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Digitalization as a Factor in the Socio-Psychological Adaptation of Students

Anatoliy V. Karpov, Alexander A. Karpov, Anastasia A. Volchenkova
Demidov Yaroslavl State University

ABSTRACT

This article explores the impact of digitalization on individual adaptive potential, defined as the psychological prerequisites for successful adaptation, essential for an effective educational process. The study identifies patterns in how digitalization reshapes students' adaptive potential and its core components, or key adaptive qualities. A comprehensive psychodiagnostic approach was applied, including methods for assessing the development of adaptive qualities, calculating intercorrelation matrices, and using the χ^2 method to evaluate the homogeneity of their structural organization. The research involved two cohorts of university students in Yaroslavl (Russia), selected through stratified sampling: a historical group from 2014 ($n = 78$) and a current group from 2024 ($n = 74$). Both groups included students majoring in the humanities and natural sciences, ensuring comparability in key demographic and educational characteristics. Results revealed a significant decrease in the development of several adaptive qualities among current students compared to their counterparts ten years earlier. These changes manifest at two levels: the analytical level, reflecting a reduction in separate qualities, and the structural level, showing altered integration and coherence within the system of adaptive qualities. Structural transformations were found to have the most pronounced impact on overall adaptive potential. Collectively, these findings point to a new phenomenon, described as a “syndrome of decreased adaptability,” resulting from the influence of digitalization. The study highlights the need for targeted educational and developmental interventions to support students' adaptive capacities in the digital era.

KEYWORDS

adaptation, digitalization, adaptive qualities, individual adaptive potential, personality structure, decrease in adaptability

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Introduction

One of the main trends in modern society is large-scale digitalization, which has a transformative effect on various areas of human activity, including education, communication, and professional practices (Brynjolfsson & McAfee, 2014). Research in digital cognitive science shows that digital technologies significantly affect cognitive processes such as attention, memory, and information processing (Carr, 2011; Greenfield, 2015). These changes are complex, affecting not only individual mental functions, but also mechanisms of social adaptation (Turkle, 2015).

The impact of digitalization cannot be unambiguously assessed as positive or negative: it represents a multi-layered continuum of effects. On the one hand, technologies expand access to information and contribute to the development of new competencies, on the other hand, they can affect the depth of cognitive processing and emotional regulation (Wolf, 2018). Evidence highlights the risks of digitalization, such as diminished concentration and greater cognitive load (Adler & Benbunan-Fich, 2012; Mark et al., 2012). This focus reflects not only academic interest but also the practical need to devise strategies that mitigate negative effects of technological change (Livingstone & Sefton-Green, 2016).

Contemporary research shows that digitalization exerts a polymorphic impact on cognition, affecting both adaptive capacities and maladaptive risks (Carr, 2011; Parsons, 2017). Notable trends include a reversal of the Flynn effect, with IQ gains observed in the pre-digital era (≈ 1.5 points per decade) now declining (Attrill, 2015; Flynn, 2015; Spitzer, 2012), likely reflecting shifts in cognitive style under digital influence (Gazzaley & Rosen, 2016). Linguistic studies report reduced active vocabulary and weaker syntactic structuring (Karpov, 2023; Wolf, 2018), alongside regression in divergent thinking compared to data from 20 years ago (Tsygankova et al., 2022). Memory development shows asymmetry, with enhanced short-term and episodic memory (Bakunovich & Stankevich, 2018; Bevez & Goryagin, 2019; Kudinova, 2017; Sparrow et al., 2011) but relative deficits in semantic and long-term memory (Loh & Kanai, 2016; Matveeva, 2012). These findings, however, remain subject to verification, as the effects of digital technologies on cognition are debated (Attrill & Fullwood, 2016).

Given the complex and systemic nature of these cognitive and regulatory changes, this study aims to examine the impact of digitalization on students' cognitive, metacognitive, and regulatory processes, with particular attention given to maladaptive syndromes and their implications for socio-psychological adaptation. The

hypothesis of the study is that digitalization of the educational environment mediates the transformation of cognitive processes (metacognitive functions, regulatory mechanisms, and communicative abilities), which leads to systemic changes in the adaptive potential of the individual.

By analyzing longitudinal empirical data, this study seeks to identify patterns of cognitive decline, reduced metacognitive abilities, and diminished motivational regulation, providing insights to support cognitive and personal development in increasingly digital environments.

Theoretical Framework

To understand the complex cognitive, metacognitive, and regulatory transformations associated with digitalization, it is essential to examine existing theoretical models and empirical findings that characterize the qualitative changes in human cognition within digital environments. Over the past decade, research has identified a qualitative shift in executive functions and complex cognition in digital contexts, including clip thinking (fragmented processing; Toffler, 1980), digital thinking (algorithmic processing and high multitasking; Curzon & McOwan, 2017), and 5G thinking (ultra-parallel processing; Karpov, 2023; Maslova, 2013). These developments are linked to core features of the digital environment, such as hypertextuality (Antonova et al., 2018), distributed information (Kudinova, 2017), and multichannel perception (Soldatova & Nestik, 2010).

Empirical evidence suggests a complex impact of digitalization on various cognitive processes, including changes in attention mechanisms (Attrill & Fullwood, 2016), transformation of mnemonic strategies (Attrill, 2015), and modification of perceptual patterns (Antonova et al., 2018). Studies of cognitive transformations in the context of digitalization point to the formation of a *specific symptom complex*, including both primary disorders of basic cognitive functions and secondary metacognitive deficits. Leading experts (Carr, 2011; Small & Vorgan, 2011; Tretyakova & Tserkovnikova, 2021) conceptualize this phenomenon as a *syndrome of cognitive decline*, characterized by a qualitative restructuring of cognitive processes under the influence of digital environments. Constant interaction with digital technologies leads to significant changes in attention (predominance of the distributed type with decreased concentration), memory (increased dependence on external information carriers), and thinking (a tendency toward clip-like and superficial processing).

A ten-year longitudinal study (Karpov, 2022) proposed the concept of a *syndrome of reduced metacognitive abilities*, characterized by a systemic weakening of higher-order regulatory functions. This syndrome manifests in three primary dimensions: diminished capacity to reflect on one's own cognitive activity; impaired control over cognitive processes, particularly attention and working memory; and a marked deficit in the voluntary regulation of mental activity, evidenced by decreased cognitive flexibility and strategic thinking. Empirical data demonstrate a pronounced progression of this syndrome, as comparative analysis of students in 2012 and 2022 shows statistically significant decreases ($p < .01$) in the following:

- Basic metacognitive processes: planning of cognitive activity (28%–30%), monitoring task execution (25%–27%), and evaluation of results (23%–25%). Integral metacognitive abilities: ability to account for multiple cognitive parameters simultaneously, flexibility in switching strategies, and accuracy in predicting results (22%–27%);
- Reflexivity: depth of self-analysis, adequate self-assessment, and critical thinking (20%–25%). These systemic changes align with Ward's (2021) concept of a "digital cognitive style," characterized by reduced depth of information processing, weakened analytical strategies, and predominance of reactive cognitive activity.

In addition, another study highlights the syndrome of decreased personality regulatory capacity (Karpov et al., 2024), showing a close relationship between cognitive and regulatory subsystems. Empirical data indicate conjugate dynamics of cognitive and regulatory changes, forming a holistic picture of mental transformation in the digital environment. Similar systemic changes occur in the motivational domain, particularly in educational activity, resulting in a syndrome of demotivation (Karpova, 2023).

The above-described systemic transformations of cognitive, metacognitive, and regulatory processes naturally influence socio-behavioral adaptation, understood as the harmonization of individual characteristics, social requirements, and digital society conditions. Empirical trends, such as a 25%–30% decrease in cognition, 20%–25% in metacognition, and 15%–20% in regulatory capacity, form predictors of maladaptation.

Building on the longitudinal findings and conceptual frameworks presented above, this study continues this line of investigation by examining how cognitive, metacognitive, and regulatory changes develop over time and affect students' socio-psychological adaptation. This continuation allows for a systematic analysis of the dynamics identified in earlier studies, providing empirical insights into the evolving impact of digitalization on cognitive and personal development.

Methods and Research Procedure

The study was organized using a comparative longitudinal analysis methodology, which enables us to trace the dynamics in students' socio-psychological adaptation amid the rapid transformation of the digital educational environment. The study relies on a systems approach, which treats digitalization as a multidimensional factor exerting complex effects on cognitive and personal development, as well as on adaptation processes.

The key independent variables were parameters of digitalization in the educational environment that include quantitative indicators of digital technology use (measured in hours of daily interaction); qualitative characteristics of digital activity (distinguished into informational-cognitive, communicative, and recreational components); and the degree of integration of digital technologies into the educational process (ranging from auxiliary tools to forms that transform the educational paradigm). Time was conceptualized as a comparative parameter, more specifically, data from 2014 and 2024, serving as an integral indicator of the evolution of digital conditions. This reflects

not only technological changes but also transformations in digital practices and cognitive strategies.

The study involved two groups of students from universities in Yaroslavl (Russia), majoring in humanities and natural sciences. The historical cohort ($n = 78$) comprised students from 2014, including 44 female and 34 male participants, aged 17 to 26 years. The current cohort ($n = 74$) included students from 2024, with 38 female and 36 male participants, aged 18 to 24 years. The sample was constructed according to principles of stratified representativeness, ensuring that key parameters—area of specialization, demographic characteristics, and institutional conditions of education—were carefully matched across cohorts. Methodological consistency was maintained through the use of a single diagnostic tool for both groups, minimizing potential errors in intergroup comparison.

To achieve a comprehensive assessment of digital environment transformation, a triangulation approach was applied, combining content analysis of regulatory documents (educational standards and curricula), expert evaluations of university technological infrastructure, and systematic monitoring of participants' digital behavior. This ensured multidimensional verification of changes in the digital context over the ten-year period.

It should be noted that the ten-year interval between the two surveys represents not only a significant chronological span but also a period of profound and rapid digitalization, unparalleled in previous eras. This period saw the emergence of the generation often referred to as Generation Z, or zoomers, exhibiting psychological characteristics distinctly different from the preceding, pre-zoomer cohort. These clear generational differences underscore both the feasibility and the necessity of a comparative analysis of digitalization's influence, as reflected in the two groups under study.

To identify the key determinants of socio-psychological adaptation, we conducted a comprehensive analysis, which included a systematic literature review and content analysis of academic literature. As a result, we identified eight key adaptive qualities (AQ) with the highest predictive potential for adaptation processes: emotional stability (ES), tolerance to conflict behavior (TCP), behavioral regulation (BR), acceptance of others (AO), self-control (SC), communicative potential (CP), intelligence (IQ), and internality (IN). These qualities are detailed below.

The selection of these eight qualities was guided by contemporary research emphasizing the need for an integrated approach to adaptive potential (Masten, 2018). Specifically, the presented system results from an integrative analysis of theoretical models and empirical findings, ensuring that each quality met three key criteria: theoretical validity, demonstrated connection with adaptation indicators, and measurement reliability. Together, these qualities reflect the multidimensional nature of adaptation, encompassing cognitive, emotional, and social aspects of personality functioning.

Emotional-regulatory component. This component includes three interrelated qualities. Emotional stability, framed within theories of emotional intelligence (Salovey & Mayer, 1990) and coping behavior (Lazarus, 1991), plays a central role in modulating affective responses under stress. Meta-analytic evidence (Kansky et al., 2016) confirms its strong relationship with adaptation

outcomes. Behavioral regulation, grounded in self-regulation models (Baumeister & Heatherton, 1996), ensures purposeful organization of activity in changing conditions. Longitudinal studies (McClelland et al., 2017) indicate that well-developed BR enhances the likelihood of successful adaptation. Self-control, based on the limited-resource concept (Baumeister et al., 1998), allows suppression of impulsive reactions in favor of long-term goals, showing robust correlations with adaptive functioning (de Ridder et al., 2012).

Social-communicative component. This component includes qualities that support effective interpersonal interaction. Tolerance to conflict behavior, derived from social conflict theories, helps maintain social ties despite disagreements (Oetzel et al., 2006). Acceptance of others, rooted in humanistic psychology (Rogers & Dymond, 1954), underpins the formation of positive relationships. Communicative potential, informed by social intelligence models, facilitates effective information exchange. Together, these qualities form a system of social competence critical for adaptation in group contexts.

Cognitive-evaluative component. This component comprises two complementary qualities. Intelligence, interpreted through cognitive adaptation theories (Piaget, 1950), enables efficient processing of new information and problem-solving. Internality, conceptualized within locus of control theory (Rotter, 1966), reflects a sense of personal responsibility for life events. The interaction of these qualities provides a cognitive foundation for accurate situational assessment and the selection of adaptive strategies.

The synergistic interaction of these qualities underscores the importance of considering them jointly within a comprehensive model of adaptive potential. This configuration aligns with contemporary views on the multi-level nature of adaptation (Masten, 2018), integrating both internal psychological resources and external social demands. Importantly, the proposed system of adaptive qualities is dynamic and can be expanded as theoretical frameworks evolve and empirical evidence on socio-psychological adaptation mechanisms accumulates.

Each of the key adaptive qualities was assessed with the help of validated psychodiagnostic tools:

1. The State-Trait Anxiety Inventory (Spielberger et al., 1970) adapted by Khanin (1976) was used to assess Emotional stability.
2. The *Strategies of Behavior in Conflict* questionnaire by Thomas & Kilmann (1974) adapted by Grishina (2008) was applied for evaluating Tolerance to conflict behavior.
3. A method by Maklakov and Chermianin was used for Behavioral regulation (Maklakov, 2001).
4. A method for diagnosing social and psychological adaptation by Rogers and Diamond (1954) adapted by Osnitskii (2004) for Acceptance of others.
5. A questionnaire for identifying the severity of self-control by Nikiforov (1989) was used to evaluate Self-control.
6. A questionnaire for diagnosing agreeableness according to the Campbell scale adapted by Mendzheritskaia (1998) for Communicative potential.

7. The intelligence structure test by Amthauer (Beauducel et al., 2010) adapted by Tunik (2009) was used for assessing Intelligence.
8. Rotter's Locus of Control Scale (1966) adapted by Shmelev was used to evaluate Internality.

The choice of these methods was determined by their satisfactory psychometric properties (validity and reliability) and their alignment with the conceptual framework of the study. The use of this diagnostic complex allowed us to obtain standardized indicators of each key adaptive quality, forming the basis for the subsequent structural analysis of their interrelations and contributions to socio-psychological adaptation.

The results obtained during psychodiagnostic assessment underwent multi-level statistical processing, enabling a comprehensive analysis of the data at varying levels of detail. In the first stage, we applied the classical method of parallel profiles developed by Rossolimo (1914) and adapted to modern psychometric requirements. This method, which visualizes parameters in a single coordinate system, allows not only for graphical representation of the data but also for identifying key patterns in their distribution.

When interpreting the profiles, special attention was given to two crucial aspects. First, absolute indicators (profile height) were analyzed, reflecting the overall level of development of the studied qualities and serving as a reliable measure of adaptive potential. Second, relative indicators (profile configuration) were considered, demonstrating the degree of variability of psychological characteristics and revealing possible disharmonies in the development of individual functions. This two-pronged approach provides a comprehensive understanding of both the general level of development and the individual features of cognitive style.

Drawing on the current research evidence (Karpov, 2022), we identified three main types of psychological profiles, each with its own distinctive features. The harmonious (plateau-shaped) type, characterized by minimal spread of values ($\sigma < 0.5$), reflects balanced psychological qualities and was observed in approximately one-quarter of participants. In contrast, the disharmonious (sawtooth) type, with pronounced variability of indicators ($\sigma > 1.2$), indicates uneven functional development and appeared in 15%–20% of subjects. The intermediate type, most common (50%–60%), occupied a central position along the continuum, corresponding to a normal distribution. In our study, this profile type predominated, serving as a representative indicator of the typical level of development of cognitive, regulatory, and communicative competencies in the modern student population.

Of particular diagnostic interest are the extreme profile variants, given their high differential significance. Research shows that such profiles demonstrate stable correlations with certain behavioral patterns, reflect specific cognitive functioning, and allow accurate prediction of individual adaptation strategies. They also serve as reliable markers of individual psychological characteristics, making them valuable in differential diagnostics.

Despite its advantages, such as the clarity of data presentation and ease of interpretation, the parallel profile method has some limitations. It analyzes only paired differences between indicators and does not reveal hidden structural relationships.

Furthermore, it is insufficient for multifactorial modeling and comprehensive analysis of complex psychological constructs.

To address these limitations, a structural-psychological approach was implemented, primarily through the calculation of intercorrelation matrices. This technique determines mutual correlations among the studied indicators, enabling analysis of holistic structural relationships rather than isolated parameters. Intercorrelation matrices were constructed separately for the two student groups (2014 and 2024 cohorts), allowing comparative analysis of the structural organization of key adaptive traits.

At the next stage of analysis, indices of structural organization were calculated. Three key indices were used: the structural coherence index (SCI), reflecting integration of positive relationships; the structural divergence index (SDI), characterizing differentiation of negative relationships; and the structural organization index (SOI), an integral measure of the ratio and significance of all identified relationships. Calculation of these indices was based on weighting coefficients determined by statistical significance (three points for $p < .01$, 2 points for $p < .05$) and subsequent summation across the entire structure.

Structural analysis offers a methodological advantage over traditional comparison of independent samples, as it reveals not only differences in individual indicators but also qualitative changes in the organization of the holistic system of key adaptive traits. This is especially relevant for the digital environment, as structural changes may signal deep shifts in cognitive and regulatory adaptation mechanisms.

To assess similarity or differences in structural characteristics between groups, the χ^2 method was employed, allowing formal evaluation of homogeneity or heterogeneity in intercorrelation matrices. These matrices were represented as structure diagrams, providing graphical visualization of significant correlation relationships and enabling formal assessment of structural differences between cohorts.

While the chosen methodology allows identification of group differences, further studies are required to establish causal links between characteristics of the digital environment and observed changes. Such studies should include detailed operationalization of digital environment parameters, control of confounding factors, and application of multivariate analyses to determine the strength and direction of influence of specific digital factors.

Overall, the applied methodological set provides a comprehensive framework for studying both quantitative and qualitative changes in the structure of key adaptive traits, offering critical insights into mechanisms through which the digital environment affects socio-psychological adaptation.

Results

As described in the previous section, our research procedure included two main stages, the first of which was based on an *analytical approach*, more precisely, the level of consideration of the problem under study. As a result, we identified indicators that measure the level of development of each key adaptive quality individually (Table 1).

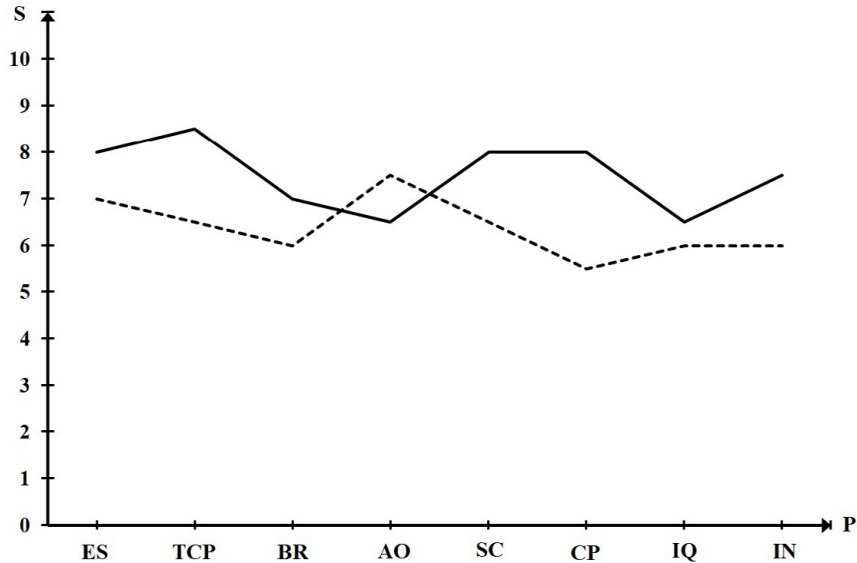
Table 1
Values of the Diagnosed Parameters in the Two Groups of Subjects

Variable	Groups of subjects		<i>p</i>
	1 st group (2014)	2 nd group (2024)	
ES	24.08 (4.22)	19.41 (4.63)	.000
TCB	49.84 (5.21)	41.41 (4.92)	.000
BR	132.44 (11.01)	120.20 (14.00)	.000
AO	25.66 (4.20)	27.88 (4.44)	.031
SC	78.08 (5.20)	66.05 (5.98)	.000
CP	27.44 (5.02)	19.49 (5.01)	.000
IQ	114.79 (12.01)	111.66 (9.60)	.051
IN	69.44 (6.01)	61.39 (10.40)	.000

Note. ES = emotional stability; TCB = tolerance for conflict behavior; BR = behavioral regulation; AO = acceptance of others; SC = self-control; CP = communicative potential; IQ = intelligence; IN = internality; *p* = asymptotic significance of differences according to the Mann–Whitney test; *p*-values < .05 are highlighted in bold.

Then, profiles were constructed for the two groups, representing the full set of measured values on a single coordinate plane. Raw psychodiagnostic scores were standardized (T-scores) to enable the parallel profiles method. The resulting profiles are shown in Figure 1.

Figure 1
Expression of Key Adaptive Qualities in the Two Groups



Note. P = comparison parameters (individual qualities); S = degree of expression (in stens); ES = emotional stability, TCP = tolerance for conflict behavior, BR = behavioral regulation, AO = acceptance of others, SC = self-control, CP = communicative potential, IQ = intelligence, IN = internality; solid line = 2014 data, dashed line = 2024 data. *Source:* developed by the authors.

The comparative analysis of the adaptive quality profiles between the 2014 and 2024 cohorts gives us some key insights into psychological development in modern conditions.

The parallel profile method allows a detailed comparison of parameters across groups, highlighting statistically significant differences. Notably, the modern student cohort shows a clear decline in key adaptive qualities: the 2014 cohort's profile is significantly higher than the 2024 cohort's ($p < .01$), reflecting substantial psychological changes over ten years.

As shown in Table 1, this trend is systemic: statistically significant differences were found in six out of eight studied qualities ($p < .05$), while one parameter shows a pronounced downward trend ($.05 < p < .1$), and another demonstrates inversion dynamics at the level of a statistical trend. These results indicate stable negative dynamics in the development of key adaptive characteristics among modern youth. The systemic nature of these changes is underscored by the decrease observed across most parameters studied.

Overall, the analysis demonstrates a pronounced decline in the key adaptive qualities in today's student population, highlighting the need for further in-depth research into the underlying causes and mechanisms of these changes.

Next, we focus on the general measure of adaptability, assessed using the methodology of Maklakov and Chermianin (Maklakov, 2001). Statistically significant differences ($p < .05$) were found between the 2014 and 2024 student cohorts. The overall level of key adaptive qualities decreased by 20% (from 60 to 51 T-scores), which is consistent with similar findings on foreign students' adaptation (Chimbelenge, 1996). Notably, creativity indicators also fell by 20%–25%, highlighting the importance of considering this decline in the context of digital transformation.

The reduction in creativity reflects a complex interplay of direct and indirect effects of digitalization. Directly, it alters cognitive processes, including the shift to “clip thinking,” changes in divergent thinking mechanisms, and modified idea-generation processes. Indirectly, digitalization transforms key social spheres: in education, emphasis shifts from creative tasks to standardized assessments, while in leisure, ready-made entertainment replaces spontaneous creative activity. Broader sociocultural shifts, such as the accelerated pace of life, reduced time for reflection, utilitarian value orientations, and transformed communication practices, further reinforce these changes. Digitalization thus acts as a profound systemic factor, influencing creativity both on the neurocognitive and social levels.

These findings underscore the need to revise current approaches to fostering creative potential, considering the realities of the digital age, and to develop targeted programs aimed at mitigating these negative trends.

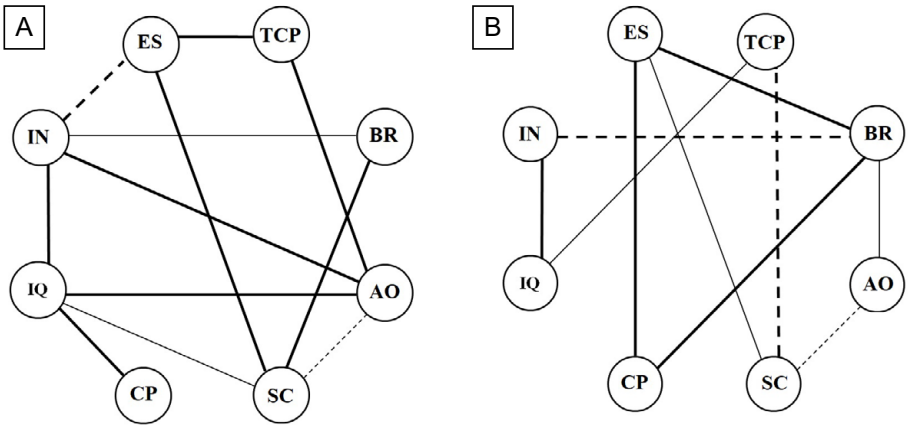
When compared with previously cited studies on declines in cognition and metacognition, we can see that the patterns are remarkably similar, even in quantitative terms: creativity decreased by approximately 20%; basic metacognitive processes—metathinking and metamemory—and their resulting metacognitive qualities declined by 25%–30%; and a comparable reduction was observed in overall reflexivity, albeit slightly lower, within 20%–25% (Karpov, 2022).

It is important to note that these data should not be interpreted as reflecting a direct causal relationship. The determination of these changes is likely far more complex, mediated indirectly through multiple significant factors. Nevertheless, the proportionality of these quantitative transformations is evident and cannot be attributed to methodological artifacts. Underlying these shifts, there are likely deep connections and inter-level interactions between two fundamental subsystems of the psyche—cognitive and regulatory—with the latter playing a decisive role in ensuring an adequate level of adaptation, including socio-psychological adaptation.

Taken together, these results demonstrate significant negative transformations in key adaptive qualities, affecting not only individual traits but also their overall structural organization. To better understand these changes, a *structural-level analysis* is required.

For this purpose, intercorrelation matrices of the studied parameters were calculated separately for each group, and *structure diagrams* highlighting significantly correlated parameters (correlograms) were constructed (Figure 2).

Figure 2
Structure Diagrams of Key Adaptive Qualities



Note. ES = emotional stability, TCP = tolerance for conflict behavior, BR = behavioral regulation, AO = acceptance of others, SC = self-control, CP = communicative potential, IQ = intelligence, IN = internality; Panel A = 2014 data, Panel B = 2024 data; bold line = connections significant at $p < .01$; semi-bold line = connections significant at $p < .05$; solid lines = positive connections; dashed lines = negative connections.

Further, the method for determining generalized structural indices, described above, was applied to these parameters. This method includes calculating the coherence index, which reflects the degree of integration or synthesis of parameters into a unified whole; the divergence index, which indicates the degree of differentiation or disintegration; and the general organization index, which represents a combination of the first two indices and reflects the overall organization, which is understood as the predominance of integrative tendencies over disintegrative (“disorganizational”) ones. The resulting index values are presented in Table 2.

Table 2
Values of Structural Indices in the Two Groups

Index	1 st group	2 nd group
SCI	28	18
SDI	5	8
SOI	23	10

Note. SCI = the structure coherence index; SDI = structure divergence (differentiation) index; SOI = structure organization index.

Discussion

The analysis of the full set of results presented above, and in particular the data in Table 2, allows us to highlight the main findings and explicate the patterns underlying them.

Firstly, the differences between the two groups are most pronounced in the coherence index of the structure of key adaptive qualities. In the first group, the ICC is 28 points, whereas in the second it drops to 18 points. This substantial decrease (35.7%) indicates a qualitative restructuring of the system of key adaptive qualities, manifested in a disruption of structural integrity and the consistency of its components. Therefore, a decline in the structuring of the overall set of regulatory parameters emerges as the dominant “vector” of these transformations.

A detailed examination of these changes highlights several key aspects. At the level of individual components, significant transformations were observed. In the regulatory domain, a fundamental shift occurred in the relationship between internality and behavioral regulation: in the 2014 group, there was a moderate positive correlation ($r = .38; p < .05$), whereas in the 2024 group a strong negative relationship appeared ($r = -.52; p < .01$). This may suggest the emergence of new regulatory strategies in which an internal locus of control is associated with less structured behavioral regulation.

In the cognitive-social domain, we detected the following notable changes: the previously strong positive correlation between IQ and acceptance of others was lost (from $r = .61; p < .01$ to $r = .12; p > .05$); the correlation between IQ and communicative potential weakened significantly (from $r = .54; p < .01$ to $r = .23; p < .05$). In the social adaptation domain, we found a new negative relationship between self-control and tolerance for conflict behavior ($r = -.41; p < .05$), while the positive relationship between self-control and emotional stability weakened (from $r = .49; p < .01$ to $r = .28; p < .05$). These shifts indicate a profound transformation of the relationships among key components of adaptation. Particularly notable is the redistribution of connections in the “cognitive abilities–social skills–regulatory processes” triangle, reflecting the formation of new adaptive behavior patterns in the digital environment.

At the systemic level, three trends are evident: an increase in the proportion of negative correlations (from 12% to 23%); a decrease in the density of significant connections; and a reconfiguration of the central elements of the structure. These observations align with contemporary perspectives on the systemic nature of adaptation processes (Masten, 2018) and support the hypothesis of the disintegrative

character of the observed changes. Importantly, structural transformations exceed changes in individual indicators, which is consistent with the principle that “the whole is greater than the sum of its parts” in systems theory.

Secondly, the divergence index (SDI) exhibits more moderate dynamics and smaller absolute values (five in 2014, eight in 2024). This is naturally explained by the specific organization of key adaptive qualities, where integrative, structure-forming mechanisms dominate over differentiating ones (Karpov, 2015). Although the absolute change in SDI is small ($\Delta = 3$ points), it is statistically significant ($p < .05$) and reflects a stable tendency toward increasing divergence. This may indicate the following: enhanced cognitive differentiation in the digital environment; the emergence of more flexible but less stable adaptation patterns; and a shift in the balance between integrative and differentiating regulatory mechanisms. While these changes do not radically restructure the system, they mark the beginning of a transformation in the principles governing adaptive potential. Recent studies suggest that such shifts can precede larger-scale systemic changes and warrant careful longitudinal monitoring (Yiu et al., 2020).

Thirdly, the dominance of integrative tendencies and the mechanisms supporting them is most clearly reflected in the organization index. It decreases from 23 points in 2014 to 10 points in 2024, a drop of 56.5%, indicating a fundamental restructuring of systemic relationships among adaptive potential components. Since this change is largely driven by the coherence index, whereas divergence dynamics are less pronounced, the patterns largely mirror those observed for coherence.

The results indicate a significant decrease in the adaptive potential of individuals in the second group. This decline occurs both at the analytical level, reflecting lower values of individual adaptive qualities, and at the structural level, which concerns the overall organization and integration of these qualities. Structural transformations are predominantly negative, as a decrease in the degree of organization reduces the functional resources of the system, in this case, adaptive potential.

The most fundamental conclusion is that the degree of organization or the structuredness of core adaptive qualities has substantially *decreased* in the second group. The difference in general organization, which is the most important structural index, between the two groups was *measured multiple times* and found to be substantial: it is 2.3 times higher in the first group. Such a difference is clearly not an artifact but reflects deep structural changes. It is, therefore, necessary to identify these changes and explain their overall significance and underlying causes, a task further supported by the following result.

Comparison of the matrices of key adaptive qualities and the structure diagrams derived from them, using the χ^2 criterion, revealed statistically significant heterogeneity ($p < .95$). This indicates that the primary “vector” of transformation in the structural organization of adaptive qualities lies in qualitative changes rather than merely quantitative reorganizations. In other words, the general structural organization of adaptive qualities differs fundamentally between the two cohorts. These structural differences, in turn, determine further quantitative changes in the overall organization of these qualities.

Taken together, these results can be interpreted the following way. The very question of possible transformations in an individual's adaptive potential and in the constitutive adaptive qualities is informed by prior findings on similar transformations in cognitive, regulatory, and motivational subsystems. As noted, these subsystems have shown tendencies toward decreased cognition, metacognition, regulation, and motivation. It is therefore reasonable to expect that generalized behavioral and activity patterns, as well as overall socio-psychological adaptability, may exhibit a similar decline. This conclusion is supported both by analytical comparisons of adaptive qualities between the two groups and by structural analyses of their overall organization.

The structural perspective is particularly significant because it highlights mechanisms central to systemic organization, including the psyche. The integration of individual components into a coherent whole generates synergetic effects, producing capacities beyond the sum of the components themselves. At a phenomenological level, this manifests as differences in adaptive potential between the 2014 and 2024 cohorts. Thus, our findings reveal profound transformations in the structural organization of individual qualities, extending beyond localized changes in the level of individual adaptive traits. They underscore both the significance and the pronounced impact of digitalization on the systemic organization of key adaptive qualities.

When interpreting these results, it is important to consider that transformations in adaptive qualities are influenced not only by digitalization but also by broader societal changes. For example, shifts in educational practices and in leisure and recreational activities can significantly affect the development of individual adaptive potential. Nearly every major social sphere has undergone changes that, to varying degrees, shape personal development and the key subsystems of the psyche. This raises the question of which regulatory changes are directly attributable to digitalization and which are influenced by other societal transformations.

Closer examination suggests that this distinction strengthens, rather than weakens, the argument. Many of these broader societal changes themselves result from digitalization. Consequently, digitalization exerts both a direct effect on the adaptive potential of individuals and an indirect effect by transforming the main spheres of society, which in turn shape adaptive qualities. Thus, digitalization functions as a central, synthesizing factor in the evolution of the individual's adaptive potential.

Conclusion

The results indicate a significant decrease in the development of several key adaptive qualities in current Russian students compared to those who studied ten years ago. These changes are systemic, affecting both individual indicators and the structural organization of these qualities. However, attributing these changes solely to the digitalization of the educational environment requires caution. Although the transformations coincide chronologically with the period of intensive digitalization, further research is needed to establish cause-and-effect relationships. This includes operationalizing specific parameters of the digital environment, controlling for socioeconomic factors, and analyzing mediating psychological mechanisms.

In this study, adaptive potential is understood as the set of individual psychological prerequisites for successful adaptation, while socio-psychological adaptation refers to the process and outcome of interaction between the individual and the environment. The data suggest a decline in adaptive potential, which may but does not necessarily lead to adaptation difficulties, as compensatory mechanisms can offset these changes.

The most notable finding is the deterioration in the structural organization of adaptive qualities, reflecting a disruption of the systemic consistency of cognitive, regulatory, and communicative components. These changes require further investigation in the context of both digital and socio-cultural transformations of the past decade.

Our findings support the conceptualization of a stable pattern of changes in adaptive potential, which can be tentatively designated as the “syndrome of decreased adaptability.” This construct, which requires additional theoretical and empirical verification, aligns with previously observed declines in cognition and regulatory capacity. The specificity of these changes is seen in the qualitative restructuring of the adaptive system, evidenced by reduced structural organization, altered correlations among components, and an imbalance between coherence and divergence in the system of qualities.

It is important to note that the study focused on selected adaptive qualities rather than the full personality structure. Interpretation of the results must consider multiple factors, including the intensity and nature of digital technology use, sociocultural shifts in educational paradigms, and economic and demographic changes.

The observed chronological correlation between these changes and digitalization holds independent theoretical and practical significance. At the same time, it represents a first step toward establishing causal relationships, providing a foundation for further research involving operationalization of digital impact parameters, control of confounding variables, and longitudinal observation.

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