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DIGITAL TECHNOLOGY INTEGRATION IN SCHOOLS: A THEORETICAL APPROACH

Daniela COMAN, Stefan COJOCARU

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Digital Technology Integration in Schools: A Theoretical Approach

Daniela COMAN¹, Stefan COJOCARU²

Abstract

Digitalisation in schools represents one of the structural dimensions of contemporary society rather than a peripheral technological development and it definitely has direct consequences for the school organization, institutional culture and pedagogical practice. Although the Technology Acceptance Model (TAM) continues to be one of the most influential frameworks for explaining technology adoption and it emphasizes the arguments and possible explanations for digital technologies adoption in school system, recent research suggests that digital technology integration in education cannot be understood isolated and only through subjective evaluations of technological utility and usability. Moreover, we will notice that it is a multilevel process shaped by digital competence, institutional support, school culture, family involvement, infrastructure, and socio-economic inequality, like a triangulation model. This article develops a sociological and educational framework for examining digital technology integration in education by drawing upon theoretical contributions and research on digital competence, digital skills, open educational resources, digital divide, and teacher technology acceptance. From this perspective, the paper argues that digital literacy should be conceptualized as a form of socially distributed capital and take into consideration that teachers might function as central mediators between technology and learning outcomes. We cannot ignore how the pandemic period intensified the existing inequalities while revealing the importance of digital tools, school-family collaboration and most of all the organizational limits. Digital technologies became indispensable in order to keep the educational process within its normal limits, although it intensified the preexisting inequalities that affected eventually: students, families and teachers. Therefore, TAM is presented as a useful framework that must be extended through multilevel and contextual analysis in order to explain meaningful and sustainable digital technology integration in schools.

¹ Alexandru Ioan Cuza University, Department of Sociology, Social Work and Human Resources, Iasi, ROMANIA. E-mail: danielacoman333@gmail.com (Corresponding Author)

² Alexandru Ioan Cuza University, Department of Sociology, Social Work and Human Resources, Iasi, ROMANIA. E-mail: contact@stefancojocar.ro; ORCID: 0000-0003-4873-5340

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Introduction

Digitalisation has become gradually incorporated in everyday functioning of contemporary societies, influencing how people communicate, access information and participate actively in institutional life. Educational systems all over the world have been deeply affected by these transformations, as online platforms expanded, schools increasingly relied on digital infrastructure and also on mediated forms on interaction with teachers and their new teaching and learning methods. The expansion of digital technologies in schools should be considered more than a technical analysis of tools and platforms; it requires a critical understanding of how technology interacts with school culture, teacher pedagogical style, family support, public policies and also social structure. In Romanian educational context, the persistent disparities related to digital competence, institutional capacity and socio-economic inequality became visible through the uneven distribution of technological resources between urban and rural schools (UNICEF Romania & BRIO, 2023), teachers' preparedness and unequal access to digital learning environments considering the disadvantaged communities. Integration of digital technologies in schools and in educational process, from sociological point of view, represents more than purely technical analysis of software, platforms and devices, but a way to search a perspective capable of examining how technology interacts with institutional practices, family resources, pedagogy, school culture and broader inequality (Feenberg, 1999; Frank, Zhao, & Borman, 2004).

Research on educational technology has long been influenced by the Technology Acceptance Model (TAM; Davis, 1989; Bagozzi, 2007; Abdullah, & Ward, 2016; Scherer, Siddiq, & Tondeur, 2019; Alshammari, & Alkhawaldeh, 2025; Lai, 2017; Granić & Marangunić, 2019), which explains technology adoption through perceived usefulness and perceived ease of use. Although TAM still is influential because it provides a clear and explanatory simplicity of why individuals choose to use or avoid technologies, contemporary educational realities suggest that digital technology integration in schools cannot be understood exclusively as individual psychological choice (Pittman & Gaines, 2015). It is rather a choice influenced by regional disparities, institutional funding, leadership, collegial support, individual creativeness, teacher training, parental involvement and access to material resources (Ertmer, 2005; Scherer *et al.*, 2019; Tondeur *et al.*, 2017).

The latest pandemic period intensified these issues and made them especially visible (Mailizar, Burg, & Maulina, 2021). The rapid transition to online schooling revealed noticeable disparities distribution of access to devices, connectivity and digital competencies, while also showing how essential digital tools had become for maintaining educational continuity. In Romania, numerous schools

and families encountered significant barriers in integrating digital technologies in education especially due to inadequate infrastructure (OECD, 2023), limited digital literacy and insufficient institutional support (UNICEF Romania & BRIO, 2023). Reports and empirical studies from the pandemic period confirm that school closures amplified pre-existing inequalities and that students and teachers in vulnerable communities faced substantial barriers to participation in digital learning (Bonaf & González, 2020; UNESCO, 2020; van de Werfhorst *et al.*, 2022). These developments make it necessary to reconsider digital technology integration not as a linear process of adoption, but as a complex social phenomenon.

Transformation of Education through Digitalisation

Digitalisation can be seen as integration of digital technologies into social, cultural, economic, and educational life and in general in contemporary societies. Within the education field, the process includes the use of software, hardware, digital platforms, learning management systems, communication tools, and online resources to support teaching, learning, and assessment. However, transformation is not limited to technical modernization; it also changes how knowledge is transmitted, how learners participate and how schools organize learning environments in order to achieve progress.

The integration of digital technologies has effects for both pedagogical practices and the organization of educational interactions. Three dimensions are central to educational digitalisation: (1) both students and teachers require digital competence in order to participate effectively in technology-mediated learning; (2) digital technologies enable the transmission of foundational knowledge and new information in forms that can be adapted to diverse learners; (3) schools require adequate infrastructure, including hardware, software, and connectivity, in order to support instructional use. Without these conditions, we cannot take into consideration a process of integration while analyzing digitalisation in school system and in education in general. The process of integration and adoption of digital technologies in the educational field is not a linear process of innovation, but is rather a complex social transformation, at the intersection of multiple layers: public policy, institutional culture, resource access, social inequality, structural dimensions and digital change.

The European framework for digital competence for citizens, often referred to as DigComp, emphasizes five domains: information and data literacy, communication and collaboration, digital content creation, safety and problem-solving. This framework is useful for education because it shows that digital competence is not limited to operational skills. It also includes critical judgment, ethical behavior, communication and the capacity to solve problems in digital environments. For schools, this means

that digital literacy must be understood as both a learning outcome and a condition for participation in contemporary life.

European policy developments have increasingly recognized this issue. The European Commission's Digital Education Action Plan and related initiatives emphasize the need for more effective digital education ecosystems, improved infrastructure, teacher training, critical thinking stimulation and digital competencies growth. Nowadays there are multiple platforms and tools such as SELFIE, which were developed to support schools in reflecting on their digital readiness and identifying areas for improvement. These policy measures show that digitalisation in education is now understood as a systemic question involving curriculum, staff development, and organizational capacity.

Digital Competence and Digital Literacy

Digital competence refers to the capacity to use confident, critical and responsible digital technologies across educational, social and professional context. In educational contexts, it applies to students, teachers and families and includes the ability to access, evaluate, create and communicate information safely through digital means. These competences are essential not only for academic performance but also for employability, civic participation, lifelong learning and social integration.

A key insight from recent research is that the basic digital competence is developed outside formal schooling. Students enter educational environments having unequal forms of digital capital (due to the socio-economical background, family resources, accessibility to digital tools) and they often acquire digital skills through informal practices, family environments, peer interaction, and everyday engagement with media and communication technologies. When formal education integrates digital tools effectively, it can build on these existing experiences and transform them into more structured and transferable forms of knowledge. If schools fail to do this, they risk widening the gap between students with strong digital exposure and those with limited access (Kirschner, Sweller, & Clark, 2006).

This theory can also be applied to teachers, who are the main vectors in forming and influence the process for the future minds and also the critical thinking of their students (Gallimore, *et al.*, 2024). Digital competence for teachers is not a matter of technical training, but the ability to select appropriate resources, design meaningful and attractive learning activities, manage classroom interaction and align technology use with curricular goals. Studies of teacher adoption show that support conditions, competence, training courses and confidence are essential for sustainable use and integration of digital technologies (Howard *et al.*, 2021; Joo *et al.*, 2018; Sánchez-Prieto *et al.*, 2019). Therefore, digital competence should be treated as a central dimension of professional capacity rather than as

an optional add-on. When educational institutions succeed in integrating digital technologies into everyday lessons in schools, in the curricula, student's previous experience with media, online communication and digital interaction can be transformed into more transferable competences and more structured forms of knowledge. These considerations are also relevant in the case of teachers, whose role extends beyond simple transmission of dates and information toward the formation of critical thinking, educational participation and direct involvement from students encouraging their inner reflexive capacities. The center mediator role of the teachers between technological infrastructure and learning process will be analyzed deeply while presenting this theoretical perspective.

School Culture and Institutional Conditions

The integration of digital technologies into formal education cannot be explained exclusively through access to infrastructure or technological equipment, but also on school culture (Mason, 2008). Equally important is school culture that includes shared beliefs, values, norms, routines, relationships, and expectations that shape how a school functions. It also includes leadership style, communication patterns, safety, physical environment, openness to diversity, and the degree of collaboration with families and communities.

From this perspective, technology integration becomes embedded within the everyday life of the school rather than functioning as an isolated technical intervention (Hew & Brush, 2007). Educational institutions characterized by innovation, collaboration, and professional learning is more likely to support meaningful use of digital tools than a school characterized by rigid routines or weak collegial relations. By contrast, schools that encourages communication with families and local institutions is better positioned to sustain digital learning beyond the classroom.

The work of Neil Selwyn (2016) emphasizes that digital tools cannot be separated from the social relations in which they are used and operate. Technology is always introduced into a specific institutional environment and its effects depend on the norms and practices of that environment. This means that the same digital tool may produce very different outcomes across schools depending on leadership, staff collaboration, and organizational readiness.

School culture becomes particularly significant in understanding technology integration because it is often shaped by the relationship between formal and informal learning. During the pandemic, these boundaries became blurred as home environments turned into learning spaces. Families were required to support children's access to devices, schedules, and online communication, often without sufficient preparation or institutional support. This revealed that schools do not operate in isolation; they rely on broader social systems that can either sustain or weaken educational continuity. Schools do not function independently from their social environment but actually we observe a proof that these depend on a wider

network of family support, community resources, teachers' collaborative behavior and institution cooperation.

The Dynamics of Digital Divide

The latest pandemic intensified concerns about the digital divide inside the society. School closures affected students unevenly, especially in communities with limited access to devices, internet connectivity, and adult support. Research has shown that educational inequalities during the pandemic were strongly influenced by socio-economic status, family resources, and the technological capacity of households and schools (Bonal & González, 2020; van de Werfhorst *et al.*, 2022).

The digital divide has at least three dimensions: access to material resources such as devices and internet connections; differences in digital skills and competence and the cumulative effects of broader social inequalities that shape who benefits most from digital opportunities. These dimensions are interrelated and reinforce one another. This means that digital technology integration cannot be treated as a neutral process, but a process that create polarization. Schools serving disadvantaged communities often face multiple barriers at once: weaker infrastructure, lower family access to devices, reduced support for learning at home, and fewer opportunities for professional development. As a result, digitalisation may reproduce rather than reduce inequality unless it is accompanied by deliberate equity-focused policy and institutional support.

The Romanian context illustrates this concern clearly. National reports show that digital competence levels remain below the European average, and structural issues such as double-shift schooling and uneven infrastructure continue to constrain educational innovation. Such conditions make it difficult for schools to implement extra-curricular or digitally enriched learning in a consistent way. A multilevel analysis must therefore include both micro-level acceptance and macro-level inequality.

Concerns toward Digital Technologies

Research on teachers' attitudes toward digital technologies has shown that active adoption within the educational process is influenced by both external and internal factors. External barriers include limited infrastructure, lack of time, insufficient training, weak technical support, and a lack of pedagogical resources. Internal barriers include beliefs about teaching, resistance to change, anxiety about technology, and doubts about the relevance of digital tools. These findings align with TAM model proposed as a theoretical approach in this article, but they also show that acceptance is shaped by contextual and relational conditions. In this sense, attitudes toward digital technologies are best understood as socially produced rather than purely individual.

The theoretical perspective proposed in this article supports the idea that technology acceptance is not shaped exclusively by individual attitudes of personal preferences, but also by institutional, contextual conditions. From this perspective, orientations towards digital technologies should be understood as socially constructed inside organization and cultural environments rather than being interpreted uniquely and depending only by individual psychological dispositions (Selwyn, 2016). A teacher may be open to innovation but unable to implement it because the institutional environment does not support change. Conversely, a school may provide devices and platforms, yet usage may remain superficial if teachers do not see the pedagogical value of the tools.

Studies have consistently found that teachers' willingness to use technology depends on perceived usefulness, perceived ease of use, self-efficacy, and social support (Cohen & Wills, 1985; Alshammari, & Alkhaldeh, 2025).

The role of the family became increasingly visible and also significant specially when households were transformed into essential spaces for educational participation. During the pandemic, families became key partners in digital education, providing space, supervision, and emotional support. This placed new demands on households and revealed how deeply schooling depends on family resources. The concept of family deprivatization captures this shift by showing how domestic life became more exposed to institutional expectations during online schooling. Future work should therefore include family-school relations as part of the broader ecology of digital learning.

Policy Support and Institutional Involvement

Open educational resources and digital platforms have become important instruments for supporting equitable access to learning materials. When properly designed and implemented, they can expand access to high-quality content, reduce costs, and support teacher adaptation. However, their usefulness depends on whether teachers are trained to use them and whether schools have the infrastructure to support access. Policy support is therefore essential to have progress (Coburn & Russell, 2008). European strategies on digital education have emphasized the need to improve teacher competences, expand digital infrastructure, and promote inclusive access. These efforts are aligned with broader goals of educational modernization and social inclusion. At the same time, policy cannot rely only on access provision. It must also address the cultural, organizational, and pedagogical conditions that determine whether resources are actually used effectively.

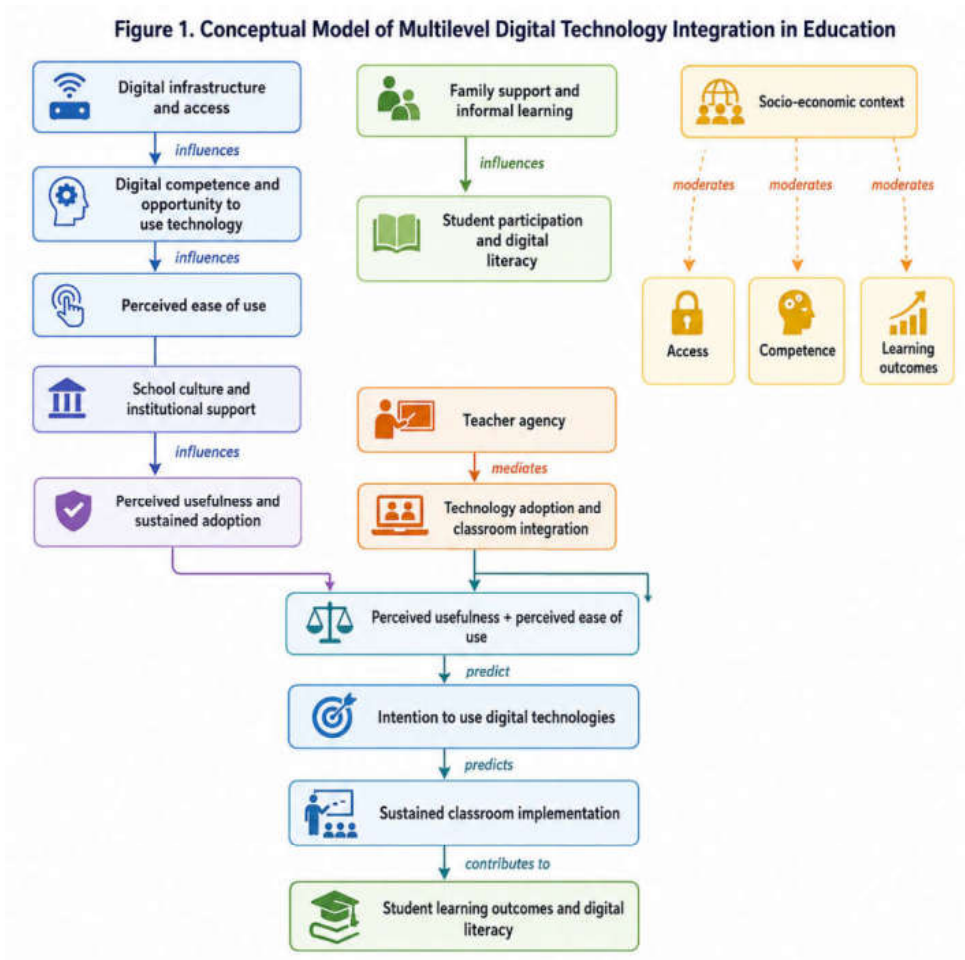
SELFIE, as an European Commission's tool (Self-reflection on Effective Learning by Fostering Innovation through Educational Technologies) has as purpose to help schools evaluate how are the digital technologies integrated into teaching process, leadership and organizational level. The tool encourages schools to improve their digital readiness and institutional level. From sociological perspective the approach recognizes that the digital integration process is mainly formed by institutional culture and organizational support rather than by individual motivation and is a good example of this broader policy approach because it encourages schools to reflect on their digital practices and identify areas for development. Such instruments are valuable because they connect technological planning with institutional self-assessment. They also support the idea that digital transformation should be school-based and context-sensitive rather than imposed as a uniform solution.

TAM in a Multilevel Framework

TAM remains useful because it provides a clear baseline for measuring individual acceptance. Perceived usefulness and perceived ease of use continue to matter, especially when studying teachers' willingness to integrate digital tools into practice. However, TAM becomes more powerful when it is embedded in a multilevel framework that includes digital competence, school culture, support systems, and inequality.

In this extended model, perceived usefulness should be interpreted as pedagogical usefulness, not just technical convenience. Perceived ease of use should reflect compatibility with teaching routines, curricular demands, and institutional expectations. Behavioral intention should be understood as part of a broader process of professional agency. This approach makes it possible to examine how individual perceptions interact with structural conditions.

Structural equation modeling is especially well suited to this task because it can test relationships among latent variables and examine mediation effects. For example, institutional support may shape perceived usefulness, while school culture may influence perceived ease of use and sustained use. Teacher agency may mediate the relationship between acceptance and classroom implementation. In addition, socio-economic context may moderate the relationship between access and outcomes. This type of design would allow future research to move beyond descriptive accounts of technology use and toward more explanatory multilevel models (Figure1).



Conclusion

Digital technology integration in education must be understood as a multilevel social process shaped by digital competence, school culture, institutional support, family involvement, and structural inequality. While TAM remains a valuable framework for studying individual acceptance, it cannot by itself explain the complexity of educational digitalisation. Teachers are central actors in this process because they mediate between technological possibilities and classroom realities.

The evidence reviewed in this article suggests that successful digital integration depends on much more than access to devices or positive attitudes toward

technology (Al-Adwan *et al.*, 2021). It requires a supportive school culture, equitable infrastructure, professional competence, and policies that address the digital divide. Future research should therefore combine TAM with sociological and organizational perspectives in order to produce a more complete and context-sensitive explanation of digital technology integration in education.

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