risks that arise as a response to accumulated cognitive debt. When a team attempts to compensate for time lost due to distractions, it typically resorts to intensifying work or ignoring certain quality standards, which leads to an increase in technical debt. This creates a vicious cycle: cognitive fatigue degrades the quality of decisions, and correcting errors requires new cycles of concentration that are once again interrupted. The method allows this destructive dynamic to be detected at an early stage, providing management with objective data on when additional pressure on the team will lead only to product degradation rather than to faster delivery.

The practical significance of the proposed method lies in establishing a scientific foundation for the implementation of adaptive management decisions. Unlike classical monitoring approaches, this method relies on leading risk indicators. Based on a probabilistic model, the management system can automatically recommend measures of «cognitive quarantine», involving the temporary restriction of non-priority communications for key specialists at moments of highest risk. This not only helps stabilize project schedules but also prevents professional burnout, which is often the result of prolonged work under conditions of high cognitive viscosity and constant context switching.

In conclusion, integrating cognitive characteristics into IT project management systems makes it possible to transform the development process into a more predictable and resilient mechanism. An understanding of the nature of cognitive losses and the use of formalized metrics—such as cognitive debt and the cost of interruption – provide managers with an objective tool for protecting the team’s intellectual resources. This ensures high quality of the final product and adherence to schedules in the dynamic environment of Agile development, grounded in a deep analysis of the relationship between communication noise and individual professional productivity.

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