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TRANSFORMATION OF COGNITIVE PROCESSES UNDER THE INFLUENCE OF INFORMATION FLOWS

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Annotation

The article examines how intensive information flows in the digital environment transform human cognitive processes. Special attention is paid to attention, memory, perception, thinking, decision-making and deep reading. The paper argues that information flows do not simply increase the amount of available knowledge, but also change the mechanisms through which people select, process, store and interpret information. On the one hand, digital media expand access to knowledge, support fast search and stimulate new forms of distributed cognition. On the other hand, constant notifications, multitasking, fragmented reading and dependence on external memory may weaken concentration, critical reflection and long-term semantic understanding. The article concludes that the main task of modern education is not to reject information technologies, but to develop cognitive hygiene, media literacy and reflective thinking.

Keywords: information flow, cognition, attention, memory, digital environment, multitasking, critical thinking, cognitive transformation.

In the twenty-first century, the human mind functions in an environment where information is produced, transmitted and consumed at unprecedented speed. Digital platforms, social networks, search engines, online databases, mobile



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applications and artificial intelligence systems have created a continuous information flow that accompanies almost every aspect of social, educational and professional life. This flow is not neutral. It influences not only what people know, but also how they perceive, remember, compare, evaluate and make decisions.

The transformation of cognitive processes under the influence of information flows should be understood as a complex and contradictory phenomenon. The digital environment provides rapid access to scientific, cultural and practical knowledge. It allows individuals to communicate across distances, learn independently and solve problems through collective intelligence. At the same time, the excessive amount of information may create cognitive overload, reduce attention stability and encourage superficial processing. As Nicholas Carr argues, the Internet changes the conditions of reading and thinking by encouraging speed, scanning and permanent switching between fragments of information [1, 115]. Therefore, the purpose of this article is to analyze the main directions in which information flows transform cognitive processes. The study focuses on attention, memory, reading, thinking and decision-making. The central idea is that modern cognition increasingly becomes hybrid: it combines internal mental operations with external digital tools. This creates new opportunities, but also new risks for intellectual development.

Information flow can be defined as the continuous movement of messages, signs, images, texts and data through communication channels. In traditional societies, information was limited by oral communication, books, newspapers and institutional education. In the digital age, information becomes immediate, interactive and algorithmically selected. A person no longer only searches for information; information itself constantly reaches the person through notifications, recommendations, advertisements and news feeds.



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This situation changes the structure of cognitive activity. Earlier, knowledge acquisition often required linear reading, long concentration and gradual interpretation. Today, the user often moves between short texts, images, videos, hyperlinks and comments. Such an environment supports speed and flexibility, but it also increases the probability of distraction. Cognitive load theory explains that human working memory has limited capacity; when too many elements compete for attention, learning and understanding become more difficult [4, 295].

The problem is not the existence of information itself, but the imbalance between the amount of information and the ability to process it meaningfully. If a person receives more signals than the mind can organize, cognition becomes reactive rather than reflective. In this sense, information overload may transform the individual from an active thinker into a passive receiver of fragmented stimuli.

Attention is one of the cognitive processes most directly affected by digital information flows. In the digital environment, attention becomes divided between many competing objects: messages, links, images, videos, tasks and social interactions. As a result, sustained attention is often replaced by intermittent attention. Research on media multitasking shows that individuals who frequently use several media channels at the same time may experience difficulties in filtering irrelevant stimuli. Ophir, Nass and Wagner found that heavy media multitaskers were more vulnerable to interference from irrelevant environmental stimuli and irrelevant memory representations [6, 15583]. This means that multitasking does not always develop mental flexibility; in many cases, it weakens selective attention. The transformation of attention has important educational consequences. A student who constantly switches between a textbook, smartphone, social network and video platform may remain physically present in the learning process but cognitively fragmented. Such fragmentation reduces the depth of processing. Information is seen, but not always understood;



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read, but not always integrated into long-term knowledge. However, it would be one-sided to describe digital attention only negatively. Digital environments can also train rapid orientation, visual search and the ability to work with complex interfaces. The key issue is balance. Productive cognition requires both fast attention for orientation and slow attention for analysis. If the first dominates completely, intellectual work becomes shallow.

Memory is also transformed by information flows. In earlier models of learning, the main task was to store knowledge internally. In the digital age, a significant part of memory is externalized: people remember not the information itself, but where and how to find it. This phenomenon is often connected with the concept of transactive memory. Sparrow, Liu and Wegner demonstrated that when people expect information to remain available online or on a computer, they are less likely to remember the content itself and more likely to remember the location of the information [5, 776]. This finding is important because it shows that search engines and digital storage systems change the strategy of remembering. The mind adapts to an environment where information can be retrieved at any moment.

External memory has advantages. It reduces the burden on biological memory and allows people to work with large volumes of data. Scientists, students and professionals can access sources, archives and databases much faster than before. Nevertheless, excessive dependence on external memory may weaken internal knowledge structures. Without basic internal knowledge, a person may find information but fail to evaluate its accuracy, context and meaning. Deep understanding requires more than access. It requires connections between ideas, concepts and experiences. If memory becomes only a system of links and search habits, cognition may lose semantic depth. Therefore, modern education should



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not focus only on finding information; it must also develop the ability to remember, compare and interpret essential concepts.

Reading is another sphere where cognitive transformation is especially visible. Traditional reading is usually linear and requires concentration. Digital reading is often non-linear: the reader moves through hyperlinks, comments, advertisements and multimedia elements. This changes perception and comprehension. Maryanne Wolf emphasizes that the reading brain is not biologically fixed; it develops through cultural practice and can change when reading habits change [2, 39]. If a person mostly reads short digital fragments, the brain becomes accustomed to rapid scanning rather than slow interpretation. Such reading may be useful for searching facts, but it is less effective for philosophical, scientific or literary understanding. Multimedia learning theory also shows that people process verbal and visual information through different channels. Richard Mayer argues that learning improves when words and images are organized according to cognitive principles, but poorly structured multimedia may overload the learner [3, 57]. This is highly relevant today, because many digital platforms combine text, sound, video, animation and interactive elements. When these elements are meaningful, they support understanding. When they are excessive, they distract attention and reduce comprehension. Thus, perception in the information age becomes more visual, faster and more fragmented. The user learns to recognize patterns quickly, but may lose patience for complex argumentation. This creates a contradiction between speed and depth. Scientific thinking requires the ability to remain with a problem, analyze evidence and tolerate complexity. The digital environment often rewards the opposite: speed, emotional reaction and immediate response.

Information flows also influence thinking and decision-making. In a world of constant updates, people often make judgments quickly, based on headlines,



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short posts or emotionally charged images. Daniel Kahneman's distinction between fast and slow thinking is useful here. Fast thinking is automatic, intuitive and effortless, while slow thinking is analytical, deliberate and more demanding [7, 20]. Digital information flows often activate fast thinking because they are designed for quick reaction. This does not mean that fast thinking is always harmful. In everyday situations, intuition helps people act efficiently. However, social, scientific and moral problems require slow thinking. They demand comparison of arguments, verification of facts, awareness of bias and logical reasoning. When information flows are too intense, the individual may not have enough time or motivation for such reflection. Algorithmic personalization creates another challenge. Digital platforms often show users information that corresponds to their previous interests, emotions and beliefs. This may create an "information bubble" where the person repeatedly encounters similar viewpoints. As a result, critical thinking becomes weaker because alternative perspectives are excluded from everyday cognitive experience. The transformation of thinking is therefore connected not only with technology, but also with culture. If society values speed more than truth, visibility more than depth and reaction more than reflection, cognitive processes adapt to these values. The result may be intellectual impatience: the inability to engage with complex ideas for a long time.

Despite these risks, information flows should not be understood only as a threat. Digital information environments can enrich cognition when they are used consciously. They expand access to education, support collaborative research, help visualize complex processes and create opportunities for lifelong learning. Internet searching, for example, may activate neural circuits related to decision-making and complex reasoning, especially among experienced users [8, 116].

Information technologies also support distributed cognition. A person can solve problems together with other people, databases, artificial intelligence tools



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and digital models. In this sense, cognition becomes networked. The modern learner does not only memorize facts, but learns to navigate, evaluate and synthesize information from multiple sources. The main condition is cognitive discipline. The user must learn to control the information flow instead of being controlled by it. This includes setting priorities, limiting distractions, checking sources, reading long texts, practicing note-taking and developing metacognitive awareness. Cognitive transformation becomes positive when digital tools support thinking rather than replace it.

The transformation of cognitive processes requires changes in education. Schools and universities cannot ignore the digital environment, because students already live within it. At the same time, education should not simply copy the logic of social media and short attention cycles. Its task is to cultivate deep cognition.

First, students should be taught information literacy. They need to distinguish reliable sources from manipulative content, scientific argument from opinion and evidence from emotional persuasion. Second, education should include exercises for sustained attention: reading long texts, writing analytical essays, solving complex problems and discussing ideas in depth. Third, teachers should use digital tools according to cognitive principles, avoiding unnecessary overload. Fourth, memory should be developed not as mechanical memorization alone, but as meaningful internalization. Students should know how to search for information, but they should also possess conceptual frameworks that allow them to understand what they find. Finally, reflective thinking should become a central educational goal. In the age of information flows, the most important competence is not simply to know more, but to think better.



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Conclusion

Information flows transform cognitive processes in deep and multidimensional ways. They change attention by increasing fragmentation and multitasking; they change memory by strengthening dependence on external storage; they change reading by encouraging scanning and non-linear perception; they change thinking by promoting fast reactions and reducing time for reflection. At the same time, information flows create new opportunities for learning, collaboration and intellectual expansion. The central problem is not technology itself, but the quality of human interaction with it. If digital tools are used without control, they may lead to distraction, overload and superficial thinking. If they are used consciously, they may support creativity, research and flexible cognition. Therefore, the future of cognitive development depends on the formation of cognitive culture: the ability to manage attention, evaluate information, preserve deep reading and combine digital speed with human reflection.

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