Kerres, Michael (2026). Cultural Resistance: Why do digital innovations fail - in Germany?. In K. Tödt, Büching, C., & Granas, B. (Eds.), Digital Education and Innovation. Springer. (preprint)

Cultural Resistance: Why do digital innovations fail – in Germany?

Michael Kerres[1]

[1] Chair of Instructional Design and Educational Technology, University of Duisburg-Essen, Germany

Abstract. Previous governmental funding programs have not been able to sufficiently ensure the sustainable integration of digital technology in German schools, a phenomenon starkly evident in international comparisons. This situation is often attributed to a lack of technology acceptance, particularly among teachers; however, this paper argues that a culturally rooted scepticism toward technology and data aggregation provides a more compelling explanation. This position appears to be historically grounded in experiences with totalitarian surveillance and is structurally reinforced by the multi-level federal system, impeding cohesive innovation through collaboration between public and private institutions. Consequently, this paper suggests creating a policy based on a more culturally sensitive innovation strategy that addresses structural impediments and establishes a trustworthy, decentralised digital ecosystem, positioning digital education as an essential public good based on European values.

Keywords: Digitalisation, digital innovation, digital education, innovation policy, support measures

1 Digital Education in Germany

Digital technology has not really taken off in German schools. This observation was sharply highlighted when schools closed during the

COVID pandemic in spring 2020, forcing a sudden shift to digital remote learning scenarios, which revealed the paucity of digital technology in German schools (Kerres, 2020a).[1]

As early as 2019, the federal government in Germany implemented significant fiscal measures, beginning with the DigitalPakt Schule (Digital Pact for Schools)[1], which initially allocated €6.5 billion for 2019 to 2024, predominantly focusing on the provision of technical infrastructure and digital devices. This was augmented by a supplementary agreement providing an additional €1.5 billion for technology procurement during the pandemic.[1] This policy was continued by the Digital Pact 2, which commits €5 billion until 2030, shifting focus toward educational concepts, skills development, instructional design research, and implementation. Other ancillary measures, such as the €204 million funding for competence centres for digital and digitally supported teaching (2023–2026) and the strategy for promoting Open Educational Resources (OER), demonstrate a broad, multi-layered governmental effort.

These later measures follow the idea that the provision of digital equipment must be accompanied by more elaborate activities to address digital transformation as a social and institutional change process (Wohlfart & Wagner, 2022). Nevertheless, rapid transformation is not anticipated. A crucial question is whether the existing funding schemes have been appropriately allocated to support the anticipated shift, or whether the pessimistic assessment that "school equipment would be better today without the Digital Pact" (Krein, 2022) holds true.

This situation reflects a pervasive policy trap, in which public spending focuses on the most visible and aching symptoms—the lack of equipment—while failing to address the root causes. Kammerl & Osterkamp (2010) describe this as a vicious circle in school development and policy regarding digital transformation. When pressure to act increases, fundamental structural development issues are often deferred in favour of achieving quick, noticeable wins. Structural

---

[1] https://www.digitalpaktschule.de/

changes, such as reforming school governance to expand the direct responsibilities and agility of individual schools, are approached hesitantly because they are politically painful and time-consuming (cf. Hauck-Thum & Pallesche, 2022; Schiefner-Rohs, 2017; Waffner, 2021; Heinen & Kerres, 2017). It is notable that massive investments could not successfully bypass systemic inertia; rather, policies potentially reinforced the system's capacity to absorb change without undergoing fundamental transformation.

2 Empirical Data on the Status Quo

The empirical data concerning the status of digitalisation in German schools present a deeply sobering picture, particularly when observed in international comparative studies.

While school administrators claim progress, reporting that "schools in Germany are now well equipped with digital devices and infrastructure and are catching up internationally" and that "most pupils also have the necessary devices and access" (Lewalter et al, 2023, p. 237), quantitative metrics demonstrate persistent shortcomings regarding the presence of digital learning in the classroom.

German schools possess 0.57 PCs and laptops per pupil in Year 9, significantly below the OECD (2025) average of 0.87 computers. More striking, however, is the contrast between adoption frequency and depth of pedagogical integration. The proportion of teachers using digital media daily has increased, rising from 9.1% in 2013 to 23.2% in 2018, and reaching 69.9% in 2023. Despite this high reported frequency, the actual intensity of digitally supported learning remains critically low, averaging 23 minutes per school day. This represents the lowest figure among industrialised nations (Eickelmann et al., 2024).

This contradiction—a substantial increase in the availability of digital technology juxtaposed with minimal time using digital tools (23 minutes)—is highly consequential. It strongly suggests a strategy of defensive compliance. Teachers appear to be satisfying widespread

calls for digitalisation without strongly investing pedagogical efforts for a deeper, transformative integration.

Furthermore, metrics on digital competence are concerning. Although young people in Germany use digital media frequently in their free time, especially for personal communication and entertainment, they rate their own digital competence lower than the average in other countries (OECD, 2025). The 2023 ICILS survey even revealed a substantial *decline* in digital skills compared to 2018, despite the massive investments of the Digital Pact. Critically, 18.3% of pupils fall below the lowest level of computer and information literacy, a proportion approximately twice that found in Finland. These pupils possess only very basic skills, limited to simple digital tasks like opening programs or basic navigation, and struggle significantly with critically and reflectively using digital information.

In summary, advances in hardware availability are constrained by profound deficits in effective pedagogical deployment. The data highlight a system with increasing access to hardware that fails critically at achieving meaningful usage and skill development.

3 Components of the Digital Ecosystem

Public debate often centres on whether classrooms have enough computers, generally measuring success by the number of devices per student. Yet, while essential for digital transformation, simply providing hardware falls far short of building the required ecosystem for future learning. This ecosystem encompasses a much more complex combination of elements beyond the availability of digital devices and includes, for example, access to digital learning materials, a range of dedicated learning tools, platforms for collaborative learning, examination tools, portfolio software, and a variety of emerging AI tools, along with software for administrative purposes. Crucially, this environment will also incorporate elaborate mechanisms, such as role management and authentication, licensing and rights

management, as well as many other elements of an evolving digital infrastructure.

The term "education ecosystem" (Otto et al., 2023) describes an interconnected network that integrates a variety of participants and resources. It aims at synergies across institutions and argues for a stronger cooperation between educational institutions, publishers, businesses, research organisations, and investors. A preliminary goal would be to foster discussion about an ecosystem reflecting European educational values—open access, free speech, broad participation, and genuine inclusion—where public and private actors jointly create secure learning environments. Currently, it seems that education remains fragmented and lacks a clear, integrated vision for this comprehensive system.

4 Public and Private Actors in EdTech

A key characteristic of the German context is that almost every aspect of digital infrastructure in schools is managed and controlled by state actors. Unlike in other countries, Germany has struggled to develop a market for educational media and technology. Public authorities operate servers, select and procure learning software, educational media, devices, and licenses, oversee network infrastructure, and are also responsible for teacher training and classroom resources. As a result, state agencies dominate nearly all interactions among stakeholders in the system.

A few private companies from Germany successfully contribute to building the educational ecosystem. While a number of startups and young firms are developing EdTech solutions, especially in the field of vocational training, most struggle to gain a foothold among large institutional clients in the public sector, such as schools and universities. This is largely because schools typically lack dedicated budgets

for digital resources and technology, making sustainable market growth difficult for these enterprises.[2]

Internationally, EdTech companies have been able to attract high levels of investment; the 2025 TIME ranking lists 350 EdTech companies[3], including two German ones: *Lecturio*, an international provider of health-related content, and *Bettermarks*, a platform for school learning content.[4] Among the 63 largest publicly traded education companies, five have a European background, but none are German. The language learning platform *Duolingo*, which has only been on the market since 2012, is considered the world's most capital-rich EdTech company with €13.3 billion of financial assets, followed by the UK publisher Pearson Education.[5]

In Germany, the provision of digital media and infrastructure falls under the responsibility of state authorities and intermediate-level government agencies, defining and operating the digital environment primarily as a sovereign task. This state-centric approach, operated by a range of administrative responsibilities and structures, struggles to keep up with the speed and agility of digital product cycles. The discussion regarding digitalisation, especially in schools, remains confined to the logic of state responsibilities and their bureaucracy, overlooking the need to develop cooperation between state and non-state actors that is necessary for a vital digital ecosystem.

Amid layers of bureaucracy and state control, the digital landscape develops slowly, remains dominated by top-down decision-making, and is difficult to adapt to local needs. Elaborate regulations and administrative complexities often stifle innovation, ultimately undermining efforts to modernise education.

This policy framework eventually leads to an exclusion of smaller domestic EdTech innovators, leaving only large international corporations with major financial resources able to navigate the complex,

---

[2] https://gründen.nrw/aktuelles/edtech-startup-monitor-status-huerden-und-potenziale-fuer-gruenderinnen-der-bildungsbranche

[3] https://time.com/collection/worlds-top-edtech-companies-2025/

[4] A third company based in Germany (Morressier.com) offers a solution in the field of scientific communication.

[5] https://companiesmarketcap.com/de/bildung/groesste-bildungsunternehmen-nach-marktkapitalisierung/

fragmented regulatory landscape. Although designed to shield education in a democracy from undue external influences, this approach paradoxically manifests the dependency on powerful global companies based outside the country.

Unlike other countries where private companies significantly contribute to the market for educational media and technologies, teacher training and development, and consulting and evaluation, Germany's approach strictly relies on public authorities in this value chain—at the federal, state, and municipal levels. While this scenario is sometimes positioned as important to keep the influence and interests of the private sector away from the educational system, we would evaluate this structure as a major shortcoming for the sustainable development of a digital ecosystem for learning in the long run.

5 The Impact of Data Protection

The mechanisms of systematically preventing digital transformation can best be explained by the implementation of data protection schemas in Germany. Since each of the 16 states has enacted its own data protection law, school authorities in each respective state must create separate data protection concepts, implement unique audit trails, and ensure compliance with differing requirements, for example, in regards to data storage and deletion, retention management, logging, and backup schemas. Consequently, separate digital ecosystems emerge, leading to (for the external observer) illogical inconsistencies—for instance, Microsoft products may be permitted in one federal state, while Google products are forbidden, only for the assessment to be completely inverted in the adjacent state.

Nevertheless, the resistance to change embedded in Germany's education system is not accidental but rather a deliberate structural feature. It reflects historical lessons learned from periods when political authorities attempted to use schools as instruments for ideological indoctrination. By creating multiple layers of governance and distributed decision-making across the federal states (Länder), the

system was designed to protect educational autonomy from centralised political manipulation. These mechanisms are not a design flaw, but an intentionally built-in element of the multi-level system of educational governance. It ensures the resilience of the education system, and – on the surface - correlates with stability and the ability to absorb change.

6 Positioning the Status Quo: Interim Conclusion

In many places in German schools, innovative solutions are emerging that demonstrate the potential for pedagogically interesting and promising solutions. As outlined, they often fail to establish a sustainable business case, mainly due to the lack of market mechanisms. Yet, the empirical data on digital technology in German education have presented a sobering assessment of the integration of digital technology in teaching and learning.

Recognising these difficulties, one common interpretation suggests that change will simply take more time, given the ground lost and the fact that digital transformation constitutes a cultural shift toward new methods of learning and instruction that will need a new generation of teachers and learners.

However, when planning future policies for digital innovation, a more profound inquiry might be necessary into why digitalisation has taken hold so slowly in education in Germany, and how innovation policies might adapt more adequately to this peculiar situation.

Perhaps we can identify more fundamental mechanisms responsible for this phenomenon, which may have been overlooked in previous innovation policies and funding schemas. Perhaps some measures have failed because they did not address more basic obstacles. Perhaps we can reevaluate the reluctance to use digital technology in schools as a comprehensible phenomenon. A deeper understanding of the context behind these observations might enable a more effective response to this issue. These considerations could interpret the hesitance to use digital technology in schools as an

explainable phenomenon, necessitating the development of a more suitable approach.

The next section first looks at research addressing this issue as a problem of insufficient technology acceptance, focusing on individual decision-making and how it can be positively manipulated.

7 Technology Acceptance as a Binary Decision

Research on technology acceptance is extensive, featuring central constructs such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (cf. Granić, 2022). These models frame acceptance as a construct based on cognitive processes related to the technology's perceived usefulness and perceived user-friendliness.

The research approach typically focuses on methods to enhance acceptance, such as refining user interfaces, introducing incentive systems, implementing participatory design, or providing comprehensive training strategies to improve the onboarding experience (Christianto Leonardo & Santosa, 2024; Marikyan et al., 2023). In this field, broad acceptance of digital technology is generally assumed to be an intrinsically positive goal. Consequently, a lack of acceptance is implicitly understood as a "source of error"—whether due to deficiencies in the digital product, its functionality, or the lack of social engineering during its introduction—and is deemed a negative problem that must be overcome.[1]

Research, mainly in the context of information management, discusses technology acceptance as a binary decision, analogous to the decision to purchase a new digital product. When applied to educational technology, this logic examines, for example, whether an educational software is utilised or not. This perspective, however, proves limited for teaching and learning, where engagement with a new digital tool cannot be understood as a single binary decision, but as an ongoing process of individuals' approximation and familiarisation. This process is often long-term and iterative, involving initial

willingness, new experiences, sharing ideas, potential rejection, and possible future re-engagement (Rogers, 2003; Ertmer, 1999). Therefore, the vast amount of research following the logic of technology acceptance seems of limited value for the current discussion.

8 Resistance to Change and Sovereignty of Subjects

To move beyond the limitations of models of technology acceptance, our analysis incorporates Klaus Holzkamp's (1995) subject-based learning perspective. From this view, the resistance to adopting innovations can be interpreted as a *considered reaction of sovereign subjects*. Everyday learning, in this framework, is the goal-oriented pursuit by individuals seeking to expand their scope of action and opportunities for developing their capabilities in interaction with the environment (cf. Faulstich et al., 2005).

In this context, resistance towards innovations is not merely a disturbance or a deficit; rather, it is seen as an expression of the learner's subjective interpretation of affordances and threats of an environment. Resistance arises precisely when there is an unresolved tension between the individual's own interests and external conditions which they feel are imposed upon them. This conflict can manifest as open opposition or passive behaviour, such as refusal, distancing, or cursory participation without genuine interest.

This experience results in *defensive learning,* which manifests a behaviour purely intended to avert disadvantages or threats to one's quality of life (e.g., avoiding sanctions) without fostering genuine interest. In contrast, *expansive learning* arises when individuals act out of their own interests in response to a problem they experience as meaningful, thereby expanding their capabilities. Resistance against innovations, therefore, signals a discrepancy between externally determined imperatives and the subject's own interests, thus representing a meaningful reaction of sovereign subjects.

This theoretical perspective applies equally to teachers, who, as subjects, react to the explicit or implicit demands of their

institutional environments and technologies' affordances. Their resistance to digital technology thus implicitly reveals a fundamental, often elusive, unease. While research on technology acceptance suggests that poor acceptance must be overcome, viewing this resistance through Holzkamp's lens requires taking it seriously as a deliberate expression against the individual's experiences and biography. A teacher's refusal to genuinely adopt digital technology for instruction, even while superficially adapting to expectations, can then be interpreted as a subjectively wise, albeit sometimes hidden, response to a situation that contradicts their personal or professional interests.

9 Digital Resistance – a Cultural Phenomenon

Empirical data confirms persistent scepticism among teachers in Germany regarding digital technology. Studies show that teachers reported higher levels of scepticism regarding digital media use in ICILS 2018 than in 2013, with 2023 values settling between the two extremes (Drossel et al., 2023). These results have been documented in several other countries as well (Ertmer et al., 2012; Kim et al., 2013; Antonietti et al., 2022), but the situation in Germany is characterised by a specific cultural background, which is outlined in the following section.

It would be too easy to blame teachers in general for the situation in German schools. When teachers themselves are asked, they rightly point to inadequate equipment (also beyond the devices in the classroom) and gaps in the digital ecosystem for education, as well as the lack of support for maintaining and operating the digital environment on-site and online. Digital learning creates a greater dependency on technical availability, which can only be met by technical support (Drossel et al., 2023; Krein, 2022; Schiefner-Rohs, 2017).

Furthermore, this critical attitude is not limited to teachers; it often extends to parents and those responsible for policy

implementation and resource allocation in ministries, central authorities, state institutes, and school administrations.

Overall, the public debate in Germany seems to be distinguishably different from the international discussion (Kerres, 2020a). While the focus in other countries is often on how digital technology can be introduced more quickly, the German discussion engages more fundamentally with the *pros and cons* of digital technology itself (cf. Kerres, 2020b). The discussion is highly emotional, framing digital technology either as a central threat to education or as a decisive prerequisite for future economic viability.

Quantifiable cultural differences reveal that 30% of the population in Germany belongs to the group of "digital sceptics," the highest proportion internationally (Aden, 2021; Kostka, 2023). This scepticism extends to data on lower political participation in social media (Hoffmann et al., 2024), more critical views on facial recognition (Kostka et al, 2022), and heightened sensitivity regarding data handling in the health sector (Kühnel & Wilke, 2025). These findings support the view that reluctance toward digital technology is not an individual acceptance problem but a symptom of a more culturally embedded tradition.

10 Multi-Level School System – Sovereign Actors

The reluctance to integrate digital technology is deeply intertwined with structural elements of the German education system (Brüsemeister, 2007; Drewek & Harney, 2025).

The current system evolved after World War II as a conscious response to the previous political regime, which relied on centralised control of education, culture, and media, backed by extensive surveillance. As mentioned, structures were implemented precisely to protect against undue influence through central authorities. The public school system is thus designed as a multi-level structure based on the principle of *sovereignty* of the states in the field of education, characterised by a variety of actors.

This structure comprises the federal level, the state level, the intermediate support system (institutes, quality agencies, media support centres, libraries), municipal school authorities, and the school level. Its roots reflect conscious political decisions aimed at regional autonomy, democratic participation, and the deliberate avoidance of centralised control (Tenorth, 2020). Teachers, as sovereign actors, enjoy a high level of freedom in choosing and designing content and instructional methods for their lessons, unlike teachers in any other country in the world.

This robust position of the teacher prevents centralised control. Furthermore, it neccesitates a complicated and sometimes tedious system based on exchange and deliberative coordination mechanisms. The structure is explicitly designed to ensure the *resilience* of the school system against political appropriation attempts and interference by other external (private) parties, and does so by mitigating strong top-down elements.

From the perspective of innovation, this governance structure entails difficulty in implementing change within a coherent education policy. The mechanism of the school system strongly relies on the individual teacher deciding for or against an innovation. Digital transformation, on the other hand, relies heavily on structural changes across an entire school. The diagnosis, therefore, is that the school system is structurally designed to absorb and largely neutralise top-down innovations. Resistance to change cannot merely be attributed to the unwillingness of individuals; it is structurally built into the system.

11 Data Protection and Privacy – Historically Grounded

Data protection is frequently mentioned as a major obstacle to digitalisation in Germany. Legislation adheres to the idea of *data avoidance* and the individual right of *informational self-determination*, guided by the principle that the least risk arises when no data is stored. Germany is considered one of the nations with the strictest

rules for data protection and demonstrates a strong will to implement these regulations.

This deep sensitivity can be explained historically through the experiences of totalitarian and authoritarian regimes in Germany—both fascism and communism—that enforced their rule through the systematic surveillance and spying of individuals. The persecution and killing of people of Jewish descent by the National Socialists was possible only because of the availability of a vast amount of data and access to an early data processing system. The national census of May 17, 1939, which recorded religious affiliation, enabled cross-regional evaluation of profiles to identify Jewish ancestry across Germany. This registration was, in essence, one of the first large-scale applications of computer technology involving "big data" analysis with a high social impact (Black, 2012; Luebke & Milton, 1994).

Similarly, the surveillance system in the communist German Democratic Republic (GDR), which involved a high percentage of the population acting as informants, relied heavily on surveillance technology. The sheer extent of this surveillance still has a long-term detrimental effect on interpersonal and institutional trust that persists to this day and correlates with measures like income and (un)employment rates (Lichter et al, 2021).

These collective experiences have left a cultural mark characterised by scepticism towards state surveillance, data acquisition, aggregation, and evaluation. This historical trauma is unique among comparable nations.

Decades later, this specific and culturally embedded sensitivity culminated in massive public protests against the 1983 national census in West Germany, leading to its postponement until 1987 and establishing "informational self-determination" as a fundamental right of the individual by German courts (cf. Mühlichen, 2022).

The current discussion regarding the handling of private data in the public sphere can therefore be interpreted against the backdrop of a history of establishing the concepts of data avoidance and informational self-determination into public consent and law. Learning analytics or large-scale AI that inherently rely on casual data acquisition obviously seem unacceptable in this larger picture.

This perspective elevates Germany's data protection stance from a technical limitation to a necessary political and ethical imperative. Against this backdrop, digital solutions and AI models based on the acquisition of big data and subtle surveillance technology (cf. Zuboff, 2022), especially when sharing data with state authorities, carry negative connotations.

Maybe surprisingly, users seem to be less willing to share data with *public* institutions in Germany than with privately owned companies such as social media platforms. Studies have analysed the conditions under which users are more open to sharing their data and how this differs across various nations: This willingness varies widely between countries, depending on variables such as institutional trust and cultural dimensions like individualism versus collectivism (Bauer & Schiffinger, 2016; Hoffmann & Boulianne, 2024; Kühnel & Wilke, 2025).

12 Digital Innovations – Rethinking Policies

The preceding considerations might suggest rethinking innovation policy regarding digital technology in education. The traditional approach aims to win people over with positive arguments, hoping that the experience and participation in successful projects will help foster acceptance and wider use. However, these efforts remain challenging if they fail to address the underlying obstacles and cultural configurations embedded in collective memory.

Since the scepticism toward digital technology has been classified as historically and culturally based, and the resilience of the school system has been described as a deliberate structural feature, the objective cannot be to break this collective stance, but rather to address this condition through measures that rely on a deeper understanding of these underlying conditions.

While international discussions often are based on a progressive (and sometimes naive) belief in the benefits of digital technology and artificial intelligence for learning (cf. Kerres, 2025), Germany's

position in the academic discourse aligns more closely with the emerging *Critical Tech Studies* discourse in the international arena (cf. Macgilchrist, 2021). This line of scholarly discussion focuses on critical issues of educational technology, such as reliance on products from foreign, potentially unfriendly states, perceived lack of digital sovereignty, unsolicited use of personal data for training AI models, opaque mechanisms for regulation of learning processes, and the limited willingness of AI companies to make their models and mechanisms publicly available. These criticisms, though increasingly international, are voiced particularly strongly in Germany (Selwyn, 2021; Williamson, 2016).

13 Digital Ecosystem for Education – Perspectives

The analysis of cultural and historical factors—specifically the deep-seated scepticism toward surveillance and data aggregation stemming from Germany's past, coupled with the structurally deliberate decentralisation of the federal school system—suggests a more elaborate rethinking of innovation policy in education.

This paper is intended as a proposal for advancing this discourse, acknowledging that it does not aim to outline the appropriate measures to address the problem. It advocates for a detailed discussion on how German innovation policy can pursue a culturally sensitive strategy that confronts structural impediments inherent in the multi-level educational governance and supports the creation of a trustworthy digital ecosystem founded upon robust public-private sector collaboration.

Emulating innovation policies from other countries is unlikely to succeed, not only because comparative countries are technologically more advanced in this area, but also because their underlying beliefs – for example, about data acquisition for the "optimisation" of learning - run counter to an educational view of learners as autonomous subjects focused on self-regulation that is firmly established in German discourse.

A digital ecosystem following these considerations should be conceptualised to reflect the values of a liberal democracy and the idea of education as a public good, leveraging decentralisation to foster trust and diversity. This approach would rely on a digital ecosystem for education that enables principles of networking and decentralisation, freedom of expression, and productive discourse while protecting individuals against offensive and criminal acts in the digital sphere.

Design Principle	Implementation Mandate	Rationale and Goals
Federated and Decentralised Structure	Mandate an infrastructure based on a decentralised network of providers whose offerings are interoperable (federated). This system must be designed to enable interaction without allowing any single actor to dominate the market.	Directly counters the fear of centralised control and surveillance, aligning with the cultural imperative of "informational self-determination" and avoiding digital monopolies.
Public-Private Collaboration (PPP)	Acknowledging that a vital digital ecosystem requires the interaction of state and non-state actors. Innovative governance models, potentially involving Public-Private Partnerships (PPP), should be explored to integrate agile, research-based solutions from the EdTech sector while maintaining public oversight.	Utilises the agility of the private sector to develop necessary tools, while state involvement ensures adherence to data protection laws and the principle of education as a public good.
Recognising the Internet as an original Educational Space	Policy must transition from viewing digital technology as merely an additive tool for traditional institutions (schools, adult education centres) to recognising the internet (plus AI) itself as an educational space that requires active shaping	Acknowledges the formative power of the digital sphere in political socialisation and combats threats like conspiracy theories and hate speech, ensuring culturally developed values are robustly implemented in this new public space

Ultimately, a more fundamental challenge remains: We need to recognise the internet itself as an essential educational space for

lifelong learning (beyond the traditional institutionalised school system), and as a political sphere that requires active shaping and reflection not only from a legal perspective, but from an educational one as well.

Policy and public discourse remain fixated on traditional institutional settings (like schools and adult education centres), overlooking the formative, and sometimes corrosive, power of digital technology, artificial intelligence, and the internet. The digital sphere is where young people and adults experience major personal and political socialisation, and where issues like conspiracy theories and hate speech threaten political communication and social coexistence in society.

Germany, therefore, has the opportunity to utilise their culturally rooted position more wilfully as a political blueprint. By embracing the imperative of informational self-determination, structural resilience, and autonomy, it can pioneer a sovereign European strategy of trustworthy digital education. This model must consistently recognise digital technology as a crucial space for socialisation and education that must be actively addressed in political decision-making, ensuring culturally developed values are robustly implemented in this new digital sphere.

14 Literature

Aden, H. (2021). Privacy and Security: German Perspectives, European Trends and Ethical Implications. In R. Iphofen & D. O'Mathúna (Hrsg.), *Ethical Issues in Covert, Security and Surveillance Research* (Bd. 8). https://doi.org/10.1108/S2398-6018202108

Antonietti, C., Cattaneo, A., & Amenduni, F. (2022). Can teachers' digital competence influence technology acceptance in vocational education? *Computers in Human Behavior*, *132*, 107266. https://doi.org/10.1016/j.chb.2022.107266

Bai, Q., Dan, Q., Choi, Y., & Luo, S. (2025). Why We Disclose on Social Media? Towards a Dual-Pathway Model. *Behavioral Sciences*, *15*(4), 547. https://doi.org/10.3390/bs15040547

Bauer, C., & Schiffinger, M. (2016). *Perceived Risks and Benefits of Online Self-Disclosure: Affected by Culture? A Meta-Analysis of Cultural differences as moderators of Privacy Calculus in Person-to-Crowd Settings*. European Conference on Information Systems. https://www.semanticscholar.org/paper/Perceived-Risks-and-Benefits-of-Online-affected-by-Bauer-Schiffinger/6176ec5eeeccf8d74191e0d31f127b0d1681f0e6

Black, E. (2012). *IBM and the Holocaust: The Strategic Alliance Between Nazi Germany and America's Most Powerful Corporation-Expanded Edition* (Expanded.). Dialog Press.

Brüsemeister, T. (2007). Steuerungsakteure und ihre Handlungslogiken im Mehrebenensystem der Schule. In J. Kussau & T. Brüsemeister (Hrsg.), *Governance, Schule und Politik: Zwischen Antagonismus und Kooperation* (S. 63–95). VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-531-90497-9_3

Christianto Leonardo, M., & Santosa, D. W. (2024). *Systematic Literature Review and Future Research Agenda on Change and Innovation Management Focusing on Technology Adoption and Digital Transformation* (SSRN Scholarly Paper No. 5004709). Social Science Research Network. https://doi.org/10.2139/ssrn.5004709

Cloarec, J., Meyer-Waarden, L., & Munzel, A. (2024). Transformative privacy calculus: Conceptualizing the personalization-privacy paradox on social media. *Psychology & Marketing*, *41*(7), 1574–1596. https://doi.org/10.1002/mar.21998

Drewek, P., & Harney, K. (2025). Gesellschaftliche Verfasstheit von Schule und Berufsbildung. *Studienbuch Bildungswissenschaften 3: Schulsysteme verstehen und Professionalität entwickeln*, *3*, 29.

Drossel, K., Gerick, J., Niemann, J., Eickelmann, B., & Domke, M. (2023). Die Perspektive der Lehrkräfte auf das Lehren mit digitalen Medien und die Förderung des Erwerbs computer-und informationsbezogener Kompetenzen in Deutschland im internationalen Vergleich. *ICILS*, 149–188.

Eickelmann, B., Casamassima, G., Drossel, K., & Fröhlich, N. (2024). *ICILS 2023 im Überblick: Zentrale Ergebnisse, Entwicklungen über ein Jahrzehnt und mögliche Entwicklungsperspektiven*. Waxmann.

Ertmer, P. A. (1999). Addressing first-and second-order barriers to change: Strategies for technology integration. *Educational technology research and development*, *47*(4), 47–61.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, *59*(2), 423–435. https://doi.org/10.1016/j.compedu.2012.02.001

Faulstich, P., Forneck, H. J., Grell, P., Häßner, K., Knoll, J., & Springer, A. (Hrsg.). (2005). *Lernwiderstand – Lernumgebung – Lernberatung*. wbv.

Granić, A. (2022). Educational Technology Adoption: A systematic review. *Education and Information Technologies*, *27*(7), 9725–9744. https://doi.org/10.1007/s10639-022-10951-7

Grell, P., & Rau, F. (2011). Partizipationslücken – Social Software in der Hochschullehre. *MedienPädagogik. Zeitschrift für Theorie und Praxis der Medienbildung*, *21*, 1–23.

Hartong, S., Breiter, A., Jarke, J., & Förschler, A. (2025). Digitalisierung von Schule, Schulverwaltung und Schulaufsicht. In T. Klenk, F. Nullmeier, & G. Wewer (Hrsg.), *Handbuch Digitalisierung in Staat und Verwaltung* (S. 613–622). Springer Fachmedien. https://doi.org/10.1007/978-3-658-37373-3_43

Hauck-Thum, U., & Pallesche, M. (2022). Schulentwicklung in der Kultur der Digitalität. *Lernende Schule*, *2022*(100), 33–35.

Heinemann, A., Leber, J., Sander, P., & Ahmad, C. (2022). Strategien und Maßnahmen für die schulische Curriculumsentwicklung im Kontext der Digitalisierung. Ein Critical Review zur vergleichenden Analyse politischer Initiativen. In A. Wilmers, M. Achenbach, & C. Keller (Hrsg.), *Bildung im digitalen Wandel. Lehren und Lernen mit digitalen Medien.* (Bd. 3, S. 69–102). Waxmann. http://nbn-resolving.de/urn:nbn:de:0111-pedocs-299752

Heinen, R., & Kerres, M. (2017). Bildung in der digitalen Welt als Herausforderung für Schule. *DDS - Zeitschrift für Erziehungswissenschaft, Bildungspolitik und pädagogische Praxis*, *109*(2), 128–145.

Hoffmann, C. P., & Boulianne, S. (2024). It's Fine If Others Do It Too: Privacy Concerns, Social Influence, and Political Expression on Facebook in Canada, France, Germany, the United Kingdom, and the United States. *Social Media + Society*, *10*(4), 20563051241290334. https://doi.org/10.1177/20563051241290334

Holzkamp, K. (1995). *Lernen: Subjektwissenschaftliche Grundlegung*. Campus.

Kalckreuth, N. von, & Feufel, M. A. (2023). Extending the Privacy Calculus to the mHealth Domain: Survey Study on the Intention to Use mHealth Apps in Germany. *JMIR Human Factors*, *10*(1), e45503. https://doi.org/10.2196/45503

Kammerl, R., & Ostermann, S. (2010). Medienbildung–(k) ein Unterrichtsfach? Eine Expertise zum Stellenwert der Medienkompetenzförderung in Schulen. *Hamburg: Medienanstalt Hamburg/Schleswig-Holstein (MA HSH)*.

Kerres, M. (2020a). Against All Odds: Education in Germany Coping with Covid-19. *Postdigital Science and Education*. https://doi.org/10.1007/s42438-020-00130-7

Kerres, M. (2020b). Bildung in der digitalen Welt: Über Wirkungsannahmen und die soziale Konstruktion des Digitalen. *MedienPädagogik: Zeitschrift für Theorie und Praxis der Medienbildung*, *17*, 1–32. https://doi.org/doi.org/10.21240/mpaed/jb17/2020.04.24.X

Kerres, M. (2025). Mediendidaktik: Versuch einer Positionierung. *MedienPädagogik: Zeitschrift für Theorie und Praxis der Medienbildung*, *65*, 1–27. https://doi.org/10.21240/mpaed/65/2025.04.26.X

Kerres, M., Sander, P., & Waffner, B. (2022). Zum Zusammenwirken von Bildungsforschung und Bildungspraxis: Gestaltungsorientierte Bildungsforschung als Ko-Konstruktion. *Bildungsforschung.org*, *2*, 1–18. https://doi.org/10.25539/bildungsforschun.v0i2.935

Kim, C., Kim, M. K., Lee, C., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and Teacher Education*, *29*, 76–85. https://doi.org/10.1016/j.tate.2012.08.005

Kokolakis, S. (2017). Privacy attitudes and privacy behaviour: A review of current research on the privacy paradox phenomenon. *Computers & Security*, *64*, 122–134. https://doi.org/10.1016/j.cose.2015.07.002

Köller, O., Hasselhorn, M., Hesse, F. W., Maaz, K., Schrader, J., Solga, H., Spieß, C. K., & Zimmer, K. (2019). *Das Bildungswesen in Deutschland: Bestand und Potenziale*. utb GmbH.

Kostka, G. (2023). Digital doubters in different political and cultural contexts: Comparing citizen attitudes across three major digital technologies. *Data & Policy*, *5*, e27. https://doi.org/10.1017/dap.2023.25

Kostka, G., Steinacker, L., & Meckel, M. (2022). Under big brother's watchful eye: Cross-country attitudes toward facial recognition technology. *Government Information Quarterly*, *40*, 101761. https://doi.org/10.1016/j.giq.2022.101761

Kowalczuk, I.-S. (2013). *Stasi konkret: Überwachung und Repression in der DDR*. C.H.Beck.

Krein, U. (2022). ‹Hätten wir keinen Digitalpakt, hätten wir eine bessere Ausstattung›: Schulische Infrastruktur zwischen politischen Versprechungen und netzfreier Realität. *MedienPädagogik: Zeitschrift für Theorie und Praxis der Medienbildung*, *49*, 185–203. https://doi.org/10.21240/mpaed/49/2022.06.28.X

Kühnel, E., & Wilke, F. (2025). Health data sharing in Germany: Individual preconditions, trust and motives. *Frontiers in Public Health*, *13*. https://doi.org/10.3389/fpubh.2025.1538106

Lewalter, D., Kastorf, T., & Moser, S. (2023). Digitalisierungsbezogene Lerngelegenheiten und -aktivitäten in Schule und Freizeit. In D. Lewalter, J. Diedrich, F. Goldhammer, O. Köller, & K. Reiss (Hrsg.), *PISA 2022: Analyse der Bildungsergebnisse in Deutschland* (1. Aufl.). Waxmann.

Lichter, A., Löffler, M., & Siegloch, S. (2019). *The Long-Term Costs of Government Surveillance: Insights from Stasi Spying in East Germany* (SSRN Scholarly Paper No. 3486145). Social Science Research Network. https://doi.org/10.2139/ssrn.3486145

Lichter, A., Löffler, M., & Siegloch, S. (2021). The Long-Term Costs of Government Surveillance: Insights from Stasi Spying in East Germany. *Journal of the European Economic Association*, *19*(2), 741–789. https://doi.org/10.1093/jeea/jvaa009

Luebke, D. M., & Milton, S. (1994). Locating the victim: An overview of census-taking, tabulation technology, and persecution in Nazi Germany. *IEEE Annals of the History of Computing*, *3*, 25–39.

Macgilchrist, F. (2021). What is 'critical' in critical studies of edtech? Three responses. *Learning, Media and Technology*, *46*(3), 243–249. https://doi.org/10.1080/17439884.2021.1958843

Marikyan, D., Papagiannidis, S., & Stewart, G. (2023). Technology acceptance research: Meta-analysis. *Journal of Information Science*, 01655515231191177. https://doi.org/10.1177/01655515231191177

Meissner, F., & Nordheim, G. von. (2019). Exploration of a fragmented discourse. Privacy and data security in Süddeutsche Zeitung: 2007–2017. *Mediatization Studies*, *2*(0), 103–123. https://doi.org/10.17951/ms.2018.2.103-123

Mühlichen, A. (2022). Informationelle Selbstbestimmung. In N. Baur & J. Blasius (Hrsg.), *Handbuch Methoden der empirischen Sozialforschung* (S. 371–381). Springer Fachmedien. https://doi.org/10.1007/978-3-658-37985-8_23

Neuendorf, U. L. (2017). *Surveillance and control: An ethnographic study of the legacy of the Stasi and its impact on wellbeing*. UCL (University College London).

OECD. (2025). *How's Life for Children in the Digital Age?* OECD Publishing. https://doi.org/10.1787/0854b900-en

Otto, D., Scharnberg, G., Kerres, M., & Zawacki-Richter, O. (Hrsg.). (2023). *Distributed Learning Ecosystems. Concepts, Resources, and Repositories*. Springer Nature.

Rogers, E. M. (2003). *Diffusion of Innovations*. Free Press.

Scheiter, K., & Lachner, A. (2019). DigitalPakt – was nun? Eine Positionierung aus Sicht der Lehr-Lernforschung. *Unterrichtswissenschaft*, *47*(4), 547–564. https://doi.org/10.1007/s42010-019-00059-2

Schiefner-Rohs, M. (2017). Medienbildung in der Schule. Blinde Flecken und Spannungsfelder in einer Kultur der Digitalität. *MedienPädagogik: Zeitschrift für Theorie und Praxis der Medienbildung*, *27*, 153–172. https://doi.org/10.21240/mpaed/27/2017.10.15.X

Selwyn, N. (2021). *Education and technology: Key issues and debates*. Bloomsbury Publishing. https://books.google.com/books?hl=en&lr=&id=dMZKE-AAAQBAJ&oi=fnd&pg=PR1&dq=info:Dt7sH6x2hckJ:scholar.google.com&ots=wnSTRR5GBz&sig=aECqqDO07wwpeRlCkN15PlyUUuU

Tenorth, H.-E. (2020). *Die Rede von Bildung: Tradition, Praxis, Geltung - Beobachtungen aus der Distanz* (1. Aufl. 2020 Edition). J.B. Metzler.

Waffner, B. (2021). Schulentwicklung in der digital geprägten Welt: Strategien, Rahmenbedingungen und Implikationen für Schulleitungshandeln. In A. Wilmers, M. Achenbach, & C. Keller (Hrsg.), *Bildung im digitalen Wandel. Organisationsentwicklung in Bildungseinrichtungen* (Bd. 2, S. 67–103). Waxmann. https://doi.org/10.25656/01:23605

Williamson, B. (2016). Digital education governance: An introduction. *European Educational Research Journal*, *15*(1), 3–13. https://doi.org/10.1177/1474904115616630

Wohlfart, O., & Wagner, I. (2022). „DigitalPakt Schule 2019 bis 2024" – Analyse der strukturellen Digitalisierung des Bildungssystems in Deutschland. *PraxisForschungLehrer*innenBildung. Zeitschrift für Schul- und Professionsentwicklung. (PFLB)*, *4*(1), 202–213. https://doi.org/10.11576/pflb-5973

Zuboff, S. (2022). Surveillance Capitalism or Democracy? The Death Match of Institutional Orders and the Politics of Knowledge in Our Information Civilization. *Organization Theory*, *3*(3), 26317877221129290. https://doi.org/10.1177/26317877221129290

Michael Kerres is a Professor of Educational Science who holds the Chair of Educational Technology and Instructional Design at the Institute for Vocational and Adult Education at the University of Duisburg-Essen (Germany). His research group focuses on educational technology and artificial intelligence from the perspective of educational science, exploring the future of learning in close collaboration with partners from the educational field. Kerres is also the founder and (co-) partner of learninglab gGmbH, Cologne. As a non-profit organisation, learninglab contributes to the digital transformation in education by undertaking projects that include consulting, development, and evaluation of innovation initiatives within educational institutions.