European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available online at: www.oapub.org/edu

DOI: 10.46827/ejes.v12i8.6141 Volume 12 | Issue 8 | 2025

THE IMPLEMENTATION OF DIGITAL TRANSFORMATION IN SCHOOLS: CHALLENGES IN THE ERA OF THE 4th INDUSTRIAL REVOLUTION

Konstantinos Zogopoulos[1],
Georgios Panagiotopoulos[2i]
[1]PhD Candidate,
Department of History-Archaeology,
University of Patras,
Greece
[2]Professor,
Department of History-Archaeology,
University of Patras,
Greece

Abstract:
This study explores the challenges faced by teachers and school principals in Greece when implementing the digital transformation, in the context of Education 4.0 and the 4th Industrial Revolution. The survey adopts a mixed methodological approach, combining quantitative data from 1,359 Primary and Secondary Education teachers with qualitative data from interviews with 20 principals from different regions of the country. The findings paint a complex picture. Technological infrastructure is generally considered adequate, but serious weaknesses are emerging in equipment maintenance, compatibility of new technologies and financing. Teacher training is considered inadequate and not adapted to real needs, with shortcomings in time, practical application and support. An important inhibiting factor is the resistance to change, mainly by a portion of teachers – especially older ones – due to fears, reservations or fatigue. On the contrary, managers emerge as agents of support and guidance, although they recognize the difficulties of their role. Issues such as data security, digital risks and the compatibility of new technologies with pedagogical practice appear as areas of intense concern. The research concludes that the digital transformation in Greek schools depends not only on equipment, but also on the human dimension: attitudes, skills, leadership and institutional support. A holistic approach is needed with investments in infrastructure, continuous training, institutional changes in the timetable and strengthening of educational leadership. Only in this way can an environment be created that allows the effective and sustainable integration of technologies into school practice.

[i] Correspondence: email kzogopouos@upatras.gr, pangiorgos@upatras.gr

Keywords: Education 4.0, educational leadership, digital transformation, technological challenges

1. Introduction

The fourth industrial revolution (4th IR) brings rapid technological changes that decisively affect all sectors, including education (Panagiotopoulos & Karanikola, 2020; Schwab, 2016). In this context, the concept of Education 4.0 emerges, a new educational paradigm that meets the needs of 21st-century society and exploits the innovations of the 4th BE (Konkol & Dymek, 2024; Chakraborty et al., 2023; Panagiotopoulos et al., 2023). Education 4.0 emphasizes digital skills, personalized and connected learning through advanced technologies such as artificial intelligence and the Internet of Things (Sharma, 2019). Its central value is lifelong learning and the development of 21st-century skills (critical thinking, creativity, collaboration, adaptability) so that students can respond to complex future challenges (Penprase, 2018; Fischer et al., 2020). The cultivation of digital literacy is also important, as more and more professions require digital skills (Primikiris, 2021). The substantial integration of technology into the educational process is considered essential for the transformation of schools and the preparation of students for the digital age.

In the Greek educational context, the importance of digital transformation has been recognized and national initiatives are being implemented in this direction, such as the recent "Digital Care" program, which provided schools with modern technological equipment (interactive whiteboards, tablets, etc.) and provided incentives to students to acquire digital media, while at the same time promoting actions to enhance digital literacy and online safety. Despite these important steps, many schools still face challenges on the ground. Teacher training remains fragmented, indicating the need for a more systematic approach for teachers to acquire the competences that will allow them to apply Education 4.0 practices in the classroom (Aravantinou-Fatourou & Kalogridi, 2022). In addition, there is a perception gap between teachers and principals. The former focuses on the practical problems of the classroom (lack of time, training), while the latter approaches digital transformation at a more strategic level (Onan, 2024; Zogopoulos & Karatzas, 2025). These complex difficulties underline the multidimensional nature of the project.

The purpose of this study is to explore the challenges and difficulties faced by teachers and principals of primary and secondary education in Greece when implementing the digital transformation of school units. In particular, the study attempts to answer two key research questions. First, what difficulties do teachers face in implementing digital transformation in schools? Secondly, what challenges do principals face in implementing digital transformation in the school unit?

2. Literature Review

2.1 Education 4.0 and Digital Transformation in Primary and Secondary Education

The Fourth Industrial Revolution (4th IR) introduces rapid technological changes that decisively affect all sectors, including education. According to Schwab (2016), the 4th IR is distinguished by its speed, breadth and impact, as technologies such as Artificial Intelligence (AI), the Internet of Things (IoT) and big data connect billions of people and improve the efficiency of organizations. Within this context, the concept of Education 4.0 emerged, i.e. a new educational paradigm that aligns with the needs of 21st-century society and exploits the technological innovations of the 4th IR (Konkol & Dymek, 2024; Chakraborty et al., 2023). Education 4.0 integrates advanced digital technologies into teaching and learning processes, contributing to the digital transformation of primary and secondary education.

Education 4.0 refers to the adaptation of educational practices to the requirements of the digital age. As Sharma (2019) notes, this is an approach that emphasizes digital skills, personalized learning, and connected education using AI, IoT, and other innovations. Its core value is lifelong learning and the development of 21st-century skills such as critical thinking, creativity, collaboration, adaptability, so that students can respond to complex challenges (Penprase, 2018; Fischer et al., 2020). The integration of technology is considered essential for personalized learning, where each student can follow their own learning path based on their needs and interests (Hussin, 2018; Miranda et al., 2021). Thus, Education 4.0 transforms the traditional school into a student-centered learning environment that is more flexible, adaptable to individual needs and with an emphasis on the active role of the student (Tang et al., 2022). In the Greek literature, the understanding of the concept goes hand in hand with international trends. Primikiri (2021) underlines that Education 4.0 requires a readjustment of learning processes with the aim of developing collaborative, critical and creative skills in students. At the same time, the importance of individualized learning is highlighted. Aravantinou-Fatourou (2022) proposes the utilization of multiple intelligence theory as a tool for more effective contemporary teaching practices.

Digital transformation in education is about the substantial change of educational methods, tools and infrastructures through technology. The integration of digital technologies in the classroom is not limited to the introduction of individual tools (such as computers or interactive whiteboards), but entails restructuring the way we teach and learn. For example, innovations such as artificial intelligence, machine learning, data analytics, and IoT can be leveraged to make learning more interactive and personalized. The steps of digital transformation are already being observed in Greek primary and secondary education. During the pandemic period, e-learning platforms such as Webex and e-me were used extensively, while they continue to support hybrid teaching schemes (combination of face-to-face and distance) (Aravantinou-Fatourou, 2022). In addition, digital infrastructures such as the Ministry of Education's "Digital Classroom" platform and the Panhellenic School Network provide materials and tools for adapting teaching

to the needs of each student, facilitating the personalization of learning. The emphasis on digital literacy is also important. Students need to develop competences to use digital tools effectively and responsibly, as more and more professions require these skills (Primikiris, 2021).

Innovative actions are already being implemented in Greek schools that reflect the principles of Education 4.0. A typical example is the new Skills Workshops in primary schools, where students participate in experiential activities of collaboration, problem solving and creative thinking. These workshops aim to cultivate horizontal skills, beyond sterile knowledge, preparing children for the modern world. In addition, activities such as school robotics groups and creative competitions (e.g., the "Bravo Schools" project) give opportunities for students to develop leadership skills, innovative thinking and the ability to collaborate effectively with peers. Such initiatives are aligned with the international guidelines of Education 4.0, which promotes the balanced development of both "soft skills" – communication, teamwork, and the technical skills (hard skills) that students will need in the future labor market (Marcial, 2020; Miranda et al., 2021).

Despite the multiple benefits, the transition to Education 4.0 presents difficulties in schools. Traditional education systems often find it difficult to adapt quickly. There is a lack of appropriate assessment tools for skills such as critical thinking and collaboration, and inequalities in access to digital resources between schools (e.g., between schools with adequate equipment and others with shortages). Therefore, the digital transformation in primary and secondary education needs systematic support from education policy and leadership. In Greece, important actions have been launched, such as the "Digital Care" program, which aims to equip all schools with modern digital equipment (interactive whiteboards, tablets, etc.) and to subsidize students for the acquisition of technological means. At the same time, actions are being implemented to enhance digital literacy and online safety (e.g., through the Hellenic Safer Internet Center and the "Staying Safe on the Internet" campaign), so that students become responsible digital citizens. With these efforts, primary and secondary education in Greece is attempting to synchronize with Education 4.0, gradually transitioning from the traditional school to a modern, innovative school environment that will better prepare students for the challenges of the 4th industrial revolution.

2.2. Teachers and the Challenges of Digital Transformation in Greek Schools

Teachers are the cornerstone of any educational change, so their role and preparation are crucial to the success of schools' digital transformation. In the era of Education 4.0, the role of the teacher is transformed from a traditional transmitter of knowledge to a guide and animator of learning. The teacher is now called upon to facilitate the active participation of students, to create collaborative and personalized learning experiences, and to encourage students to take more responsibility for their learning (Wirkala & Kuhn, 2011). This shift towards a more student-centered, "coaching" role requires new skills and attitudes from teachers. Digital competence, flexibility in pedagogical approaches, ability to use data to support learning, and openness to innovation.

Despite the benefits of digital transformation, many teachers face significant difficulties in practice. A key challenge is inadequate training in Information and Communication Technologies (ICT) and pedagogical methods of the digital age. For example, research in Greece (Aravantinou-Fatourou & Kalogridi, 2022) showed that, although seminars on contemporary educational topics are offered, existing training programs do not adequately cover all dimensions of Education 4.0. Digital technologies and innovative teaching practices are rarely meaningfully included in current training, which often still focuses on more traditional subjects. As a result, many teachers do not feel ready to integrate new technologies into the classroom or implement methods such as personalized learning and project-based learning. Indeed, in the daily life of Greek schools, there is the phenomenon that many teachers still teach with an "Education 1.0" or "2.0" mentality, while the aim is to design lessons based on the principles of Education 4.0 (Miranda et al., 2021).

In addition, there is often resistance to change on the part of teachers. This resistance can be due to many factors. The fear of the unknown of technology, the insecurity that new methods will reduce their control or autonomy in the classroom, or the belief that digital solutions can be complex and time-consuming without corresponding benefits (Awang et al., 2020; Kern & Graber, 2017). Older teachers, in particular, may feel less comfortable with digital tools and may be reluctant to use them if they have not been adequately supported. Quite often, this resistance is directly related to the training deficit. When teachers have not been trained in new technologies or have not seen examples of good practice, it is natural for them to be skeptical.

Another challenge is the practical barriers in the school environment. Inadequate technological infrastructure in some schools (e.g., few computers, slow internet, lack of interactive systems) makes it difficult to integrate digital material into teaching. Also, the lack of continuous technical support, i.e. specialized personnel or services to deal with technical problems, creates insecurity for teachers. If lesson time is lost due to a system failure or malfunction, the teacher is often discouraged from trying the same technology again. Furthermore, the limited time and pressure to cover the material is a significant stress. Designing innovative courses (e.g., a STEM project or a computer-based cross-curricular assignment) requires a lot of preparation time, as well as in-class time for implementation and evaluation. Within the strict time frames of the Curricula, many teachers find it difficult to devote sufficient time to such activities without leaving behind the coverage of the exam material. In addition, the assessment of pupils in innovative activities (such as group projects, ICT-based tasks) requires new skills on the part of the teacher, so that the assessment is objective and fair – a field for which many have not been trained (Karanikola & Panagiotopoulos, 2018).

Several initiatives have been developed in the Greek educational reality to support teachers in the digital transformation. The Institute of Educational Policy (IEP) and other bodies organize training programs for teachers, with subjects such as the use of digital tools in teaching, the development of digital educational materials and the cultivation of modern skills in students. At the same time, teachers now have access to online learning

platforms (MOOCs) and open educational resources. For example, platforms such as Mathesis and e-learning of the University of Athens offer free online courses that teachers can take to upgrade their knowledge in various subjects (Brown et al., 2021). Despite these steps, the overall picture shows that a more systematic and targeted training is needed. As studies point out, new training policies are needed for teachers to acquire the competences that will allow them to implement Education 4.0 practices in the classroom (Aravantinou-Fatourou & Kalogridi, 2022). This includes both technical training (handling of new educational software, platforms, tools) and pedagogical dimension (how we actually integrate technology to improve learning and not just for spectacle).

An additional issue is the difference in perception and priorities between teachers and school administration when it comes to digital transformation. Research shows that while both sides recognize the importance of technological innovation in the school, teachers focus mainly on practical classroom problems – e.g., lack of time and training, while principals think more strategically (Onan, 2024; Zogopoulos & Karatzas, 2025). Teachers often consider that decision-makers (principals, policy-makers) are theoretically addressing the issue of digital transformation, without providing the necessary practical support. This creates a gap: principals may feel that their school is sufficiently prepared for the digital age, while teachers feel that they need more guidance and resources (Al-Maashani & Hshim, 2019). Bridging this gap requires better coordination and communication within the school community. As Sukandi (2024) notes, a successful transition to Education 4.0 requires a shared vision between leadership and educators so that everyone understands the goals and benefits of change. Teachers must be actively involved in the design of the school's digital initiatives, express their needs and ideas, and receive support to implement innovations.

2.3. The Role of Educational Leadership in Digital Transformation: Opportunities and Challenges

Educational leadership at school unit level (principals) and at a broader administrative level, plays a key role in promoting and implementing digital transformation. An effective educational leader can inspire the vision of change, strategically steer technology integration, and create the conditions for teachers and students to thrive in the new digital era. Conversely, leadership shortcomings can be an obstacle to innovation. In this context, both the capabilities/opportunities that educational leadership has to accelerate the digital transformation, as well as the difficulties/problems it faces, are examined.

First of all, educational leadership in the digital age requires a new set of competences, also known as "digital leadership". This leadership model combines traditional administrative and pedagogical skills with technological proficiency and the ability to manage change. For example, Onan (2024) finds that modern principals consider digital leadership to be a key driver of success, as a "digital leader" must know how to manage change, ensure data security in school, and support ICT infrastructure. Zhu (2015) defines five key characteristics of such a leader: (a) deep understanding of

learning and the process of change, (b) creativity and innovative thinking, (c) ability to inspire and guide the team, (d) proficiency in using data for decision-making, and (e) social intelligence in communicating with all members of the school community. In other words, the digital leader is not just the one who knows how to use technology, but above all the one who can change the culture of an educational organization, create a climate of innovation, encourage teachers to adopt digital tools and facilitate the development of skills for all staff. Such a leader acts as a change agent for the integration of new technologies, gradually transforming the school into an advanced digital learning environment (Couros, 2013).

Educational leadership has the potential to positively impact many factors in the school community during the digital transformation. With appropriate initiatives, the leader can increase teachers' professional satisfaction. Research shows that when the principal actively promotes the use of technology and supports staff in this effort, teachers feel more satisfaction and commitment to their work (Yuan & Wang, 2025). In fact, the director's digital leadership seems to improve teachers' digital skills through continuous training and encouragement, which in turn increases their enthusiasm and performance – thus creating a positive domino effect (Yuan & Wang, 2025). In addition, a visionary leader can develop professional learning communities in the school, where teachers share knowledge and experiences about technology integration. These types of networks (e.g., digital learning working groups, participation in communities such as eTwinning) boost teachers' confidence and accelerate the dissemination of good practices (Antonopoulou et al., 2020). Leadership can also emphasize not only technology itself but also the well-being of all members of the school community. As Antonopoulou et al. (2021) point out, digital leadership is not just about using tools, but about improving the overall quality of the educational environment and the well-being of students and teachers. This means that an effective leader makes sure that technology is used in a way that empowers people – facilitates teachers' work, gives a voice to students, and strengthens communication with parents and the community.

Despite these possibilities, exercising educational leadership in the era of digital transformation comes with significant challenges. A central difficulty is the absence of a clear vision and support at the national level. In many cases, school leaders are trying to innovate without a coherent education policy framework guiding the digital transformation. In Greece, although strategic plans have been developed (e.g., National Plan for Digital Education), there is often a lack of coordination and practical guidance, resulting in managers feeling alone in their efforts (Franciosi, 2012). In addition, insufficient funding for equipment and training hampers leaders' efforts to improve digital infrastructure. As Onan (2024) notes, limited financial support and technological weaknesses of staff intensify the problems of integrating digital practices.

Another major obstacle is teachers' management of resistance to change. Principals are often confronted with teachers, who, as mentioned, are reluctant to change their established practices. Leadership must therefore understand the sources of this resistance and develop counter-strategies. A major reason for resistance is the fear of the unknown.

Teachers may feel anxious that they will not be able to handle the new media well or that they will be exposed in case of failure (Jones et al., 2016). They may also feel that they are losing some of their control – e.g., when students use the internet freely in the classroom or when methods become more student-centric, some teachers worry that their role is being discredited.

The educational leader must address these concerns with empathy and support. Providing continuous professional development and technical assistance to teachers is critical. For example, organizing practical workshops where teachers will test new applications in a safe environment, or creating mentoring groups within the school where the most experienced in ICT will help others. In addition, participatory decision-making can reduce resistance. Research shows that when educators are actively involved in change planning and feel their voices are heard, they are more likely to support innovations (Khan et al., 2022; Saputra, 2022). A democratic, cooperative way of leadership favors consensus over competition.

Leaders also need to address ethical and equity issues that accompany the digital transformation. The increasing use of digital platforms brings to the fore issues such as the protection of students' personal data, the safe use of the internet and the risk of widening inequalities (digital divide). The educational leader has a responsibility to ensure that technology serves the values of education. Clear rules must be established in the school for privacy and cybersecurity, and the principal should oversee their implementation (Sharma et al., 2023). At the same time, it must ensure that no student is left behind due to a lack of access – e.g., by finding ways to provide devices or internet connection to students from economically weaker families. These efforts require social sensitivity and the ability to mobilise resources outside of school (such as partnerships with local government or companies).

Finally, a practical difficulty for managers is that they themselves need continuous training. Their role is evolving and requires them to keep up with technological developments and modern pedagogical trends. As some case studies report, many school leaders started their careers in pre-digital times and now need to adapt quickly (Alphonse, 2023). Enhancing the skills of leaders themselves – through dedicated training programmes for managers in the digital age – is therefore key. In Greece, actions such as training seminars for principals from IEP and postgraduate education programs in educational innovation leadership have started to provide such knowledge, but their participation and implementation need to be expanded.

2.4 Purpose of the Survey

The purpose of this research study is to investigate the challenges and difficulties faced by teachers and principals of Primary and Secondary Education in Greece for the digital transformation of school units.

2.5 Research Questions

1) What difficulties do teachers face in implementing digital transformation in schools?
2) What challenges do Primary and Secondary Education principals face in implementing the digital transformation in the school unit?

3. Methodology of the Survey

3.1 Research Tool Structure

The present research was carried out in the context of the preparation of the doctoral thesis. The research includes two phases: a) A quantitative one, using a two-part self-report questionnaire (Demographic-Professional Characteristics and the Module with the Challenges of Digital Transformation). The Digital Challenges Section of the questionnaire contains 35 closed-ended questions, and respondents were asked to answer on a six-point Likert scale (1=Strongly disagree, 2=Disagree a lot, 3=Disagree a little, 4=Agree a little, 5=Agree a lot, 6=Agree completely). The data collection for the quantitative research took place in the period February-March 2025. b) A qualitative phase using a semi-structured interview with two basic questions during the period from mid-April to mid-May 2025. The Zoom video conferencing platform was used for the interviews.

3.2 Sample Research

For the conduct of the quantitative research, the method of random sampling was used. The questionnaire was created through Google Forms and sent to the Directorates of school units (Primary, Junior High and High Schools) from all over Greece via email. The sample of the survey consisted of 1359 teachers of Primary and Secondary Education who responded and completed the questionnaire. For the qualitative research, the method of intended sampling of Directors from all over Greece was used. The sample of the survey consisted of a total of 20 Directors of Primary, Junior High and High Schools from all over Greece.

3.3 Data Analysis

The present research study followed a mixed methodological approach, combining quantitative and qualitative data collection techniques in a single research project. A central element of the mixed approach is the triangulation of data, i.e. the use of multiple sources or methods in order to cross-check and verify findings. Initially, in the quantitative survey, the data obtained from 1359 Primary and Secondary Education teachers from all over Greece were analyzed using the statistical software SPSS 29.0 for Windows.

The reliability of the internal consistency of the variables of the questionnaire (Table 1) is high (0.909>0.70). Also, the values of the correlation indices range from +0.412 to +0.686>+0.3 demonstrating a high internal coherence of variables for knowledge about

the 4th industrial revolution. A check of the normal distribution of variables was then performed with the Kolmogorov-Smirnov test, which showed a normal distribution (>0.05). The data was analyzed using descriptive statistics (Tables, Percentages, Mean Values, Standard Deviations). In the analysis of qualitative data, codes, subjects, tables and diagrams were created. A triangulation was then carried out to cross-reference and compare the findings from the two research phases.

Table 1: Reliability check

	N of Items	**Corrected Item-Total Correlation**	**Cronbach's Alpha**
Knowledge of the 4th Industrial Revolution	35	0,412-0,686	0,909

4. Results of the Survey

4.1 Quantitative Research

In the first phase of the survey (quantitative), 1,359 Primary and Secondary Education teachers from all over Greece responded, the majority of whom were women. Their percentage reached 71.1%. Men made up 28.9% of the sample. In terms of age, most of them belonged to the category of 56 years and older, with a percentage of 32.7%. This was followed by the ages of 41 to 50, with 26.9%. The younger ages (22-30) had the lowest percentage (4.9%). Compared to the years of service, the highest percentage was collected by the category with 21 to 30 years, reaching 32.5%. Teachers aged 1 to 10 and 11 to 20 had similar rates, about 25 percent. The percentage (1.1%) of those who had more than 40 years of service was very small. As far as the higher qualification is concerned, most (61.8%) had a master's degree. 8.8% held a doctorate. The basic degree was the only qualification for 24.7%. A small percentage (4.6%) stated that they have a second degree. The vast majority (84.5%) were permanent teachers. Substitutes were 15.5% of the sample. The distribution by level of education was almost equal. Primary Education teachers were 49% and Secondary Education teachers were 51%. Finally, at the higher level of studies in Information and Communication Technologies (ICT), the largest percentage (50.3%) had attended the B' level. The First Level followed with 32.2%. 11.3% had another type of training, and 6.2% had no training in this field at all.

Regarding the Challenges of the Digital Transformation of Schools, according to the perceptions of the surveyed teachers of PE and DE, the presentation of the results is organized in five dimensions (Technological Infrastructures and Resources, Training and Digital Skills, Resistance to Change and Reservations, Data Protection and Digital Risks, Integration of Technologies and Pedagogical Connection).

a) Technological Infrastructures and Resources

The existence of adequate technological equipment in the school is positively assessed by 75.1% (MT=4.26 TA=0.038) of the participants (Table 2). This view shows a high level of acceptance for the basic technological infrastructure. The coverage of school needs by the

internet connection is considered satisfactory by 69.5% (MT=4.12; TA=0.042), with the agreement moving at positive levels. Technical difficulties with devices and software are reported by 68.5% (MT=4.08; TA=0.040), A fact that reveals existing obstacles to daily use. The maintenance of the equipment is considered moderate, with 58.4% (MT=3.70; TA=0.041). The attitude towards the ability of existing infrastructures to meet the needs of new technologies is more restrained, with acceptance by 54.7% (MT=3.59; TA=0.042). The picture for financing is negative, which is characterized as insufficient by 31.8% (MT=2.72; TA=0.043), while their perception that financial constraints affect the ability to integrate new technologies is very positive by 66.59% (MT=4.59; TA=0.040). Low acceptance is also achieved by the compatibility of new technologies with existing infrastructures, which reaches only 28.9% (MT=2.74; TA=0.040).

Table 2: Percentage Distribution, Average Value, and Standard Deviation Technological Infrastructure and Resources

Statements	I totally disagree	I disagree quite a bit	I disagree a bit	I agree a little bit	I agree quite a bit	Agree	Mean	StDev
1. The school has adequate technological equipment.	4,6	11,3	9,1	21,9	34,9	18,3	4,26	0,038
2. The internet connection covers the needs of the school.	7,5	13,0	9,9	18,8	31,1	19,6	4,12	0,042
3. There are often technical problems with the devices and software used.	6,0	12,1	12,4	25,4	25,4	18,8	4,08	0,040
4. The maintenance of the technological equipment is sufficient.	10,4	13,7	17,7	23	24,1	11,3	3,70	0,041
5. Existing infrastructure can support the requirements of new technologies.	13,7	12,4	19,2	22,5	20,3	11,9	3,59	0,042
6. Funding shall be sufficient for the purchase of new technological equipment.	31,8	19,9	16,6	14,3	11,5	6,0	2,72	0,043
9. Economic constraints affect the ability to integrate new technologies.	4,9	8,4	7,1	17,7	26,7	35,3	4,59	0,040
31. New technologies are always compatible with existing infrastructure.	23,8	27,6	18,8	15,7	9,1	5,1	2,74	0,040

b) Training and Digital Skills

The training of teachers in the new tools of artificial intelligence and virtual reality seems to be a challenge, as 42.8% (MT=3.16; TA=0.040) consider that there is relative competence, but with a large margin for improvement (Table 3). The training adequacy of the headteacher is evaluated more positively by 64% (MT=3.97; TA=0.042), showing that headteachers understand the importance of their own digital training. The adaptation of education in the needs of teachers is considered moderate by 48.4% (MT=3.40; TA=0.041). The availability of time for seminars and trainings is considered

low, as only 30.7% (MT=2.81; TA=0.042) consider the time sufficient. In contrast, continuity in training is recorded as one of the most positive elements with acceptance by 76.3% (MT=4.48; TA=0.038). The response of training to needs is more doubtful, as it is rated modestly by 44.9% (MT=3.25; TA=0.042). The inclusion of practical applications in training is recorded as relatively positive, but it is not uniform from 51.8% (MT=3.50; TA=0.040). The existence of time for the exploration of new technologies is reported by only 25.8% (MT=2.62; TA=0.039), which indicates a deficit in this direction.

Table 3: Percentage Distribution, Mean Value and Standard Deviation Training and Digital Skills

Statements	I totally disagree	I disagree quite a bit	I disagree a bit	I agree a little bit	I agree quite a bit	Agree	Mean	StDev
10. Teachers have adequate training in the use of Artificial Intelligence, Virtual Reality and Internet of Things tools in teaching.	15,2	22,5	19,4	22,5	14,3	6,0	3,16	0,040
11. The Director has adequate training in the use of new technologies and digital skills.	9,7	9,7	16,6	21,4	23,0	19,6	3,97	0,042
12. The training provided to teachers in new technologies is tailored to their needs.	11,7	20,8	19,2	22,1	17,2	9,1	3,4	0,041
13. The available time of teachers is sufficient to attend seminars and training.	25,4	24,9	19	11,9	11,7	7,1	2,81	0,042
14. Teacher training is continuous.	3,3	9,9	10,4	16,1	32,2	28,0	4,48	0,038
15. Training meets the needs of teachers.	15,5	20,8	19,0	20,8	15,9	8,2	3,25	0,042
16. Training on new technologies includes practical applications.	10,4	17,2	21,6	21,9	20,3	8,6	3,5	0,040
29. Teachers have enough time to explore and learn about new technologies.	24,7	32,7	16,8	12,1	8,6	5,1	2,62	0,039

c) Resistance to Change and Reservations

In relation to resistance to change, participants report moderate levels of reticence from teachers themselves, with 56.5% agreeing (MT=3.69; TA=0.041) (Table 4). In contrast, the headteacher's resistance is reported much less, compared to 29.3% (MT=2.77; TA=0.041), indicating that leadership encourages change. Hesitation in the use of technology in the classroom is expressed by 57.4% (MT=3.62; TA=0.039). Fear of replacement of the role of the principal and the teacher is evaluated by 53.7% (MT=3.50; TA=0.043). The view that teachers' resistance is an obstacle is reflected in 54.5% (MT=3.62; TA=0.042). Students' preference for traditional methods is limited, with only 28.3% (MT=2.74; TA=0.039) agreeing. On the contrary, the perception that new technologies are a burden with extra work is widely accepted at 75.5% (MT=4.37, TA=0.038).

Table 4: Percentage Distribution, Average Value and Standard Deviation Resistance to Change and Reservations

Statements	I totally disagree	I disagree quite a bit	I disagree a bit	I agree a little bit	I agree quite a bit	Agree	Mean	StDev
17. There is resistance to change by teachers regarding the use of new technologies.	9,7	15,2	18,3	22,1	22,5	12,1	3,69	0,041
18. There is resistance to the change by the Director regarding the use of new technologies.	24,7	25,4	20,5	12,6	11,0	5,7	2,77	0,041
19. Teachers are reluctant to use new technologies in the classroom.	9,7	15,5	17,4	27,6	20,1	9,7	3,62	0,039
20. There is a fear that new technologies will replace the traditional role of teacher and principal.	14,3	15,9	16,1	24,1	18,3	11,3	3,5	0,043
21. Resistance to change by staff is a major obstacle to the integration of new technologies.	10,8	16,3	18,3	21,6	20,5	12,4	3,62	0,042
22. Students prefer traditional teaching methods.	23,6	25,8	22,3	14,6	8,6	5,1	2,74	0,039
30. The use of new technologies adds additional workload to teachers and principals.	3,5	9,7	11,3	23,2	26,0	26,3	4,37	0,038

d) Data Protection and Digital Risks

Digital risks and data protection are highlighted as important issues by respondents (Table 5). The use of technologies and applications that can lead to dependency is rated positively by 62.9% (MT=3.96; TA=0.041), indicating a concern that is not strong. Concerns about the security of personal data are strong, with 72.7% agreeing (MT=4.23; TA=0.038). The assessment that data protection is inadequate is recorded at 55.1% (MT=3.65; TA=0.042), with a moderate degree of caution. The risk of exposure of student data is agreed by 59.5% (MT=3.72; TA=0.040).

Table 5: Percentage Distribution, Average Value and Standard Deviation Data Protection and Digital Risks

Statements	I totally disagree	I disagree quite a bit	I disagree a bit	I agree a little bit	I agree quite a bit	Agree	Mean	StDev
24. The use of new technologies and applications can create addiction and dependence in students.	6,4	13,2	17,4	21,6	23,4	17,9	3,96	0,041
25. There are concerns about the security of students' personal data with the use of new technologies.	4,9	9,5	11,9	26,0	26,5	21,2	4,23	0,038
26. Data protection is inadequately ensured at school.	11,5	15,0	16,3	23,8	21,2	12,1	3,65	0,042
27. The use of new technologies can expose students' data to risks.	8,8	14,8	17,0	26,3	20,8	12,4	3,72	0,040

e) Integration of Technologies and Pedagogical Connection

Monitoring technological developments is considered difficult by 48.8% (MT=3.44; TA=0.042) (Table 6). Communication with parents seems to present problems according to 69.8% (MT=4.14; TA=0.039), while the cultivation of relationships with the community and parents is recorded at a very high percentage, at 78.2% (MT=4.39; TA=0.037). The management of tools and platforms as a time-consuming process is estimated at 59.0% (MT=3.75; TA=0.038). The evaluation of the effectiveness of the technologies, with only 33.4% (MT=2.93; TA=0.038) recognizing it. Correspondingly, the performance of technologies is considered predictable only by 33.4% (MT=2.94; TA=0.037). Finally, the compatibility of curricula and books with the use of technologies is rated low, at 31.4% (MT=2.76; TA=0.040), which indicates a lack of synchronization.

Table 6: Percentage Distribution, Mean Value and Standard Deviation Integration of Technologies and Pedagogical Connection

Statements	I totally disagree	I disagree quite a bit	I disagree a bit	I agree a little bit	I agree quite a bit	Agree	Mean	StDev
7. There are difficulties in monitoring technological developments.	12,1	19,2	19,9	22,1	15,0	11,7	3,44	0,042
8. Problems arise in digital communication with parents.	5,5	10,4	14,3	22,7	28,3	18,8	4,14	0,039
23. The creation of cooperative relationships with parents and the local community for the management of change is cultivated.	4,9	5,7	11,3	25,2	30,0	23,0	4,39	0,037
28. The management of digital tools and platforms is time-consuming.	7,7	11,9	21,4	26,5	21,4	11,0	3,75	0,038
32. The effectiveness of new technologies has been adequately assessed.	16,3	27,8	22,5	18,1	10,4	4,9	2,93	0,038
34. The performance of new technologies is always predictable.	15,7	26,7	25,2	17,9	9,7	4,9	2,94	0,037
35. Curricula and books are compatible with the use of new technologies in the educational process.	26,3	21,6	20,8	16,6	10,6	4,2	2,76	0,040

In conclusion, when it comes to the challenges of digital transformation, according to the perceptions of the respondents, a complex picture is recorded. In some places it seems more positive. In others, a cautious or even negative trend is recorded. In the basic technological infrastructure, the picture is relatively positive. Participants appreciate that there is sufficient material and internet connection. However, significant problems are identified in maintenance and compatibility with new technologies. Funding for new equipment is also very low in acceptance. At the same time, there is a high degree of agreement on the relationship between the availability of financial resources and the

integration of new technologies. This condition seems to affect the school's ability to evolve technologically in general.

Teacher training is emerging as a field with strong contradictions. The need for stability and continuity is largely recognized. However, the quality and its adaptation to real needs seem to be inadequate. There is also no time for exploration and experimentation. At the same time, the training of the director is evaluated more positively. This may indicate that the leadership takes care of its own training, without always taking care of all the staff. The picture of resistance to change is mixed. Participants do not attribute a high degree of resistance to the principals. On the contrary, they refer more to the difficulty of the teachers themselves adapting. This evidence shows that innovation is not hindered by leadership, but rather by the context or internal inhibitions of people. It is also noted that technology increases the workload, which affects the willingness to adopt new tools. Concerns about the security of personal data appear to be intense. At the same time, it is recognized that directors take protective measures. The participants seem to believe that there are shortcomings, but there is also a mobilization to improve the situation.

There is also concern about digital risks. At the same time, concern is expressed about the possible dependence of students on technologies. The connection between technologies and pedagogy does not always seem to be clear. There are positive opinions about working with parents and the community. However, there are also several difficulties in assessing the efficiency of technological solutions. There is also a reservation as to the predictability of their performance. Curricula and books are considered to be significantly incompatible with new needs. In general, the wider environment, available resources and individual attitudes create obstacles that cannot be ignored. The participants' responses reflect the effort, but also the limits of this effort within a complex educational field.

4.1 Qualitative Research

In the second phase of the survey (qualitative), 20 Directors of Primary and Secondary Education from all over Greece responded, of which 12 were women (60%) and 8 men (40%). Half (50%) serve in Primary Schools, while the rest are distributed in Junior High Schools (25%), General Lyceums (20%) and EPAL (5%). In terms of years of total service in education, the majority (60%) have 21–30 years of experience, while smaller percentages have 11–20 years (20%) or 31–40 years (20%). Most of the participants have served as directors for 1–10 years (80%), while 20% have a tenure of 11–20 years. Almost all directors (95%) have a master's degree, while only one declared a second degree as a higher degree. As far as ICT training is concerned, 18 out of 20 (90%) have completed B' level training, while the rest have A' level. Finally, the sample comes from various Regional Units of Greece, with a greater representation from Attica (25%) and Ilia (20%), while it also includes directors from Thessaloniki, Achaia, Dodecanese, Ioannina, Corfu, Kavala, Kozani, Heraklion and Evros. The sample shows geographical dispersion and relative balance in gender, school type and degree of experience.

Regarding the challenges and obstacles of digital transformation, according to the responses of the managers, a set of structural, technical and human barriers emerge. In particular, the principals point out: inadequate infrastructure and funding (equipment shortages, slow Internet, old machinery), lack of training and time for teachers, resistance or indifference of some teachers (especially older teachers) to change, and the general bureaucratic framework that delays or hinders innovation. In addition, in the responses to the handling of resistance, the principals describe how they deal with any reactions from teachers or parents, usually through dialogue, a gradual approach, and highlighting the benefits of technology. Most people, however, note that parents rarely react. Any resistance comes mainly from some teachers. The aim is to have a positive climate and patience to convince the skeptics. Below are structured into two topics based on the findings: a) barriers to the integration of new technologies in schools, b) Management of teacher/parent resistance to technological change.

The first main theme concerns the main obstacles to the integration of new technologies in schools (Table 7). The responses of the 20 directors reveal four main categories of obstacles: (1) logistical deficiencies and inadequate infrastructure, (2) lack of adequate funding and institutional support, (3) human factors of resistance or hesitation (mentality, fears, staff fatigue), and (4) time and schedule constraints (heavy schedule, vast material, leaving no room for innovation). Some managers have also added ethical issues or reservations as a barrier, i.e. the concern of some that technology can bring negativity (however, this has been expressed by a few at this point, as ethical issues have already been covered above). Overall, most managers described a complex picture where material problems (lack of equipment, resources) are intertwined with human ones (lack of skills, fear of change), within a system that provides neither ample time nor particular incentives for digital transformation.

- **Sub-topic 1.1: Incomplete infrastructure, equipment and connectivity**

The first obstacle mentioned by the majority of directors was infrastructure. Many schools do not have the necessary or modern equipment to support the digital transformation. "*The main obstacles are building issues and Internet issues... the basic issue is the issue of equipment*" (Syn. 1) said a director, giving the stigma. Many of the responses were in the same vein: schools have an inadequate network ("*The Internet, the sch.gr that drops every three and a bit*" – Syn. 2), few and old computers, no interactive whiteboards in all classrooms, or outdated computer labs. *"… significant lack of equipment and poor internet*," a director also noted (Syn. 4). Also, some stressed the lack of technical support: *"... If the issue of infrastructure is not solved, how will the introduction of digital transformation and the introduction of digital media in the educational process take place next. When you have an internet, on the day we have a computer lesson in schools, it will always crawl, nothing works. That is, the existing network cannot support five or six computers at the same time"* (Syn. 18). One principal gave an interesting example: "*My school received 30 robotics sets. Which I have in here, 30 very beautiful robotics sets. I also have an IT teacher, who of course does not know anything about robotics*" (Syn. 5) – that is, even when equipment arrives, it may not take

place due to other shortcomings in training and utilization. Overall, however, the picture is that many schools, especially older buildings or outside large urban centers, do not have reliable infrastructure. This is a fundamental obstacle: *"... the first obstacle, I believe, is the infrastructure, i.e. the lack of infrastructure in most computer schools, computer labs, computer equipment in classrooms, projectors, networking*" (Syn. 8). Therefore, it is a priority that before we talk about digital transformation, "logistics" must be solved. Fast Internet everywhere, modern computers and interactive whiteboards, continuous technical support, training. Without them, even willing teachers are discouraged.

- **Sub-topic 1.2: Insufficient funding and institutional support – system slowness**

Closely related to the previous one is the issue of funding and more generally state support to schools for the digital transformation. Many directors have complained that resources are scarce and procedures are slow. "*The underfunding... This is the most serious of all obstacles. The obstruction of state bodies*," said a director emphatically (Syn. 3). It was mentioned that after the abolition of the Computer School Committees in the past, schools do not have autonomous access to resources (Appendix 2). Another noted: *"....in order to get a new computer, instead of a say two, we have to get involved in a bureaucracy, – ... the inadequacy that the Municipality has, not only financial, but there is also a shortage of personnel of the Municipality*" (Syn. 13), showing that even the local government finds it difficult to support. In addition, several spoke of a fragmented and rough state approach: "*With good intentions but superficial, without substantial planning*" was how one director characterized the efforts (Syn. 4). They point this out as an obstacle, because when the state does not have a coherent plan, schools receive, for example, equipment without education, or initiate actions that do not continue. A principal gave the example of the introduction of the interactive whiteboard: *"...The order (meaning from the teachers) was of course, not to take out the previous marker board, we did not dare to take out the whiteboard... I will not tell you what refusal I had at the beginning from my colleagues"* (Syn. 5), probably meaning that policy changes create discontinuity and confusion. Overall, managers consider the system itself to be a structural obstacle. Not enough funding, stable support, and there is a lot of bureaucracy. As one put it: "*Everything has to change. It is not possible...*" (Syn. 5). In other words, they often feel that they are struggling in an environment that, instead of facilitating digital transformation, delays or leaves it in limbo.

- **Sub-topic 1.3: Human factors – resistance, fear and fatigue of teachers**

A very important obstacle mentioned is human resistance to change. Many principals have observed that some teachers refuse or avoid adopting new technologies, either out of fear or out of mindset. "*I think what we face very often in our industry is resistance to change. The thought that we have learned to do things a certain way and that there is a general suspicion of what is new...*" (Syn. 9) said a director, describing the classic refusal of the young man. Some also spoke of "moral" resistance: *"... I see a lot of denial in the new.... if you tell them about the use of technologies or artificial intelligence, they immediately raise privacy issues, there is a bias*" (Syn. 5). That is, some teachers fear that technology will either overshadow them,

or bring unwanted changes (we saw this above for ethical issues). Still, many principals said that older teachers are less willing to change: "*Older teachers are not*" (Syn. 6). The lack of motivation was also highlighted: "*Teachers consider it a waste of time to do extra work so that their classroom can be transformed into a digital one*" (Syn. 11), because they are neither rewarded nor exempted from anything else. Finally, something that came from several interviews is the fatigue and limited time of the teachers: "*When the other person has 23 hours of lessons, what to do. He will do what is absolutely necessary*" (Syn. 6). Similarly, "*It's time, it's the program, it's matter, all that exists, time management and management...*" (Syn. 7). These phrases sum up that even teachers who are not against it, have so much pressure from the system (large classes, a lot of material, administrative duties) that they do not have the energy to innovate. Therefore, the barriers related to people as well. A portion of teachers appear reluctant or exhausted, and this is a brake on digital transformation. As one principal put it: "*Traditionally for me an obstacle is to convince teachers to change the way they operate.... When there are shaped attitudes and behaviors, it is very difficult for an adult to convince him that he needs to change*" (Syn. 17). This is perhaps the most difficult obstacle, because it has nothing to do with materials but with a change of culture.

- **Sub-topic 1.4: Constraints on the time, content and structure of the programme**

An obstacle that has arisen in several answers – and is also linked to the previous one – is the framework of the school curriculum and the curriculum, which leaves little room for innovative practices. "*The matter is immense... the children go to tutoring and I ask them, when you will read, when you will do activities*" (Syn. 6) said a director, showing that the pressure to cover material discourages the integration, for example, of a new digital project that may take more time. Another said: *"... The material is large, the objects are many, the available time is short...*" (Syn. 18), *"... It takes a lot of money, I think, to do all these digital transformations and applications, but with little effect*." (Syn. 2). Here it is pointed out that even if another teacher wants to, when will he do it? The schedule is suffocating, and their extracurricular time is already loaded. Some also spoke about the institutional framework of working hours: "*There is never time within hours for the teacher to deal with them*" (conclusion from several references such as Syn. 7 or 11). Also, someone said: "*The whole planning, the way lessons are done, the hours that are lost, i.e. the 45 minutes, the ones that are cut off from each other*" (Syn. 4), implying that the very model of organizing school time does not favor interdisciplinary digital activities. In general, many principals consider that the lack of time alone is one of the biggest obstacles, both as an objective (there are no teaching hours for digital projects) and as a subjective (teachers "don't have the mind" for extra effort). Systemic changes (e.g., curriculum reform, reduction of teaching hours to make room for digital innovations) may be needed in order to remove these barriers.

Table 7: Key barriers to digital transformation in schools

Code	Interview Excerpt
Incomplete infrastructure & equipment	"*The main obstacles are the equipment and the building... the Internet*" (Syn. 1)
Little funding – bureaucracy	"*The underfunding... and the obstruction of state bodies (bureaucracy)*" (Syn. 3)
Teachers' resistance/mentality	We too often face resistance to change. "*Why change it since it works?*" (Syn. 9)
Lack of time – extensive curriculum	"*It's the time, the program, the material... all this, the management, which leaves no margins*" (Syn. 7)

The second main issue concerns how principals manage resistance by teachers or parents to technological change (Table 8). The principals, in their answers, state that parents generally do not show resistance. Many characterize them as absent or indifferent, unless something creates a practical issue for them. On the contrary, some teachers appear to resist or be skeptical. The directors describe a variety of approaches to managing these situations: (a) a diplomatic approach and dialogue. Instead of imposing, they try through calm discussion to convince the hesitant, (b) gradual implementation and promotion of the benefits. They show them practically how technology makes work easier or benefits students, (c) tolerance and understanding. They realize that it takes time and do not push too hard, and (d) rely on teachers who have digital knowledge and skills, which they use as examples to seduce others. Several directors also expressed a dose of disappointment. Some reported that they are tired of trying or that the climate is not receptive and they are just doing what they can. Below are the sub-topics, with a remark: almost all of them started by saying that there is no problem with parents or that they are "indifferent" to the school's technology issues.

Sub-topic 2.1: Minimal or non-existent resistance from parents – mainly indifference

Most principals reported that they have not faced any backlash from parents regarding the school's technological development. "*I don't think there is [resistance] from the parents*" (Syn. 2) said one, while many others had similar phrases: "*Parents have nothing, they are indifferent*" (Syn. 1, 4, 5 with variations). "*They have no problem with their children learning new things, but there are certain sensitivities regarding the appearance of faces in images, videos or actions"* (Syn. 11). Some said that parents have no room to intervene in the school's technological affairs (Syn. 16). Therefore, the burden of resistance management mainly concerns the teachers' side. This is acknowledged by the principals, and essentially, their answers to "how they deal with resistance" refer mainly to teachers. Therefore, parents are not a substantial source of resistance to the digital transformation (possibly because they are either not interested or consider digital facilities to be positive – e.g., electronic communication). This is important because it means that managers do not have to manage an "external front" but only an "internal front".

Sub-topic 2.2: Empowerment through dialogue and highlighting the positive elements

The main strategy that the principals describe to overcome teachers' resistance is calm, diplomatic discussion and training by example. "*...certainly, through dialogue and trying to highlight the positive points of the introduction to the educational process*" (Syn. 18), explains a director. Most agree that imposing by administrative force does not work. Instead, they try to talk openly with teachers who are hesitant in order to understand their fears and reassure them. "*I try to make any innovation clear. That is, to understand what this innovation is coming and why it is necessary. Where does it make it easier for us, what makes it difficult for us, so that there is a framework around innovation that is clear to parents, children, teachers*" (Syn. 9) said one director. This approach involves showing teachers tangible benefits: e.g., that digital grading saves time or that an interactive lesson gains students' attention. Also, many stressed that they are innovating gradually. They do not require immediate use from everyone, but start with the willing ones and present the results. *"...That is, with the positive, calm, beautiful atmosphere it creates in the club. Through personal relationships with each colleague, we try to get through, to overcome every difficulty*" (Syn. 12), "*First of all, certainly through dialogue and trying to highlight the positive points of the introduction into the educational process. Even I myself show my colleagues how to make use of such tools*" (Syn. 18). – Here we can see a gradual intervention in a calm and positive climate with emphasis on the positive points. Overall, managers choose gradual steps with patience and a willingness to convince rather than conflict. They confront those who "resist" with arguments and mild perseverance. This practice also aligns with the soft skills that they themselves evaluate as important (empathy, communication, which we saw above). They try to use these skills to manage change.

Sub-topic 2.3: Patience, gradual climate change and the development of willing teachers

Beyond dialogue, managers recognize that it takes time to change an attitude of resistance. Many say that they show patience and do not put too much pressure on the "negatives", but try to create a climate where the mentality will slowly change. *"...there has not been such a discussion [about digital vision],... We are more looking to see, to learn. We are still at the stage of learning about what is to come*," said one principal (Syn. 5), suggesting that in an unreceptive environment, he chose to wait and focus on information rather than pushing for vision. In the same vein, several managers are trying to create positive role models. As mentioned in previous sections, they utilize technologically capable and willing teachers. "*Sometimes the seed falls on fertile ground – you find a pioneer, other times you don't. But I keep sowing seeds*," said a director metaphorically (Syn. 19). That is, he uses the "pioneers" to show others the way. Also, some principals mentioned that if there is no serious resistance, they don't consider it a problem – e.g., "*In general, there is not much resistance from teachers*" (Syn. 8), so they go ahead with those who are willing and let the rest follow when they are ready. Nevertheless, it should be noted that some directors also expressed fatigue: "*I am tired of proclaiming them [innovations]. I'm a little disappointed*," confesses a director (Syn. 10). This shows that their patience is being tested and

sometimes they feel that the climate does not change easily. Nevertheless, the common line is perseverance by mild means. Presenting ideas, highlighting positive elements of technological changes and waiting for the generation of teachers or the mentality to change. Change is a long and difficult process, and managers play an important role in this.

Sub-topic 2.4: Realism and acceptance – when resistance remains

Although not many, some principals admitted that there are not always ways to convince everyone and that some resistance simply coexist in school. Whether because of the nature of the teachers or because of upcoming retirement, some may never change their attitude. "*I wouldn't say that there is resistance. In general, they may exist*," said a director (Syn. 15), implying that she does not consider them critical. Someone else mentioned teachers who are close to retirement and "*... have stayed in their own school years*" (Syn. 19), suggesting that it may not be worth attempting a big change with them. In such cases, managers adopt a "*let's do the best we can with those they want*." It wasn't said directly, but from the context it seems that they don't openly clash with persistent deniers, they just try to help them discreetly as much as they can and not let them get in the way of others. Also, some directors noted that nothing serious has happened to them: *"... I haven't had any significant resistance, especially from parents who don't... Sometimes, some teachers say that I can't use this because I don't know it, or that it doesn't help me in my work. And then we try to help him or give instructions or bring in the IT teacher to give some help*" (Syn. 8). This suggests that perhaps the resistance manifests itself more as inaction than as active protest. Overall, the resistances may be sluggish to some extent, but they are real. Principals know that they will not succeed with all teachers, but they continue to move in the direction of change as much as they can and try not to disrupt the climate.

Table 8: Teacher/Parent Resistance Management – Managers' Strategies

Code	Interview Excerpt
Resistance of teachers/parents	"*As parents, we don't have anything... the parents are not so interested*." (Syn. 1)
Dialogue & diplomatic approach	"*Here he wants a diplomatic approach... through dialogue to highlight the positive points.*" (Syn. 7 & 18)
Patience & gradual support	"*I'm trying little by little, 'come on, see this too.' Sometimes it works, other times it doesn't, but I insist in a calm way*." (Syn. 19)
Utilization of pioneering teachers	"*I make use of teachers who have knowledge... one shows, the others slowly follow*." (Syn. 17)

To sum up, the principals outline a complex landscape of obstacles that hinder the digital transformation of schools. On the one hand, there are logistical anchorages (Figure 1). Inadequate equipment, incomplete networks, few funds, and slow procurement procedures. Issues that require systemic solutions at the state level. On the other hand, human factors are just as important. The fatigue of teachers, their lack of ICT training, but also a deeper culture of maintenance that makes some people suspicious of changes. The directors seem to be fighting on two fronts. They try to claim resources and

infrastructure (as much as they can) and at the same time persuade or encourage their staff towards change. In dealing with resistance, they adopt a participatory, supportive attitude. Very rarely do they come into conflict. On the contrary, they invest in dialogue, in education through teachers who have a positive attitude and in changing the mentality through small steps. This shows that they realize that digital transformation is not only a matter of technology, but also of people. Ultimately, directors play a 'mediating' role. They know what it takes to change the school (infrastructure and human development), they see the obstacles with realism, and they try to overcome them with constant effort and perseverance. The fact that some express frustration or fatigue underscores the importance of external support, both material and moral, to be able to continue to lead the change.

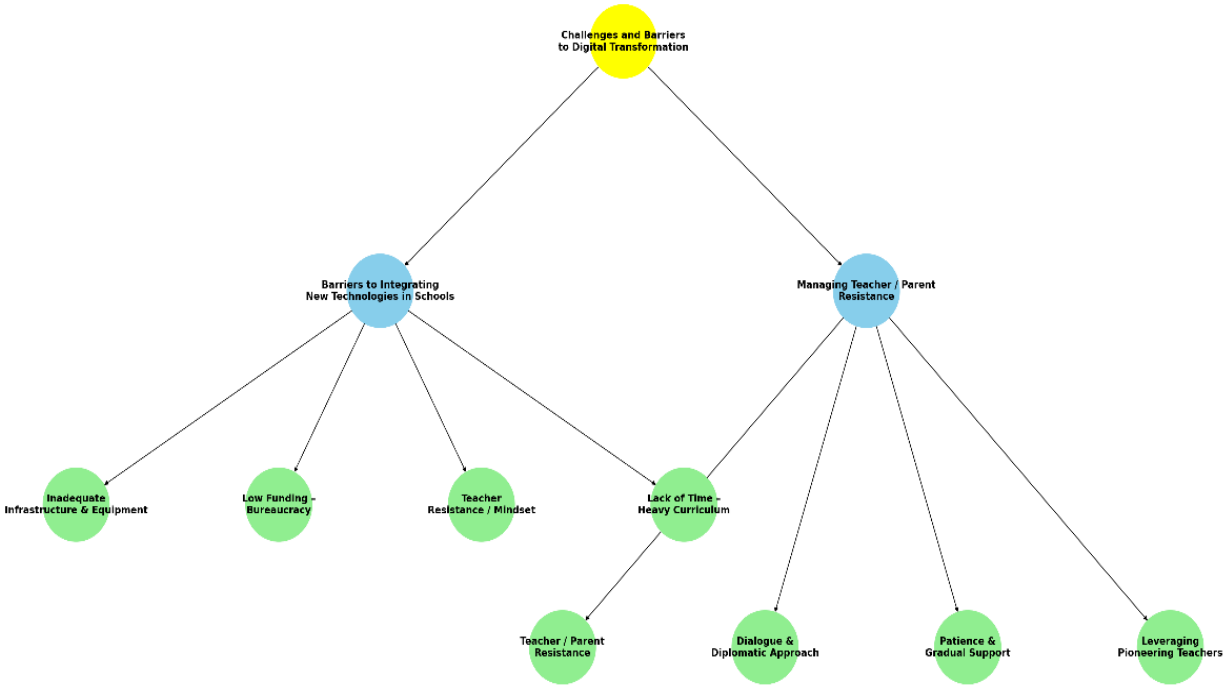

Chart 1: Challenges and obstacles of digital transformation

5. Discussion

The purpose of this research study was to investigate the perceptions of Teachers and Directors of Primary and Secondary Education from all over Greece and to compare them with each other.

Regarding the Challenges of Digital Transformation, according to the quantitative and qualitative findings, they are organized into five main themes: a) Technological Infrastructure and Resources, b) Training and Digital Skills, c) Resistance to Change and Reservations, d) Data Protection and Digital Risks, and e) Technology Integration and Pedagogical Connection.

a) Technological Infrastructure and Resources

Most teachers state that their school has adequate basic equipment. In particular, 75.1% rate positively the adequacy of the technological equipment (MT=4.26) and 69.5% consider the internet connection to be satisfactory (MT=4.12). However, 68.5% report that technical difficulties with devices or software are often encountered (MT=4.08). The maintenance of existing equipment is considered only moderate (only positively since the 58.4%, MT=3.70). About half of teachers (54.7%) believe that existing infrastructure can support the needs of new technologies. On the contrary, financing emerges as a significant weakness: only 31.8% consider the available resources for the purchase of new equipment to be sufficient (MT=2.72).

At the same time, a very high percentage (66.6%) agree that economic constraints limit the ability to integrate new technologies (MT=4.59). Only 28.9% consider that the new technologies are fully compatible with the existing infrastructure (MT=2.74), an indication of low compatibility. Directors confirm these challenges, describing severe shortcomings in technological infrastructure and resources. In the interviews, they emphasize that many schools do not have adequate or modern equipment and report shortages of operating computers, slow or unreliable internet connections, and a limited number of interactive media. In addition, they underline the absence of technical support: even when new equipment is provided, it may not be used due to a lack of appropriate training or technical assistance.

Insufficient funding is seen as one of the most serious obstacles, with resources limited and bureaucratic procedures for procuring equipment time-consuming. As a result, an environment is created where logistical conditions do not adequately support digital transformation. Quantitative and qualitative data converge on the fact that technological infrastructure and resources are a fundamental challenge. The figures show that teachers recognize a basic competence in equipment and internet, but at the same time point to shortcomings in maintenance, funding and compatibility of new technologies.

On the other hand, managers convey a more worrying picture, emphasizing logistical deficiencies and insufficient support from the system. So there seems to be a slight difference in emphasis. Teachers appear relatively satisfied with the basic equipment, while principals emphasize that it is often insufficient or not modern. Nevertheless, both sides agree that without strengthened infrastructure and resources, the digital transformation becomes significantly more difficult.

This common assumption underlines the need to improve equipment and financial support for schools. Indeed, it has been documented that the lack of basic resources – such as adequate computers, reliable internet and maintenance funds – is one of the main barriers to the integration of technology into education. Studies-reviews highlight that infrastructure and funding are among the primary factors that determine the success of technological initiatives in schools. Even the most capable and willing educational leader finds it difficult to implement his vision without the necessary means,

which demonstrates the fundamental importance of infrastructure for digital transformation (Hew & Brush, 2007; Petko, 2012; Tondeur et al., 2008).

b) Training and Digital Skills

Data show that teachers' training in new technologies is considered insufficient by the majority. Only 42.8% estimate that they have received adequate training in modern tools (such as Artificial Intelligence, Virtual Reality, etc.), indicating a large margin for improvement (MT=3.16). On the contrary, digital training of principals is evaluated much more positively, with 64% considering that the school principal has adequate training (MT=3.97). The adaptation of the provided education to the needs of teachers is considered moderate: about 48.4% rate this adaptation as satisfactory (MT=3.40).

A major obstacle is the time that teachers have for their professional development. Only 30.7% consider the time available to attend seminars and trainings sufficient (MT=2.81), i.e. almost 7 out of 10 state a lack of time. A positive element is that further training appears to a large extent as a continuous process: 76.3% agree that teacher training is continuous (MT=4.48). Nevertheless, the quality and targeting of training are questioned, as only 44.9% believe that the training fully meets their needs (MT=3.25). About half of teachers (51.8%) have a positive view of the integration of practical applications in their training, but notice that there is no uniformity in this everywhere (MT=3.50). Finally, there is a significant lack of time for personal exploration of new technologies. Only 25.8% state that they have enough time to learn and test new digital tools (MT=2.62).

Interviews with school principals confirm that the development of teachers' digital skills remains one of the weakest points of our education system. In particular, they point to the lack of adequate training as well as the limited time available for teachers to participate in educational programs as two main obstacles to the use of digital technologies in the classroom. This finding is also confirmed by studies that highlight as the main obstacles the lack of technical support and training, despite the existence of appropriate equipment (Kwaśniewski, 2024).

Typically, cases are described where teachers do not have the required skills to utilize the available equipment. One principal reported that his school received robotics kits, but the teacher in charge had no familiarity with the technology, leaving the equipment unused. This example clearly highlights the gap between technology procurement and teachers' ability to use it pedagogically – a phenomenon that has been documented in similar research studies (e.g., Riyanda et al., 2025).

At the same time, the principals point out that there is rarely a provision of time within working hours for training or experimentation with new technologies, and that the integration of equipment or new digital tools in schools is often done without being accompanied by organized and continuous support of the educational staff. This phenomenon is common in many education systems, where teachers' professional development is fragmented and without depth, without adequate monitoring or support mechanisms (Forrest, 2021; Ortega Rodriguez, 2024).

The triangular analysis of the data reinforces the above findings, as the coincidence of quantitative and qualitative data is clearly captured. Both teachers through the questionnaire and principals through interviews agree that existing training is not sufficient to effectively support the digital transformation of the school. Similar problems of inadequate training have been identified in international studies highlighting the difficulty of teachers in transferring the knowledge they have acquired in complex and changing learning environments (Levchenko et al., 2019).

In addition, teachers emphasize that training in modern tools is inadequate, while limited time does not allow them to develop or practice the necessary skills. The principals agree, mentioning the absence of targeted programs and the difficulty of integrating training into the suffocating school hours. Similar findings are also recorded in surveys on the integration of digital education in primary education, where teachers point to lack of time and institutional support as the main obstacles (Pomarejos et al., 2025).

The lack of continuous professional development affects not only teachers' knowledge, but also their self-confidence and attitude towards educational technology. Research confirms that when teachers feel well-qualified, they are more likely to experiment with innovative methods and adopt new tools (Fedorova et al., 2021; Nurhayati & Novianti, 2024). In contrast, a lack of education breeds insecurity and intensifies resistance to change, resulting in teachers attributing failure to a lack of support and asking for more resources and guidance (Villanueva & Hernandez, 2022). Overall, the picture that is formed is clear. More organized, in-depth and sustained professional development programs are needed, as well as time within hours to practice and apply new skills (Hendrarso & Habib, 2022).

c) Resistance to Change and Reservations

The quantitative results indicate that there is a degree of reticence on the part of teachers towards the changes brought about by new technologies. More than half of teachers (56.5%) agree that their staff is resistant to change regarding the use of new technologies (MT=3.69). In contrast, the resistance on the part of school management is much lower – only 29.3% see the manager resisting technological change (MT=2.77), suggesting that leadership is generally positively disposed towards transformation. In addition, 57.4% of teachers acknowledge that many of their colleagues appear reluctant to use new technologies in the classroom (MT=3.62).

There are also fears about the role of teachers: 53.7% are concerned that new technologies may replace the traditional role of teacher or headteacher (MT=3.50). More than half (54.5%) agree that staff resistance is generally a major barrier to the integration of new technologies in schools (MT=3.62). In contrast, few seem to think that students prefer traditional methods: only 28.3% agree that students prefer the old way of teaching (MT=2.74). A very important finding is that the vast majority (75.5%) believe that the use of new technologies adds additional workload to teachers (MT=4.37). This shows that

many teachers feel digital innovation as an extra burden in their already demanding everyday lives.

Managers confirm that a key barrier factor is human resistance to change. Many notice that some teachers – especially older teachers – show reluctance or fear towards new technologies. They describe cases where teachers who are used to working in a certain way are suspicious of anything new that is introduced. Some principals also report "moral" resistance: teachers who have just heard about technology or artificial intelligence raise privacy issues and express objections of principle. This indicates a fear that technology may bring about unwanted changes or reduce the control they have in the classroom. In addition, the lack of incentives is highlighted. Many teachers consider that the integration of digital tools means additional work that is not rewarded and institutionally facilitated. As characteristically said, many people treat it as a "waste of time" to prepare digital material, as long as there is no form of reward or exemption from other tasks. Many principals also emphasize the fatigue factor: teachers are already burdened with many teaching hours and administrative tasks, so that even those who are not negative about change do not have the energy or the mood to innovate.

Unlike some teachers, principals say they are not afraid of change but encourage it. Many school-administrations face teachers' resistance through dialogue and diplomacy, trying to convince them gradually, showing the benefits of the new tools. Strategies include tolerance (giving time to the hesitant) and the use of the most willing and digitally trained teachers as "examples" for the rest. Regarding parents, almost all principals agree that they are not a substantial source of resistance. On the contrary, many parents appear indifferent or distant to the school's digital initiatives, but do not actively block the changes. Only individual parental sensitivities on issues such as the publication of photos of children were reported, but in general there are no strong reactions from families.

The findings of the two approaches converge that the main resistance to digital transformation is located within the educational staff. Teachers themselves recognize that some of their colleagues are hesitant or resist the introduction of new practices. It is a phenomenon that has been repeatedly recorded in the literature as a common obstacle when introducing innovations into schools. The causes of resistance are multifaceted. Fear of the unknown and insecurity towards untested technologies, which can lead to hesitation or passive resistance, is one of the key factors (Awang et al., 2020; Kern & Graber, 2017).

In addition, some teachers are concerned that new technologies may limit their control in the classroom or degrade their pedagogical role (Lane, 2007). These perceptions make it imperative to manage concerns with open communication and support. Managers, in fact, offer such coping strategies. They encourage dialogue, gradually incorporate change, and provide examples of successful use by willing colleagues to alleviate the anxiety of the most hesitant. The lack of motivation and time highlighted, i.e. the feeling of many teachers that the effort to integrate innovations is not recognized or facilitated. It also intensifies resistance. The phenomenon where teachers consider the

preparation of digital material without reward to be a "waste of time" underlines the need to provide incentives and sufficient time for teachers to actively engage in such changes. Indeed, it has been shown that institutional support in the form of incentives and time frames for training significantly enhances teachers' willingness to adopt innovations (Ghavifekr & Yue, 2022; Prestiadi et al., 2020).

At the same time, both sides agree that school leadership does not create obstacles, but on the contrary appears supportive. The low percentage of teachers perceiving resistance from the principal, combined with the principals' descriptions of their efforts to persuade staff, suggests a shared belief that leadership encourages change.

Regarding students and parents, there is also a convergence that they are not a major source of resistance. Most teachers do not believe that students prefer the old methods, while principals confirm that parents rarely openly react. Overall, the human factor of resistance is emerging as one of the most persistent obstacles to the digital transformation of schools. The recognition of this problem by both teachers and principals demonstrates the importance of managing it with culture change strategies and continuous support of staff.

d) Data Protection and Digital Risks

Teachers express strong concerns about data security and the risks posed by the use of new technologies. In particular, 72.7% agree that concerns are raised about the protection of students' personal data when using new technologies (MT=4.23). Also, more than half (55.1%) believe that data protection in their school is inadequate (MT=3.65). At the same time, 59.5% recognize that the use of new technologies can expose students' data to risks (MT=3.72). Another digital risk identified is the possibility of addiction. 62.9% agree that the use of technological applications can create dependency in students (MT=3.96). These findings show that the majority of teachers have reservations and concerns about digital security and the impact of technology on students.

In the responses of the managers, data protection and digital risk issues do not appear as strongly as in the questionnaires. Few directors mentioned relevant issues spontaneously when talking about obstacles. Some reports, however, have been made, indicating that there are such concerns in the background. In particular, some teachers – as reported by the principals – raised privacy issues as a reason for caution against new technologies. There have been instances where the debate around the introduction of a new technology has raised objections to privacy or other ethical concerns. On the parents' side, principals noted that there may be sensitivity to issues of disclosure of information about students – for example, some parents would not like to see photos of their children displayed in online school publications. In general, however, the directors did not characterize these concerns as a dominant obstacle, but rather as secondary issues in relation to the more immediate practical problems.

There is therefore a differentiation between the two data sources: teachers (through quantitative research) highlight digital risks and data protection as significant challenges – they clearly express fears about information security and the potential

negative effects of technology (such as addiction). Instead, managers give less weight to these issues in their discussions, focusing mainly on practical and organizational problems (infrastructure, resources, human resistance) and less on the risks of the digital environment. This does not mean that they ignore digital security, but it does suggest that, from their perspective, issues such as lack of equipment or staff resistance are more immediate and tangible obstacles. They may take compliance with safety rules for granted, or they feel that these issues are being addressed through policies and directives. However, even with this different emphasis, data protection concerns do not cease to exist. Indeed, if appropriate measures are not taken, there is a real risk that student data will be compromised or misused.

These privacy concerns require clear data management policies and transparency mechanisms so that students and parents know exactly how their information is being collected and used. The need for strict application of privacy rules in education is imperative, as it has been documented that the security of student information must be considered a fundamental prerequisite of any digital initiative (Rizvi, 2023). In addition, the possibility of developing addiction or the digital burden of students in general are contemporary concerns. Strong awareness of students' digital well-being is now emerging as a priority in the international literature.

It is characteristic that actions are proposed within the school to promote the responsible use of technology, in combination with programs that enhance students' mental health (Al-Maskari et al., 2022). Overall, while teachers are expressing stronger concerns about digital security than reflected in the discourse of principals, the convergence of data underlines that issues such as data protection and digital risks cannot be ignored. These issues need to be dealt with proactively in order to ensure the confidence of everyone (teachers, students, parents) in the use of new technologies.

e) Integration of Technologies and Pedagogical Connection

Quantitative data show that the effective integration of technologies into teaching faces several difficulties. 48.8% of teachers agree that it is difficult to keep up with constant technological developments (MT=3.44), suggesting that almost half feel that they do not have time to stay informed about all the new digital media. In addition, a very high percentage (69.8%) report that there are problems in digital communication with parents (MT=4.14). testifies to difficulties either in the use or acceptance of digital communication tools between school and family. At the same time, a positive element is recorded: 78.2% note that the creation of cooperative relationships with parents and the local community is cultivated for the management of changes (MT=4.39). This finding suggests that in most school units, an effort is being made to involve the family and the community in the course of the digital transformation.

Regarding daily teaching practice, 59.0% agree that the management of digital tools and platforms is time-consuming and time-consuming (MT=3.75). That is, the use of technology can burden the teacher's timetable. A worrying finding is that only about 1 in 3 teachers (33.4%) consider that the effectiveness of technologies in teaching is

adequately evaluated (MT=2.93). A similar percentage (33.4%) believe that the performance of technologies in educational practice is predictable and stable (MT=2.94). These low percentages suggest that there is still no clear evaluation process for what works well and what does not when new digital tools are implemented. Finally, the compatibility of curricula and textbooks with the use of technologies is considered low: only 31.4% agree that existing educational material is aligned with digital practices (MT=2.76). This shows that the content and structure of the material have not yet been fully adapted to effectively integrate new technologies.

For their part, the directors outline a picture where the integration of technologies into the pedagogical work is mainly hampered by structural limitations of the educational system. One of the most recurring topics in interviews is time and material constraints, as the current school curriculum is described as "suffocating". Long teaching hours and an extensive curriculum leave no room for innovation, even when teachers are willing to implement digital action plans. The problem of time as a critical barrier has been widely documented in the literature as a first-order barrier to technology integration (Hechter & Vermette, 2013; Kopcha, 2012).

Characteristically, it is mentioned that "the material is vast" and the available teaching time is minimal, making it practically impossible to include digital activities that require additional planning. Similar findings have been recorded internationally, where teachers state that a lack of time to prepare or implement digital tools is one of the most discouraging factors (Brzycki & Dudt, 2005; Naah & Mayeem, 2020).

In addition, the directors point out that there is no institutional time within hours for familiarization with new technologies or material preparation. Teachers' extracurricular time is already filled with administrative or other tasks, so any effort to innovate is transferred to their personal time. This phenomenon has been recognized in studies that demonstrate that the educational environment and the lack of institutional support are serious external barriers (Singhavi & Basargekar, 2019; Vijayatheepan, 2025). Some principals go a step further, noting that the very structure of the timetable acts as a brake on the pedagogical utilization of technology. Their proposals include reforming the curriculum and creating more flexible structures to allow for the integration of cross-curricular, digital approaches. This request agrees with findings from quantitative and qualitative research that recognizes the rigidity of the curriculum as one of the main reasons for the limited use of ICT (Rice et al., 2001; Shi, 2016).

It is worth noting that the involvement of parents and the community in the technological upgrade of schools is considered low. Principals report that parents do not object, but rarely actively participate, confirming that community involvement in technology integration remains fragmented (Dinç, 2019).

The two data sources (quantitative and qualitative) converge on the conclusion that the integration of technology is not hindered so much by technical deficiencies, but by frameworks and constraints such as time, material structure and lack of flexibility. Researchers often classify these factors into categories of "first and second-class obstacles": external barriers such as time, infrastructure, and institutional support (first-

class), and internal barriers such as teachers' beliefs and attitudes towards technology (second-class) (Atchley et al., 2020; Tsai & Chai, 2012).

Therefore, without reforms in the structure of the curriculum and the easing of the material burden, the meaningful and pedagogically productive use of technology in the classroom will remain limited. In order to eliminate the inequalities that are created, the literature highlights the crucial importance of developing reliable infrastructures and revising curricula. Indeed, the effective integration of technologies requires the educational material and the curriculum to adapt to the new requirements, integrating digital capabilities into everyday teaching. The need for such reform has already been highlighted at the international level (e.g., ICT integration policies are needed). Aligning the curriculum with digital skills and systematically evaluating new practices are considered necessary prerequisites for the digital transformation of education to deliver (Afshari et al., 2012; Schiller, 2003). Otherwise, progress in the integration of technologies remains slow or limited, as was already seen in the late 1990s. In other words, without sufficient resources and flexible adaptation of educational practices, new technologies can hardly be used to the fullest for the benefit of learning.

Regarding the involvement of the family, there is general agreement, albeit with slightly different perspectives. Teachers report problems in digital communication with parents, such as unequal access to technological means or lack of digital literacy on the part of parents, something that has also been confirmed in international surveys (Grobler, 2022; Konca & Hakyemez-Paul, 2021). Nevertheless, a significant percentage, such as 78.2%, recognizes that there is an effort to collaborate between school and parents, which is confirmed by studies that show the willingness of parents to participate, even to a limited extent, when given opportunities (Al-Hail et al., 2021; Miguel et al., 2021).

For their part, the principals observe that the parents do not actively oppose, but neither do they participate particularly – they remain largely passive. This picture of formal information but low substantive involvement has been captured in many surveys internationally, where parents are considered important allies, but are not involved in decision-making or planning processes (Demircan & Erden, 2015). Teachers experience this situation as "difficulty in communication", while principals experience this situation as "indifference". However, both sides agree that parents are not an obstacle, which is also confirmed by research where parents have a positive attitude but often do not know how to engage effectively (Graham-Clay, 2005).

The responsibility for promoting change ultimately falls on the school, as evidenced by studies highlighting the crucial role of schools in shaping effective partnerships (Andamisari et al., 2024; Rachman et al., 2024).

Finally, one point emerges from the quantitative data that remained unclear in the interviews: the evaluation of digital practices. Only a third of teachers consider that there is an evaluation of the effectiveness of technologies and adaptation of the curriculum to their requirements. The fact that directors do not refer at all to evaluation procedures may indicate the absence of an institutional framework, or that the emphasis is on implementation rather than on measuring results. This differentiation is critical, as

assessment is considered a key step in redesigning digital strategies (Al-Hail et al., 2021; Perrigo et al., 2023).

Overall, principals and teachers recognize that full pedagogical integration of technology requires changes in school organization and culture. The triangular comparison shows broad agreement on the key problems and underlines that, for the digital transformation to work, support is needed both at the practical level (flexibility of time, adaptation of the curriculum, adequate infrastructure and technical support) and at the level of processes (evaluation and feedback on new practices). Experience has shown that when the necessary conditions are secured – infrastructure, resources, training – and when a positive climate of acceptance is formed, new technologies can fundamentally transform teaching. Conversely, when there are shortcomings, efforts often only go as far as superficial changes or fragmented applications, instead of the deep, sustainable innovation that Education 4.0 promises.

6. Recommendations

The challenges for teachers for digital transformation are many. Inadequate training, resistance due to culture and fears, practical obstacles of infrastructure and time. However, the possibilities opened up are just as important. With the right support, teachers can transform teaching, making it more engaging, participatory and tailored to students.

A teacher trained in the principles of Education 4.0 can create a classroom where students actively learn, collaborate through digital tools, use information from the internet with critical thinking and develop skills necessary for the future. Therefore, investing in teachers' professional development and removing the obstacles they face is crucial to make digital transformation a reality in Greek schools.

The role of educational leadership in digital transformation is crucial both as a dynamic driving force and as a field for addressing challenges. Effective leaders can create a shared vision and culture that embraces innovation, empower teachers through support and collaboration, and ensure that technology is leveraged for the benefit of all students. On the other hand, they need to carefully manage the human side of change, fears, resistances, training needs, as well as practical issues of resources and ethics. It also needs the necessary training to acquire and strengthen soft and hard skills.

Leadership in Education 4.0 is, therefore, a complex balancing exercise. Balance between technological drive and pedagogical substance, between innovation and integration of all, between vision and implementation. When this balance is achieved, the possibilities are enormous: schools are transformed into creative learning environments, teachers feel part of a collective and meaningful effort instead of spectators of it. Students receive an education that essentially prepares them for the digital world. The challenge for educational leadership in Greece – as well as internationally – is to harness these opportunities by overcoming obstacles, successfully leading schools into the era of the 4th Industrial Revolution.

7. Conclusion

The digital transformation in education encounters a set of interrelated challenges and obstacles. The findings highlighted problems in infrastructure and resources (insufficient equipment, weak technical support, insufficient funding), which everyone agrees are the basis of the difficulties. At the same time, a deficit was found in teachers' training and digital skills, with the absence of time and targeted training hindering their development. One of the most critical obstacles is the human dimension. The resistance of some teachers to change, due to fears, mentality or fatigue, is recognized as a determining factor of delay. At the same time, school leadership emerges as a positive factor, as it appears supportive and willing to facilitate change. Concerns about data protection and digital risks are strong among teachers, indicating that the digital transformation needs to take into account the need for digital security, even if principals do not see it as a primary barrier. Finally, the integration of technologies into everyday teaching is proving to be complex, mainly due to structural constraints: the suffocating schedule, the huge material and the lack of flexibility make it difficult to implement innovative practices.

In general, the analysis of quantitative and qualitative data showed that the different sources (teacher questionnaires and interviews of principals) converge in most findings. There is a common perception that a holistic approach is needed to overcome obstacles. This means investing in technological infrastructure, ensuring adequate funding and technical support, providing continuous and targeted training to teachers, as well as encouraging and supporting them to adopt the changes.

It also entails incorporating safe practices and raising awareness of digital risks. Finally, changes are needed at the level of educational planning. Adapting curricula, providing time for innovation, so that technology is not just added as an extra burden, but is organically integrated into the pedagogical process. In this way, the digital transformation can proceed more effectively and substantially, for the benefit of both teachers and students.

Conflict of Interest Statement
The authors declare no conflicts of interest.

About the Author(s)

Konstantinos Zogopoulos is the Principal of a Primary School. He is a graduate of the Department of Primary Education of the University of Athens and a graduate of the Department of History and Political Science at Panteion University of Athens. He has a Master's degree in Education Management from the Department of Business Administration, TEI of Western Greece (Patras). He is a PhD candidate at the Department of History-Archaeology of the University of Patras. He has published in international journals and has participated in national and international conferences. He is co-author of two books (a) Panagiotopoulos, G., Karanikola Z., & Zogopoulos, K. (2023). Skills in the contemporary context. A research dialogue. Publications: Grigoris, b) Zogopoulos,

K., & Karatzas, A. (2025). Artificial Intelligence and Education. Investigation of the views of teachers in Greece. Publications: Grigoris). His main research interests are school administration, educational technologies, research methodology.

Panagiotopoulos Georgios is a Professor at the Department of History-Archaeology of the University of Patras with the subject "Management, Development and Training of Human Resources". He was born in Lechaina, Ilia. His basic studies are in Political Science and Pedagogy. Graduate in Political Science and Public Administration from the National and Katrina University of Athens, the Pedagogical Academy of Rhodes and the Maraslion Teaching School of the University of Athens, specializing in Special Education. His postgraduate studies are in Health Unit Management and his Doctoral Thesis is in the field of human resources education and training. Since 2006, he has been an Associate Teaching Staff (SEP) in the Postgraduate Program "Education Sciences" of the Hellenic Open University and a lecturer in the postgraduate program "Education Management" of the Department of Management Science and Technology of the University of Patras. His teaching work also includes teaching in undergraduate and postgraduate study programs of the University of Patras, the Democritus University of Thrace, the University of the Aegean, and the former TEI of West. Greece, the former TEI of Patras and ASPETE. His scientific work focuses on management, education and human resource development and includes participation in research projects, international publications, writing books and chapters in books and scientific papers in international conferences.

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