

Digitalisation and digital transformation of Education: Case study of Croatia

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Abstract

This paper examines the digitalisation and digital transformation of the Croatian education system through a qualitative descriptive approach, describing key developments over past three decades within broader EU policy developments on education digitalisation. Starting from early introduction of ICT infrastructure, establishment of dedicated institutions and development of first digital services in the education system, the paper follows gradual evolution towards systemic approaches and large-scale digital transformation, with particular attention on the e-schools programme as the central and recognised driver and framework for this change. Findings show how policy framework, supported with EU funding instruments and aligned with EU digital transition priorities, together with institutional coordination, holistic approach and investments into digital infrastructure as well as human resources, enabled shift from fragmented efforts to a structured and system-wide digital transformation of education system. Significant improvements in digital readiness of Croatian education system were internationally recognised, positioning Croatia's education system as a good example of coordinated digital transformation.

Keywords: digital transformation, digitalisation, education, knowledge management, Croatia

INTRODUCTION

In last two decades we have witnessed, substantial progress of digital technology in education, particularly in expanding the time and space of education and developing innovative, sustainable learning environments (Wang et al., 2024). Digitalization, and digital transformation closely relate to current trends in Industry 4.0 and Society 5.0 (Cordeiro et al., 2025; Nosratabadi et al., 2023). Digitalization (in the organisational context) can be understood as the use of digital technologies and data (digitized and natively digital) to improve organisation, and replace or transform business

processes, while digital transformation, on the other hand, can be defined as the incorporation of digital technology into every segment of an organization's activities, which results in changes to the organization's infrastructure and how it is organised and provides value to users of its product or service (Kraus et al., 2022). Digitalisation encompasses interaction of digital technologies and two processes - the social and the institutional processes which ultimately shape both society and the economy (Calderon-Monge & Ribeiro-Soriano, 2023). Digital transformation, on the other hand, can be considered as a change that happens with the implementation of technologies in a system within organisation or company (Reis & Melão, 2023). This transformation is supported by the adoption of new technologies which results with new performance, new processes, and new business models (Reis & Melão, 2023).

However, the above definitions are primarily aimed at private, business sector. In education, while to some extent similar digital technologies have specific roles and digital transformation goes even further. Use of digital technologies can have many benefits that can improve teaching and learning through introduction of new pedagogical approaches (Vičič Krabonja et al., 2024). While some literature stresses the transformative potential of hybrid learning and AI-enabled teaching for inclusion, others stress caution regarding privacy, teacher readiness, and the risk of superficial adoption without pedagogical redesign (Amiri et al., 2025; Asare & Yap, 2025; Walker et al., 2023). On a system level digital technology may increase the work efficiency, through student application (and admission) processes, accreditation information systems or collection of system-level statistical information and improving policy design and reform based on evidence (Schleicher, 2024). Digital technologies potential is seen in the impact on improvement of access to education, enhancing its quality and enabling personalised learning (OECD, 2023a). In general, digital technologies enable the creation, storage, sharing, and use of educational knowledge at institutional and system levels. However, some authors also identify challenges regarding introduction of digital technologies into education which include professional development of teachers, resource availability, and curriculum alignment (Msambwa et al., 2024).

In past decades educational reforms have included digitalization and implementation of ICT in teaching and learning, and this was especially emphasised during the COVID-19 pandemic (Gracin & Trupčević, 2025). During the COVID-19 pandemic evolution of our world into digital one has substantially accelerated (Kraus et al., 2022). Some authors see this period as great accelerator or catalyst for increasing use of digitalization (Amankwah-Amoah et al., 2021). Education systems were especially affected during this period, forcing remote learning and teaching, and digital infrastructure and digital technologies needed for e-learning become a necessity (Bach et al., 2023). In addition, this crisis also highlighted deficiencies and inequities in education systems worldwide

As digital transformation has intensified, the role of knowledge management (KM) has become increasingly significant. KM has been defined in various ways, with Davenport (1997) describing knowledge as a key organizational asset and outlining core KM activities such as capturing, categorizing, distributing knowledge through IT, and supporting employee training. KM practices are increasingly shaped and enabled by digital technologies which facilitate the efficiency, accessibility and agility of information exchange, including acquisition, storage, availability, and access (Nunes Alves et al., 2024). ICT represent a core set of practices that support efficient and effective KM system, while studies confirm interdependence between technology and KM (Nunes Alves et al., 2024).

From the above we can see that implementation of digitalisation and digital transformation in education can be observed on system (national or policy) level and on school (institutional) level (daily teaching and learning practices). In this paper we will focus on a system level overview of digitalisation phases of Croatian education. This paper explores three interconnected goals: i) to provide small-scale focused overview of literature on digitalisation, with emphasis on digitalisation in education and with reference to its connections to KM; ii) to provide overview of relevant European Union (EU) policy frameworks, tools and actions in digitalisation, as a broader context for developments in Croatia; and lastly iii) to identify, describe and systematise key efforts, phases and developments of digitalisation of Croatian education system, with primary focus on secondary education. The main research question guiding this study is: *How has Croatian secondary education system digitally transformed in the last 3 decades?*

In the following sections, we first provide the EU and national context, then present the Croatian education system, outline the main research method, and finally discuss the findings on the phases of digitalisation in education in Croatia.

EUROPEAN AND CROATIA'S STRATEGIC CONTEXT

Within the European context, the digitalisation has been on top of EU's Agenda within numerous initiatives and action plans for more than a decade. The 2010 Digital Agenda for Europe (European Commission, 2010), followed the Education and Training 2020 (ET2020) strategic framework for European cooperation in education and training explicitly highlighted the role of education systems on e-skills. Under the ET2020, a Working Group on Digital Skills and Competences was established (2016-2018), the digital transformation on education system across Europe was examined and produced a number of outputs like the SELFI tool (the self-reflection tool for digitally capable schools), the Digital Competence Framework for Educators (DigCompEdu) which describes the mix of technology related skills for educators, the Digital Competence Framework for Citizens (DigComp2.2,) as well as revised definition of digital competences in the EU framework of key competences (Szűcs, 2018). DigComp 2.2 provides comprehensive view of digital skills relevant for individuals, including teachers (Korže & Skrbinjek, 2025). The 2020 European Skills Agenda set out EU wide benchmark that called for 70% of 16 - 74-year-olds to have at least basic digital skills by 2025 (Caravella, 2022). In the Digital Education Action Plan (2018 – 2020 and 2021-2027) EU addresses the key challenge of ongoing technological transformation and focus on preparing schools for the digital age. First to provide support for the development of a high-performing digital education ecosystem, and second to improve digital skills and competences needed for digital transformation in the digital age (Shorey, 2024; Outeda, 2024). In 2023 Digital Decade policy programme 2030 was introduced that will guide Europe's digital transformation with set targets and defined key performance indicators (KPIs). As a part of the monitoring process a DESI dashboard for the Digital Decade was set-up. The DESI index ranks the EU Member States and monitors their progress through four main dimensions and 33 individual indicators (Bittner, Kovács, & Nábrádi, 2022). The EU DESI dashboard can indirectly be linked to education systems, mainly through the Human Capital dimension, which measures digital skills and ICT education outcomes.

Most EU Member States have adopted their own policies to address digital skills shortages and expand the use of ICT, often integrating digital skills priorities into national programmes and funding them through European Social Fund (European Commission, 2019). Croatia's national response to these EU level initiatives and policy frameworks has been articulated twofold, initially as a part of broader national strategy or specific policy documents. In 2014 Croatian Parliament adopted Strategy for

Education, Science and Technology which, among others, had an objective to broaden and enhance the application of ICT in education and learning and called for development of digital e-contents, teacher development in this field and new model of use of ICT in teaching and learning (Ministry of Science, Education and Sports, 2014). More operational document was Strategic Framework for the Digital Maturity of Schools and the School System in the Republic of Croatia 2030 which grew directly from the experience of the national e-Schools pilot project (2015–2019) implemented by CARNET in Croatia. Topic of digitalisation as well as education system was address under overarching National development strategy 2030. It emphasised digital transformation and human capital development as key priorities for long term growth, with special focus on the need to strengthen digital skills and modernise education and training system to support participation in the digital economy (World Bank, 2020). One of the documents that came as a result of National development strategy was National Plan for the Development of the Education System until 2027, which among others has a thematic area dedicated to implementation of digital technologies in education system and calls for continuation of the process of informatisation and application of digital technologies in the education system, and includes for the first time reference to use of Artificial Intelligence (AI) in education. Croatia also developed Digital Croatia Strategy 2032, adopted by the Croatian Parliament in late 2022, which clearly states that digitalisation of education is crucial for developing digital competences and workplaces (Government of the Republic of Croatia, 2022). The Strategy placed education as a cornerstone of Croatian digital future, through embedding digital competencies into curricula, fostering ICT innovation, and investing in educators and infrastructure (Mladenović, 2025). Lastly, like other countries, Croatia also developed a National roadmap for the Digital Decade policy programme 2030 which has a measure of digital maturity of primary and secondary education systems which focuses on developing and strengthening digital competences of educators, digital transformation of teaching and business processes in all schools in Croatia, efficient application of digital technologies in the learning and teaching process and investments into informatization of the education system (e-services, tools and IT systems) (Ministry of Justice, Public Administration and Digital Transformation, 2024).

STRUCTURE AND GOVERNANCE OF THE CROATIAN EDUCATION SYSTEM

Education system in Croatia comprises from early childhood education and care (ECEC), primary education, secondary education, higher education, and adult learning, covering the full learning lifecycle (OECD, 2025). Governance of the system is largely centralised and led by Ministry of Science, Education and Youth (European Commission, Eurydice, n.d.).

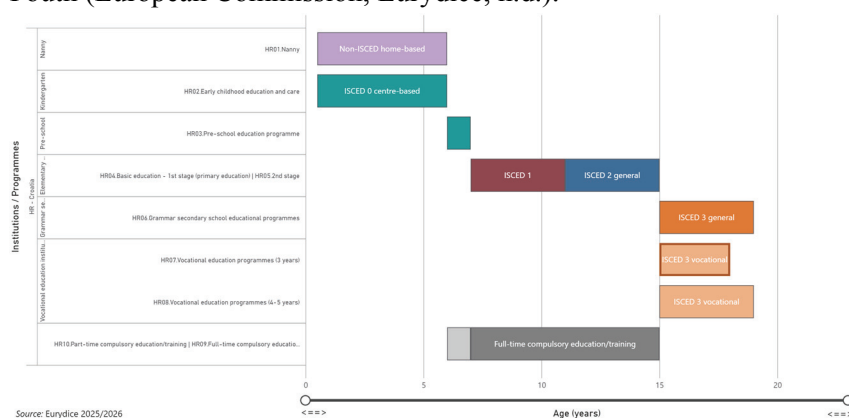


Figure 1: Structure of Croatian Education System - Early childhood and school education (non-ISCED ECEC, ISCED 0, ISCED 1-3, ISCED 4)

Source: European Commission, Eurydice. (2025)

ECEC institutions (ISCED 0) enrol children from the age of 6 months until they enter compulsory education (Domović & Drvodelić, 2025). Compulsory education (ISCED 1 and 2) lasts eight years, that students normally enrol at the age of six or seven years, and teaching is divided into regular and elective classes (Krišto & Rajić, 2024). After the compulsory education, students can enrol into upper secondary education (ISCED 3) which includes 4-year general education gymnasium programmes, art education and initial vocational education and training (VET) programmes that might last from 1 to 5 years. VET is dominant format of secondary education in Croatia, and on average 70% of learners select this type of education, and out them two thirds are in 4-year VET programmes. Upon completion, students can access tertiary education by taking State Matura exams for general education, art education and 4-year and 5-year programme VET graduates (Cedefop & Agency for Vocational Education and Training and Adult Education, 2023). According to the OECD, Croatian education and skills system in last two decades has achieved significant with a strong focus on digitalisation. Reforms have prioritised development of digital infrastructure, enhancing digital maturity of schools and the integration of digital technologies into teaching and learning (OECD, 2025).

METHODOLOGY

This paper was prepared using a qualitative descriptive approach and presents a case study of the digitalisation and digital transformation of Croatian education system. The theoretical background is based on a selective review of literature on digitalisation and digital transformation in education, with a reference to it, as enabler of KM. The aim was not to go into deep review of the field, but to highlight key concepts relevant at system level only. The policy and institutional developments analysis had two focuses: review of EU frameworks and strategies; as well as Croatian policy documents. Based on these sources, paper identifies and describes main efforts, phases and developments of Croatian education system over past three decades, with the EU framework providing broader context, but also main sources of funding for many of these efforts. The proposed method enabled to provide evidence to our main research question.

PHASES OF EDUCATION DIGITALISATION AND DIGITAL TRANSFORMATION IN CROATIA

The process of digitalisation and digital transformation of Croatian education system has gradually been developing from early technical foundations into a comprehensive strategic transformation. Two critical turning points in this evolution were the 2005 national development plan, which shifted the focus from simple infrastructure toward systemic integration and digital competence and large national upscaling using the European Union funding through European Social Fund projects. The process can be observed in several phases.

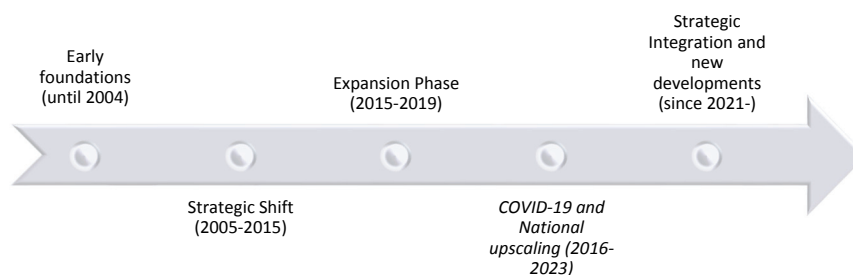


Figure 2: Phases of Education Digitalisation in Croatia

1. Early Foundations (1971, 1991–2004)

First major foundation of digitalisation of Croatian education system came in 1971 with the establishment of the University Computing Centre (SRCE) within the University of Zagreb, as a central institution for implementation of ICT in the systems of science and higher education but also in whole society (University Computing Centre Srce, n.d.). Next milestone was the founding of the Croatian Academic and Research Network (CARNET) in 1991, as a project and cooperation network of the Croatian Ministry of Science and Technology. In late 1992, the Croatian academic and research computer communications network was set up and connected to the global Internet network and that day is marked as the day the Internet came to Croatia (University Computing Centre Srce, n.d.). In March 1995, the Government of the Republic of Croatia passed the Decree on founding of the CARNET as an institution, with the aim of innovating the education system and encouraging the progress of individuals and the society through ICT (Croatian Academic and Research Network, n.d.-a). From the mid-1990s to the early 2000s, CARNET work was focused on expansion of academic network infrastructure by introducing high-speed ATM technology, organising country's first distance lecture in 1997, connecting to the pan-European GÉANT research network in 2001, and further upgrading capacity through the Giga CARNET project, which increased international connectivity (Croatian Academic and Research Network, n.d.-b).

2. The 2005 - 2015 Strategic Shift (ESDP Phase) and first changes in education system

A major acceleration happened with the adoption of Education Sector Development Plan (2005–2010) which implementation was supported by an 85 million USD loan from the World Bank for the Education Sector Development Project (World Bank, 2005). This plan as one of its aims had increasing the use of ICT and recognised that use of ICT opens a wide range of possibilities for sustainable learning opportunities and necessity to equip individuals with adequate digital skills. It addressed digitalisation from system level with the planned development of Education Management Information System (EMIS) and better monitoring of the performance of the education system to school level with teacher development and use of ICT in teaching and learning (Ministry of Science, Education and Sports, 2005). This phase was marked by significant innovations and technological development that were visible both at national and school level. Process was led by Ministry of Science, Education and Sports in collaboration with CARNET. Every school, working with CARNET, received a permanent internet connection and a number of digital services, including school website hosting for over 1.000 primary and secondary schools with institutional e-mail identities for teacher and students. (ReferNet Croatia, n.d.). Twenty years ago, in 2006 AAI@EduHr was established as a national authentication and

authorization infrastructure for science and higher education as a system that enables secure and reliable management of electronic identities, providing students, teachers, researchers and other education stakeholders simple and secure access to national and international digital services and online resources (University Computing Centre Sre, 2026). Another development was the digitised classroom pedagogical documentation - e-Class Register (e-Dnevnik), which trialled from the 2011/2012 school year. During evaluation 90% of surveyed teachers preferred it over paper records. To enable its application the Ministry changed national school administration rules to allow digital record-keeping, resulting in 30% of schools adopting it by 2014/2015. The Nikola Tesla national distance learning portal was developed and provided online courses in several subjects, ECDL computer literacy modules, combining multimedia content with interactive and audio-visual elements. Lastly, Schools 2.0 project connected 25 schools via optical fibre and installed wireless networks for tablet-based learning and videoconferencing and included a systematic teacher ICT training. This project was recognised in 2013 as one of the three most innovative in the European Prize for Innovation in Public Administration (ReferNet Croatia, n.d.). These were milestones which became set in place foundations for future developments and upscaling.

3. Expansion Phase (2015–2019)

Even larger advancements came with CARNET's European Social Found (ESF) and European Regional Development Found (ERDF) co-funded 40 million EUR "e-Schools pilot project" which involved 151 schools. It was a major leap in digitalisation by developing and integrating ICT infrastructure, digital equipment and tools, e-services and supported with teacher training signifying a shift from isolated use of technology to system wide digital integration in teaching and school management. Project included the upgrade of two central data centres to ensure reliability, scalability, and hosting of newly developed e-services, as well as the expansion of network services, and secure connectivity. At the school level, ICT infrastructure was improved with development of local wired and wireless networks, equipping classrooms with presentation and interactive technologies, and providing teachers, directors, and administrative staff digital devices. Five Regional Training Centres were established to support continuous professional development and ensure the effective use of technology in teaching and school management. (Croatian Academic and Research Network, n.d.-c)

In addition to infrastructure, the pilot phase developed a versatile cloud-based system of digital services aimed to modernise school operations and support teaching and learning processes. This included a centralised system for school management. A key component was Edutorij, a national repository of digital educational content that enables teachers and students' access and publishing of learning materials, while systems such as the Classroom Management System supported interactive, student-centred teaching. This segment also introduced CARNET delta, a learning analytics system that collects and analyses data on learners and their contexts to support prediction, personalisation, and timely intervention, enabling a shift towards data-informed educational practices. (Croatian Academic and Research Network, n.d.-c)

A central strategic outcome of the pilot phase was the development and operationalisation of the digital maturity framework, which measures digital readiness across five domains such as leadership, teaching, infrastructure, and digital competences. Through structured self-evaluation and external evaluation, schools were able to assess their initial level of digital maturity, monitor progress, and plan improvements. The School Digital Maturity Framework was developed that defines the areas and levels

of school digital maturity and is aligned with the European DigCompOrg framework (Croatian Academic and Research Network, n.d.-c).

4. COVID-19 and National upscaling (2016–2023)

Building on the pilot's success, the e-Schools programme entered its second phase, increasing value to almost 179 million EUR. It encompassed all 1,321 public primary and secondary schools. The second phase upscaled investments into modern network infrastructure across more than 2,400 school locations, installing a total of 42,294 network devices including over 35,900 wireless access points. Schools received more than 85,000 laptops for staff and over 25,000 for students, along with more than 3,000 interactive screens and a wide catalogue of additional STEM equipment including 3D printers, drones, robots, and programming sets (Croatian Academic and Research Network, 2023). Over 5,000 workshops were organised and attended by nearly 70,000 educational professionals and reaching almost every teacher in Croatia. The programme delivered 98 digital educational resources covering 22 subjects, 1,440 subject teaching scenarios, and 350 cross-curricular teaching scenarios with 119 accompanying interactive materials. The Edutorij repository grew to over 25,000 materials serving nearly 55,000 users, while the e-lektire portal reached 150,000 active readers. Perhaps most significantly, the final external evaluation of digital maturity conducted in 2023 found that more than two-thirds of schools had reached the level of "digitally advanced," with over 10% achieving full digital maturity, and more than three-quarters of all schools improving their digital maturity by at least one level compared to the programme's start (Croatian Academic and Research Network, 2023).

During the 2019/2020 school year, the e-Schools programme proved its full value when the coronavirus pandemic forced Croatian schools, like in all European countries, to transition almost overnight from standard classroom teaching to distance learning. The Ministry of Science and Education, CARNET, and education agencies were able to respond rapidly precisely because the infrastructure, tools, and training that the e-Schools programme had put in place were already there. CARNET established and maintained an infrastructure capable of supporting distance learning at national scale. CARNET also prepared and delivered various forms of training in the application of digital technologies in teaching, and created guidance texts tailored to students, parents, and school employees on the nature of distance learning and the digital and organizational skills it requires. The success of this rapid response was reflected in concrete outcomes. A qualitative and quantitative research study encompassing as many as 26,000 principals, teachers, and parents during the first school closures confirmed the importance of the e-Schools programme in enabling uninterrupted teaching (Croatian Academic and Research Network, 2023).

Other institutions in the system also responded quickly. In 48 hours, Agency for Vocational Education and Training and Adult Education (AVETAЕ) set-up and launched the web portal <https://nastava.asoo.hr>, where digital content for all 13 vocational education sectors began to be published, with materials, both for students and teachers, that were both sector specific and cross-curricular in nature. In a short period between March and June 2020, AVETAЕ collected, edited and published on the portal 6,336 digital materials that were developed by teaching professionals from vocational schools, adult education providers, higher education providers as well as companies. More than 27,000 users accessed portal based on Google Analytics data (Anđelić et al., 2020).

The European Commission pointed to Croatia as an example of a country that successfully implemented distance learning and explicitly crediting the e-Schools programme for having provided schools and teachers with all the necessary prerequisites for such a transition (European Commission, 2020).

The e-Schools programme has earned significant national and international recognition. UNESCO named the pilot project one of the 12 best projects in the world in digital education for 2017, selected from 143 submissions across 79 countries, and subsequently ranked it among its "Best Practices in Mobile Learning" in 2019. The European Commission also validated the programme by awarding it the Regiostars prize in 2020 as the best project in the category of inclusive growth and digital education, and EU citizens later voted it the second-best regional development project financed by the European Union over the preceding 15 years. Eurostat cited the programme among the main advantages in its 2020 education and training review, and the European Commission identified its successful implementation as a contributing factor to Croatia's improved ranking on the Digital Economy and Society Index (DESI) for 2021 (Croatian Academic and Research Network, 2023). European Union has marked it as an example of a holistic and comprehensive approach for the digital transformation of the education system (European Commission, 2025).

In this phase, another support for digital transition, specifically in Vocational Education Training in Croatia, was 260 million EUR project of establishment of 25 Regional centres of competence in five priority sectors, co-founded from ERDF and ESF funds. One of the aims was investments in infrastructure and equipment, including digital technologies and ICT, as well as development of digital learning materials (ReferNet Croatia & Cedefop, 2023; OECD, 2025).

With the purpose to increase transparency and availability of data in education system, in 2019 Croatian ministry in charge of education introduced embedded Power BI application called ŠeR - Školski e-Rudnik (School data mine) as an interactive web-based dashboard that enables users to explore and analyse data through dynamic visualizations in real time. It is a statistical portal with data that are collected, based on schools' input, from national information system e-Matica and it provides detailed set of statistical data on all schools in Croatia. Application is organised into multiple volumes covering school infrastructure and demographics, student performance and behaviour, state exam results and transitions to higher education, as well as secondary school enrolment patterns and trends. Together, these datasets provide a comprehensive view of pre-tertiary education system in Croatia across entry, participation, achievement, and outcomes, while functioning as a core KM tool that supports the systematic organisation, sharing, and use of data for evidence-based decision making.

Even in the absence of formal KM frameworks, implicit KM practices can be observed, linked to creation, capture or sharing of knowledge. This is evident in the Croatian public sector and education system, where there is no dedicated KM strategy nor explicit mentioning of KM terminology in key policy documents. Croatian National Public Administration Development Plans for the periods 2015–2020 and 2022–2027 do not address directly KM, however its elements like knowledge use, digitalisation, human capacity development or transformation of information into value can be observed as implicit references to KM. Croatian education system, through targeted largescale investments into digital infrastructure and technologies, introduction of advanced digital services and new platforms including those related to information management, capacity building, improvement of processes for data gathering and sharing, etc. also indirectly increased the level of KM in public sector, making explicit knowledge more visible, structured, and transferable across institutions. Savickas and Užienė (2024) argue that digital transformation and KM are complementary processes that share common foundations – technology, people, culture and organisation.

5. Strategic Integration and new developments (2021–Present)

Digitalisation is now a central pillar of the National Development Strategy 2030 and the Digital Croatia Strategy 2032.

New projects are underway. CARNET continues its work on digitalisation of education system through a number of projects, again supported with EU funding. Running from 2023 to 2029, the project continues Croatia's systematic digitalisation of education through improved data integration, user experience, and the development of new digital solutions (Croatian Academic and Research Network, n.d.-c).

Important work on introduction of artificial intelligence (AI) has also begun. In mid-2025 piloting of first AI curriculum with elective subject was carried for students in later grades of primary schools, and in second and third grades of secondary schools, including VET. The pilot was part of the BrAIIn project (Application of Digital Technologies Based on Artificial Intelligence in Education), funded by the European Social Fund Plus and launched in 2023, led by CARNET in collaboration with the Agency for VET and Adult Education, the Croatian Catholic University, and the Croatian Association for Artificial Intelligence (CroAI) (ReferNet Croatia & Cedefop, 2025). As a part of the BrAIIn project Research on the Use of Digital Technology and Artificial Intelligence and the Well-being of Children and Young People was carried out across 46 schools, using a mixed-methods approach that included surveys with 3,913 students, 924 parents, and 382 teachers, complemented by focus groups and interviews with nearly 500 additional participants including school counsellors and principals. The main findings highlight a dual perception of digital technology. Participants recognise benefits such as easier access to information, better visualisation, and increased student engagement, while also expressing strong concerns about reduced concentration, superficial learning, increased cheating, and negative effects on students' wellbeing. (Croatian Academic and Research Network, 2026)

Even though it was not in focus of this paper, it is worth mentioning that at the level of higher education, digitalisation efforts are following steps taken in lower education levels and are now focused on the development of integrated information systems analogous to EMIS framework. The 2025 European Commission's Education and Training Monitor reported that Croatia is actively developing a national information system for higher education registers, comprising registers of students, academic staff, study programme applicants, and — now fully completed — a register of digital diplomas encompassing awards issued since 1 January 2024 and retrospective data extending to 1984 (European Commission, 2025). This infrastructural development reflects a broader global shift toward education management information systems capable of tracking individual students and generating granular data that support system management, planning, and policy monitoring (Oxford Policy Management & UNICEF, 2020). The OECD review of Croatian higher education system (2023), carried out with the Ministry of Science, Education and Youth and supported by the EU Technical Support Instrument, emphasised the need for a strategic approach to digitalisation in higher education that strengthens institutional digital capacity and supports investments in digital infrastructure and high-quality digital education.

CONCLUSION WITH DISCUSSION

Over the past three decades the Croatian education system has undergone a gradual but structured process of digital transformation. From first steps of digitisation in late 90's and early 2000's focused on building connectivity and infrastructure through initial work of CARNET, followed by more structured digitalisation of education system (national and school level) in mid-2000's processes into

significant upscaling, through primarily E-schools programs and other initiatives, towards digital transformation which impacts culture, technology and workforce as described on figure 3 (Brooks & McCormack, 2020).

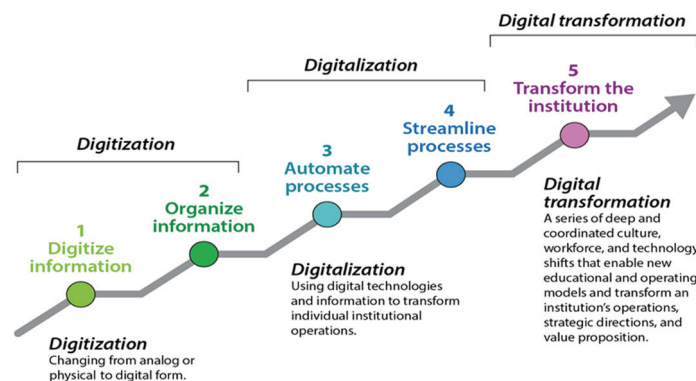


Figure 3: Stages of digital transformation

Source: Brooks, D. C., & McCormack, M. (2020). *Driving digital transformation in higher education*. ECAR.

These developments show shift towards system-wide integration of digital technologies, including learning analytics and data-driven approaches enabling innovations in teaching, learning and system monitoring (OECD, 2023b; OECD, 2025).

Croatian experience shows how effective digital transformation in education depends on combination of inter-connected factors. A national policy framework ensured institutional continuity and embedded digitalisation as a long-term national priority over more than two decades, rather than treating it as an isolated intervention. EU policy developments acted as both a guiding framework and a key driver of national digitalisation efforts, while EU structural funds provided the financial scale necessary for system-wide implementation which is consistent with Reis & Melão (2023) which emphasised the importance of coordinated organisational and strategic conditions in digital transformation. The anchoring of digitalisation efforts within a single institution, like CARNET, provided expertise, organisational knowledge, capacity and continuity across long period and phases of development. Furthermore, the innovative and comprehensive design of key initiatives, such as e-Škole programme, was vital as it simultaneously targeted both system-level and school-level transformation. Together, these elements created conditions in which digitalisation was not merely partial but led to digital transformation as a systemic and multidimensional process involving technology, organisations and human element (Reis & Melão, 2023; Kraus et al., 2022).

The e-Škole program demonstrated how digital maturity can be achieved with a structured and measurable process, supported through a combination of large-scale investments into infrastructure and equipment, the development of digital services and platforms and targeted training and support to teachers, trainers and school staff. This was confirmed by evaluation framework, with self-evaluation and external evaluation which resulted in most of the schools improving their level of digital maturity.

These developments encompassed three dimensions of KM, people, process and technology, in this sense it can be interpreted how digitalisation and digital transformation in Croatia also acted as enabler of KM in education system.

Despite these many advances, some challenges remain. The pedagogical use of digital technologies can be further improved as it is noted by OECD (2023b), that data and digital tools are not consistently used to support teaching and learning practices. Student digital competences remain uneven, with a significant share of learners not reaching basic levels of digital skills (European Commission, 2025). These findings align with positions that investments in digital infrastructure and services, does not have to lead to improved outcomes without their integration into teaching and learning processes and organisational practices (OECD, 2023a).

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