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SUBSTANTIATION OF THE CONCEPT OF COGNITIVE VISCOSITY FOR OPTIMIZING AGILE TEAM MANAGEMENT

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Abstract. The article introduces and elaborates on the scientific term cognitive viscosity, which describes the resistance of a developer's mental state to the process of regaining concentration after an interruption. The nature of this phenomenon is examined within the context of the «flow state», and a comparative analysis is conducted with the classical concept of «cognitive flexibility». It is substantiated that the study of cognitive viscosity is critical for the design of intelligent notification filtering systems that safeguard the intellectual capital of Agile teams.

Key words: cognitive viscosity, cognitive flexibility, flow state, interruption management, Agile teams, Velocity, intelligent notification filtering, developer productivity.

Introduction. In modern software engineering, developer productivity directly depends on the ability to sustain prolonged and uninterrupted cognitive focus. However, the dynamic environment of Agile teams requires continuous communication, which creates a conflict between the individual «flow state» and team-level demands. Traditional productivity models fail to account for the inertia of a specialist's thinking when returning to complex tasks.

Brief review of previous research. Studies in cognitive psychology conducted within IT environments [1] indicate that work interruptions require 10–15 minutes for context restoration and negatively affect the mental models of a task, while incoming notifications reduce the quality of the work process [2]. Contemporary intelligent message-filtering systems based on contextual analysis and machine learning [3, 4] predominantly treat the specialist as an isolated entity, whereas research on Agile practices emphasizes the importance of accounting for team dynamics [5, 6, 7]. Despite proposed conceptual models of integrated filtering [8], the problem of formalizing a mathematical relationship between individual cognitive resources and team development Velocity (Velocity) remains unresolved.

The purpose of the study is the development and theoretical substantiation of the concept of cognitive viscosity as a fundamental parameter for modeling intelligent attention management systems, enabling the minimization of losses incurred during reconcentration.

Research results and discussion. 1. Nature and mechanisms of cognitive viscosity.

Cognitive viscosity is defined by the author as «a measure of a specialist's depth of immersion in a complex architectural or logical task». Unlike a simple delay caused by reading a message, viscosity reflects the effort required to restore the mental model.

This phenomenon has two key characteristics:

- Cumulative effect – the cost of an interruption is not constant; it increases with the duration of uninterrupted work. The more complex the mental model constructed, the higher the viscosity.
- Context degradation – when interrupted, active links in working memory are lost. The time required to restore these links is the primary indicator of the state's viscosity.

It is important to note that the level of viscosity is not uniform across all types of engineering activities. Peak viscosity occurs during work with high-level abstractions, architectural design, and algorithm development. In such cases, the specialist maintains a complex hierarchy of interconnections in working memory, and breaking these links leads to a cascading loss of understanding of the current logic. In contrast, routine tasks (e.g., documentation or minor refactoring) exhibit low viscosity, as restoring their context does not require significant cognitive effort.

2. Comparative analysis of cognitive viscosity and flexibility.

For a clear identification of the term, it is important to distinguish it from cognitive flexibility. While cognitive flexibility represents an ability (active vector), cognitive viscosity reflects resistance of the cognitive state (reactive vector). A comparison of the concepts cognitive viscosity and cognitive flexibility is presented in Table 1.

Table 1. Comparison of the concepts «cognitive viscosity» and «cognitive flexibility»

Characteristic	Cognitive viscosity	Cognitive flexibility
Essence	Difficulty of returning to an interrupted task	Agility of thought and adaptability to changing conditions
Action vector	Reactive → resistance to breaking the state of concentration	Active → directed toward changing activity
Desired state	High viscosity → indicator of deep work (flow)	High flexibility → advantage for multitasking

3. Significance of the research for the IT industry.

The study of cognitive viscosity enables a shift from the subjective perception of «distraction» to the objective management of cognitive resources:

A. Loss Forecasting (Cost of Delay). It becomes possible to calculate the real cost of an interruption. For example, if a developer is in a state of high viscosity, an interruption now may cost 20 minutes of reconcentration, whereas in an hour it may require only 5 minutes.

B. Dynamic notification batching. The system can «hold back» messages until moments of natural viscosity reduction (pauses), thereby protecting the team's intellectual capital.

C. Protection of the flow state. The term provides a scientific foundation for strategies of «aggressive focus protection», which are critically important during design and architectural planning stages.

D. Prevention of professional burnout. Constantly overcoming cognitive viscosity due to chaotic interruptions is a significant factor in mental fatigue. When a developer is repeatedly forced to expend cognitive resources on reconcentration, it leads to overload and reduced job satisfaction. Implementing systems that respect viscosity states helps preserve the team's intellectual capital and reduces the risk of emotional exhaustion among specialists.

4. The functioning of an agile team as a context for cognitive viscosity.

The operation of an Agile team creates a specific context in which the cognitive viscosity of an individual specialist ceases to be merely a psychological parameter and becomes a systemic factor. Based on the analysis conducted, three primary determinants of viscosity dynamics in engineering processes have been identified:

A. Autonomy reserve as a safeguard against cascading delays. A specialist's autonomy reserve is a temporal and functional buffer during which they can perform a task without requiring clarifications from colleagues or managers. It has been established that a high level of autonomy is a necessary condition for safely entering a state of high cognitive viscosity. When the management system accounts for this parameter, it enables the developer to achieve maximum depth of concentration (flow state) without creating blocking dependencies for other team members. Thus, autonomy acts as a preventive mechanism that minimizes the negative impact of individual viscosity on the overall workflow.

B. Sprint progress dynamics as a factor in the cost of reconcentration. The cost of cognitive viscosity is not static throughout an iteration. In the early stages of a sprint (design and architectural planning), high viscosity is both desirable and «permissible», as it facilitates the construction of complex intellectual models. However, as the team approaches the release date, the cost of delay increases. In the final phase of the sprint, priority shifts from the depth of individual work to the speed of team synchronization. Under such conditions, high cognitive viscosity may become an impediment; therefore, intelligent filtering systems must adapt the notification «admission threshold» in accordance with temporal proximity to the deadline.

C. Relationship to the dependency graph and team Velocity. The cognitive viscosity of an individual specialist directly correlates with overall productivity through the logical dependencies within the project graph. When a specialist is working on a critical architectural node, the time required for reconcentration after an interruption (caused by the viscosity of the cognitive state) is multiplied by the number of tasks dependent on that node. This creates a direct mathematical relationship between individual cognitive resources and the Velocity parameter: each untimely interruption at a moment of peak viscosity on the critical path effectively reduces the throughput of the entire Agile team.

Thus, cognitive viscosity should be treated as a dynamic coefficient in the Velocity equation. If a critical task is being performed by a specialist in a state of deep immersion, any external communication at that moment must meet an exceptionally high priority threshold. Otherwise, the cumulative idle time of the team while waiting for the critical node to be unblocked will significantly exceed the duration of the interruption itself. This approach enables a transition from static sprint planning to dynamic, real-time attention management.

Conclusion. Cognitive viscosity is a fundamental characteristic of intellectual labor that previously lacked a clear terminological definition in the context of software development. It has been established that, unlike cognitive flexibility, which is an individual skill, viscosity constitutes an objective property of deep concentration itself. It is demonstrated that integrating this concept into communication management systems makes it possible to transform a chaotic stream of notifications into a controlled process, in which individual depth of work is harmoniously combined with the collective Velocity of an Agile team. The application of this parameter is key to optimizing lead time and safeguarding the mental well-being of specialists.

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AREAS OF ACTIVITY OF THE DEPARTMENT OF CYBER POLICE TO COUNTER CYBER THREATS DURING THE PERIOD OF ARMED AGGRESSION

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The beginning of the armed aggression of the Russian Federation against Ukraine significantly changed the perception of modern methods of warfare. Along with the use of military force, methods of influencing the information space are actively developing, with the aim of weakening the moral and psychological state of the enemy. and undermine the national security of the state. The Cyber Police Department, as a structural unit of the National Police, actively opposes the armed aggression of the Russian Federation in the digital space and cooperates with other structures [3, 4, 5].