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KNOWLEDGE OF SCHOOL UNIT EDUCATION EXECUTIVES REGARDING THE FOURTH INDUSTRIAL REVOLUTION

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Abstract:
The Fourth Industrial Revolution (4IR) involves the integration of digital technologies, artificial intelligence, robotics, and other advanced systems into all aspects of society, including education. School principals, as key educational leaders, play a vital role in addressing both the challenges and the opportunities that 4IR presents. Their role is dynamic and continuously evolving as technology advances, making it essential for them to stay up to date with educational and technological developments. This study, part of a broader research project, aimed to explore the level of knowledge that educational executives (Principals, Deputy Principals, and Heads) across Greece possess about the 4IR. It sought to answer two main research questions: (a) To what extent do school leaders understand technologies related to the 4IR? (b) Do demographic factors such as gender, additional qualifications, or school level affect this knowledge? The study adopted a quantitative research method, using a structured questionnaire created via Google

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Forms. The questionnaire was distributed via email to public school directorates, including Kindergartens, Elementary Schools, Junior High Schools, and High Schools across Greece. It consisted of two parts: the first collected demographic information (gender, age, school level, years of service, and role), while the second assessed knowledge of 4IR technologies through thirteen statements rated on a four-point Likert scale (1 = Not at all, 4 = To a very great extent). Data collection took place between October and mid-November 2023, with 886 school leaders ultimately participating. In terms of demographics, 55.5% of respondents were women, 58.7% were aged 51–60, and 65.5% held postgraduate degrees. Participants included 25.1% Heads of Kindergartens, 37.2% Principals/Deputy Principals/Heads of Elementary Schools, and 37.7% Principals of Junior High and High Schools (Lyceums). Regarding 4IR knowledge, participants exhibited limited understanding of emerging technologies such as Artificial Intelligence, the Internet of Things, Augmented Reality, Big Data, and Blockchain (mean scores between 1.51 and 2.28). In contrast, they demonstrated greater familiarity with more commonly used tools and platforms, including Information and Communication Technology, Social Media, and Smart Boards (mean scores between 2.64 and 3.09). This suggests a disparity between exposure to foundational digital tools and comprehension of more advanced 4IR innovations. Statistically significant differences emerged based on demographics: men had more knowledge than women; individuals with higher educational qualifications (second degree, Master's, or Doctorate) scored higher; and Heads of Kindergartens were less knowledgeable than Principals of Higher School levels. Additionally, school leaders with more years of service (11–20 years) had a better understanding of 4IR technologies than those with fewer years of experience. The findings suggest a need for targeted training and professional development in 4IR technologies for educational leaders, with an emphasis on strengthening educational leadership to meet the challenges of this new era.

Keywords: Fourth Industrial Revolution (4IR), principals, schools, professional development

1. Introduction

Digital technology creates pressures on the education system to adapt, change and improve to become more efficient. School Directors are at the heart of this change and transformation (Richardson et al., 2013). It is important and necessary for them to be aware of the new trends and developments in the field of educational technology, to be properly prepared and equipped to be able to exploit the potential of digital tools (Shet et al., 2017).

Research on the 4th Industrial Revolution and the impact on education in Greece is minimal, especially with regard to School Principals and their professional development to address the demands of the 4IR. In a quantitative survey (Panagiotopoulos, 2021) entitled "4th Industrial Revolution: The challenge of teachers'

management of new conditions", in a sample of 233 teachers of the Primary School of the Region of Western Greece, which was conducted in June 2020, it was shown that teachers, although they understand that the nature of their work is changing, present little knowledge and familiarity with software and emerging technologies of 4IR. In another quantitative survey (Karanikola et al., 2022) entitled "Teacher Competences and Learning in the 4th Industrial Revolution" with a sample of 422 teachers of Secondary Education of the Region of Western Greece which was conducted in 2021, according to the findings, the teachers of the sample present moderate levels of use of online applications, open online courses and are in need of training on new technologies and issues related to 4IR. In other countries surveys concerning the same topic as Letuma's (2023) entitled "Professional Development Needs of School Principals for the Fourth Industrial Revolution" with a sample of 505 school principals from two regions of Gauteng Province, South Africa, showed that participants present a high degree of knowledge about 4IR that can be improved. Also, gender does not affect their knowledge of 4IR. Another study conducted by Moloi and Mhlanga (2021) titled "Key features of the fourth industrial revolution in South Africa's basic education system" to 145 South African school principals showed that only a small minority of participants knew about 4IR and its implications and there is a need to provide 4IR education programs from higher education to teachers. In the research by Awodiji and Naicker (2023) titled "Preparing School Leaders for the Fourth Industrial Revolution: Assessing Their Needs for Continuous Professional Development" on 276 principals/deputy principals in public and private primary schools in Nigeria, it was found that school leaders possess a lot of knowledge about 4IR, but there is much more to learn. More knowledge and skills are needed in 4IR, 3D printing, artificial intelligence, automation and smart boards. There was also no differentiation in gender-based knowledge and skills.

The present research aspires to demonstrate the level of knowledge of school executives about 4IR and emerging cutting-edge technologies, the necessity of changing organizational behavior and training them in the new technological developments in the field of education. At the same time, this study aims to address existing gaps in the literature concerning school leadership at both the Primary and Secondary Education (PE and SE) levels, particularly in light of its evolving role amid the emerging challenges and transformations introduced by Education 4.0 and the Fourth Industrial Revolution (4IR). It also seeks to serve as a catalyst for further scholarly dialogue, critical discussion, and reflection on school principals' level of knowledge regarding emerging technologies.

2. Literature Review

2.1 Characteristics of the 4th Industrial Revolution

The Fourth Industrial Revolution (4IR) is a term used to describe the rapid technological advancements in the 21st century, particularly in technologies and production processes. 4IR is characterized by the integration of both incremental and disruptive innovations, leading to the convergence of various technologies and industries. From the trend

towards automation and data sharing, the Internet of Things (IoT), cloud computing, cognitive computing, artificial intelligence, 3-D printing, bioprinting, artificial intelligence, blockchain, virtual reality, augmented reality, cyberphysical systems, cloud computing, and cognitive computing (Fraske, 2022). 4IR differs from previous industrial revolutions due to its speed, scope, and impact on systems, affecting a large number of sectors and businesses (Bai et al., 2020).

4IR is expected to disrupt almost every business sector and reshape the future of work, requiring businesses to prepare their people for the new world ahead. Developments in 4IR are expected to increase productivity, efficiency, and quality in processes, while reshaping the future of work and requiring continuous learning and upskilling to adapt to new types of jobs (McGinnis, 2020). It has the potential to increase global income levels and improve the quality of life of populations around the world (Schwab, 2016). These technologies are reshaping industries and raising questions about their ethical and social implications (National Academies of Sciences, Engineering, and Medicine, 2017).

2.2 Education and the 4th Industrial Revolution

The Fourth Industrial Revolution (4IR) is having a significant impact on the education sector, requiring changes in teaching strategies and educational policies to prepare students for the future. The impact it has on education is also described by the term Education 4.0. It is characterized by the integration of advanced technologies such as artificial intelligence, big data, augmented reality and automation, which are reshaping industries and creating new opportunities and challenges.

It is expected to transform the educational landscape, requiring teachers to rethink traditional pedagogies and focus on developing students' non-cognitive skills necessary for tasks that machines cannot do (Marr, 2019). In addition, 4IR is driving the emergence of new educational institutions that offer education, research, and services in a different way, including massive open online courses (MOOCs), virtual classrooms, and virtual workshops (Cupta, 2022). As such, it leads to a fundamental shift in education, requiring teachers, schools and policymakers to adapt to the changing needs of the future workforce and society. The education system is called upon to prepare students to participate in the creation of new knowledge and apply it in the real world using digital tools (Elayyan, 2021; Marr, 2019).

The impact of 4IR on education is also reflected in the need for teachers to support personalized learning for creativity, innovation, and problem-solving in order to equip students with the skills needed to shape the future through technology-enabled innovation (Elayyan, 2021).

2.3 School Staff and the 4th Industrial Revolution

The development of 4IR is a major challenge in the field of education as well. It requires teachers to be able to improve skills in using ICT to support learning, to facilitate

inspiration, creativity, imagination, social empathy and teamwork, which cannot be replaced by technology (Lubis, 2019).

In the new reality that is taking shape, school principals will have to adapt and acquire the appropriate leadership style and the appropriate knowledge and skills regarding school transformation in the 21st century (Wahidin et al., 2020). School leaders can play an important role in encouraging, mentoring and motivating teachers, improving their performance and delivering quality learning with a digital approach. They should be able to facilitate equipping with ICT, keep pace with the development of science and technology, be able to respond to and cope with changes in society, and enhance critical, creative, communication, and collaboration skills (Saputra et al., 2022).

School leadership in the new era (Education 4.0) should have the ability to create channels of communication and interaction with all parts of the school, develop a culture for change in the school, effectively use technology in school management, create rich, interactive learning environments, develop an effective guidance system in schools, promote student autonomy, ensuring the participation of all stakeholders of the school community in decision-making and creating a digitalized school culture in a managerial and pedagogical context (Kin & Kareem, 2019; Kin & Kareem, 2018).

With increasing expectations for better learning outcomes and effective school functioning, principals need to acquire new information, skills, and competencies through systematic programs or interventions to meet their needs (Hallinger & Walker, 2017).

2.4 Purpose of the Survey

The purpose of this research study, which presents part of a broader research, is to investigate the knowledge of executives (Heads/Directors/Deputy Principals) of school units (Kindergartens, Primary Schools, Junior High Schools, High Schools-Lyceums) from all over Greece for the fourth industrial revolution.

2.5 Research Questions

1) To what extent do School Directors have knowledge about technologies for the 4th Industrial Revolution?
2) Do demographic factors (gender, additional studies, school level, years of service as a school executive) influence their knowledge of the 4th Industrial Revolution?

3. Methodology of the Survey

3.1 Research Tool Structure

The present research was conducted as part of a larger survey (Zogopoulos et al., 2025; Zogopoulos et al., 2024), which was done with a two-part self-report questionnaire research tool. The first part contains the demographic data (gender, age, school level, years of service as principals/deputy principals/supervisors, status of education executive in the school unit). The second part concerns the knowledge about the 4th

Industrial Revolution with thirteen statements. Respondents were asked to answer on a four-point Likert scale (1=Not at all, 2=To a small extent, 3=To a large extent, 4=To a very large extent).

3.2 Sample Research

The survey was conducted between October and mid-November 2023 using a convenience sampling method. Data were collected through a structured questionnaire developed in Google Forms, which was distributed via email to the Directorates of school units (Kindergartens, Primary Schools, Junior High Schools and High Schools- Lyceums) across Greece. The sample of the survey consisted of 886 Directors of Kindergartens, Primary Schools, Junior High Schools and Lyceums who responded and completed the questionnaire.

3.3 Data Analysis

This research is part of a wider research. The data obtained from the 886 Principals/Deputy Principals/Heads of Kindergartens, Primary Schools and Junior High Schools from all over Greece were analyzed using the statistical software SPSS 28.0 for Windows. The reliability of the internal consistency of the questionnaire variables (Table 1) is high (0.921>0.70). Also, the values of the correlation indicators range from +0.438 to +0.764>+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 were analyzed using descriptive statistics, and the parametric tests t-Test and One Way ANOVA were used, with a level of statistical significance α=0.05 (5%) for the correlations of knowledge about the 4th Industrial Revolution with the demographic and occupational characteristics of the sample.

Table 1: Reliability check

	N of Items	**Corrected Item-Total Correlation**	**Cronbach's Alpha**
Knowledge of the 4th Industrial Revolution	13	0,438-0,745	0,921

4. Results of the Survey

The questionnaire of this survey was answered by 886 Principals/Deputy Directors/Heads of Public Kindergartens, Primary Schools, Junior High Schools and Lyceums from all over the country, of which 55.5% are women and 44.5% are men. 58.7% belong to the age group of 51-60 years. Regarding additional studies, the majority (65.5%) have a master's degree, while 20.1% do not have additional studies. As far as the school unit works as education executives, 37.7% are executives in Junior High Schools, 37.2% in Primary Schools and 25.1% in kindergartens. Of the executives in the sample, the

majority (56.4%) are Directors. As for the years of service as school executives, 39.7% have "21 years or more" and 35.4% have "0-10" years of service.

As regards the participants' responses to their knowledge of the technologies of the 4th industrial revolution (Table 2), the overall average is 2.28, which indicates that they had little knowledge. They had a higher degree of knowledge about Information and Communication Technologies (ICT) (3.04±0.025) and the smart interactive whiteboard (2.64±0.032).

Table 2: Distribution of Average Values and Standard Knowledge Discrepancies for the 4th Industrial Revolution

	M.T.*	**T.A.**
As a headmaster/deputy principal/school headmaster, to what extent do you have knowledge of the following areas:		
Fourth Industrial Revolution (4IR)	1,93	0,028
3D printing	2,05	0,029
Internet of Things (IoT)	2,27	0,032
Artificial Intelligence (AI)	2,23	0,028
Information and Communication Technology (ICT)	3,04	0,025
Robotics and Automation	2,13	0,030
Cloud Technologies	2,44	0,033
Cybersecurity	2,47	0,031
Augmented Reality (AR)	1,98	0,033
Big Data	1,84	0,030
Social Media	3,09	0,027
Blockchain Technology	1,51	0,025
Smart Interactive Whiteboard	2,64	0,032
Total	2,28	0,021

*Note: 1=Not at all, 2=To a small extent, 3=To a large extent, 4=To a very large extent

4.1 Correlation of knowledge about the 4th Industrial Revolution with gender

To determine whether there is a statistically significant difference in respondents' perceptions of knowledge and understanding, skills and gender-based attitudes and values, the data were analyzed using T-tests of independent samples. With regard to the relationship between gender and knowledge of 4R (Table 4), for women and men in Levene's Test, the p-value>0.05. Thus, the average values for men and women differ statistically significantly from each other [t(884)=-1.868, p-value=0.046<0.05]. Therefore, men present a greater degree (mean=2.32) than women (mean=2.24) of knowledge of 4IR (Table 3).

Table 3: Descriptive Measures of Knowledge of the 4th Industrial Revolution for Women and Men

	Sex	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Knowledge of the 4th Industrial Revolution	Woman	492	2,24	,626	,028
	Man	394	2,32	,634	,032

Table 4: T-test Results for Knowledge Correlation for the 4th Industrial Revolution with Gender

		Levene's Test for Equality of Variances				Significance	
		F	Sig.*	t	df	One-Sided p	Two-Sided p
Knowledge of the 4th Industrial Revolution	Equal variances assumed	,013	,909	-1,868	884	,031	,046
	Equal variances not assumed			-1,865	837,706	,031	,046

* =p< 0,05

4.2 Correlation of knowledge about the 4th Industrial Revolution with additional studies

To test the difference in the average values of knowledge about 4IR between the categories of additional studies of the participants, the One-Way ANOVA dispersion analysis was used. The findings of the variance analysis show that there is no equality of average values with additional studies (Table 5). Therefore, there is a statistically significant difference in knowledge of 4IR with additional studies [F(3)= 5.073, p=0.002<0.05].

Table 5: Knowledge Variance Analysis for the 4th Industrial Revolution with additional studies

		Sum of Squares	df	Mean Square	F	Sig.
Knowledge for the 4th Industrial Revolution	Between Groups	5,965	3	1,988	5,073	,002
	Within Groups	345,668	882	,392		
	Total	**351,633**	**885**			

Comparisons of average values show that statistically significant differences in knowledge of 4IR with additional studies (Table 6) are found in the categories: a) "Master's degree" and "I don't have" (p=0.025<0.05). This difference shows that the average value of the level of knowledge for those who have a "Master's Degree" is 0.151 points higher than for those who "do not have" additional studies and vice versa. b) "Doctorate" and "I don't have" (p=0.001<0.05). The average value of the level of knowledge for those who have a "PhD" is 0.310 points higher than for those who "do not have" additional studies and vice versa.

Table 6: Comparisons of average knowledge values for the 4th Industrial Revolution with additional studies

Test Tukey HSD					**95% Confidence Interval**	
(I) Additional studies	**(J) Additional studies**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
2nd Degree	Master	-,011	,098	1,000	-,26	,24
	PhD	-,169	,117	,467	-,47	,13
	I don't have	,141	,105	,541	-,13	,41
Master's Degree	2nd Degree	,011	,098	1,000	-,24	,26
	PhD	-,158	,073	,133	-,35	,03
	I don't have	,151	,054	,025	,01	,29
PhD	2nd Degree	,169	,117	,467	-,13	,47
	Master	,158	,073	,133	-,03	,35
	I don't have	,310	,083	,001	,10	,52
I don't have	2nd Degree	-,141	,105	,541	-,41	,13
	Master	-,151	,054	,025	-,29	-,01
	PhD	-,310	,083	,001	-,52	-,10

4.3 Correlation of Knowledge for the 4th Industrial Revolution with School Level

The findings of the variance analysis show that there is no parity between the average values of knowledge about 4IR and additional studies (Table 7). Therefore, there is a statistically significant difference in knowledge of 4IR with additional studies [$F(2)=15.269$, $p=0.000<0.05$].

Table 7: Analysis of the Variation of Knowledge for the 4th Industrial Revolution with school grades

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Knowledge of the 4th Industrial Revolution	Between Groups	11,755	2	5,877	15,269	<,001
	Within Groups	339,878	883	,385		
	Total	**351,633**	**885**			

Comparisons of average values show that statistically significant differences in knowledge of 4IR with school level (Table 8) are found in the categories: a) "Kindergarten" and "Primary School" ($p=0.000<0.05$). This difference shows that the average value of the level of knowledge for those who are Supervisors in a "Kindergarten" is 0.259 points lower than for those who are Principals in a "Primary School" and vice versa. b) "Kindergarten and "Gymnasium/Lyceum" ($p=0.000<0.05$). This difference shows that the average value of the level of knowledge for those who are Supervisors in a "Kindergarten" is 0.272 points lower than for those who are Principals in a "Junior High School" and vice versa.

Table 8: Comparisons of average knowledge values for the 4th Industrial Revolution with school grade

Test Tukey HSD					**95% Confidence Interval**	
(I) School Grade	**(J) School Grade**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
Nursery School	Municipal	-,259	,054	<,001	-,39	-,13
	Junior High School/High School	-,272	,054	<,001	-,40	-,15
Municipal	Nursery school	,259	,054	<,001	,13	,39
	Junior High School/High School	-,012	,048	,966	-,13	,10
Junior High School/ High School	Nursery School	,272	,054	<,001	,15	,40
	Municipal	,012	,048	,966	-,10	,13

4.4 Correlation of Knowledge about the 4th Industrial Revolution with Years of Service as an Executive in a School Unit

The findings of the variance analysis show that there is no equality of average values of knowledge about 4IR with years of service as school executives (Table 9). Therefore, there is a statistically significant difference in knowledge of 4IR with years of service [F(4)=2.876, p=0.022<0.05].

Table 9: Analysis of the Variation of Knowledge for the 4th Industrial Revolution with the years of service of school unit executives

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Knowledge of the 4th Industrial Revolution	Between Groups	4,533	4	1,133	2,876	,022
	Within Groups	347,100	881	,394		
	Total	**351,633**	**885**			

Comparisons of the average values show that the statistically significant differences in the knowledge of the 4IR of the respondents with the years of service as school executives (Table 10) are found in the categories of years of service: a) "0-5" and "11-15" (p=0.004<0.05). This difference shows that the average value of the level of knowledge for those with "0-5" years of service is 0.186 points lower than for those with "11-15" years of service and vice versa. b) "0-5" and "16-20" years of service (p=0.019<0.05). This difference shows that the average value of the degree of knowledge for those with "0-5" is 0.133 points lower than for those who have "16-20" years of service as school executives and vice versa.

Table 10: Comparisons of average prices for the use of Digital Applications with years of Service of School Unit Executives

Test Tukey HSD					**95% Confidence Interval**	
(I) Years of service	**(J) Years of service**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**Lower Bound**	**Upper Bound**
0-5	6-10	,011	,074	1,000	-,19	,21
	11-15	-,186	,076	,004	-,39	,02
	16-20	-,133	,073	,019	-,33	,07
	21 and over	-,131	,055	,124	-,28	,02
6-10	0-5	-,011	,074	1,000	-,21	,19
	11-15	-,197	,086	,149	-,43	,04
	16-20	-,144	,083	,414	-,37	,08
	21 and over	-,142	,068	,225	-,33	,04
11-15	0-5	,186	,076	,004	-,02	,39
	6-10	,197	,086	,149	-,04	,43
	16-20	,053	,085	,970	-,18	,29
	21 and over	,055	,071	,938	-,14	,25
16-20	0-5	,133	,073	,019	-,07	,33
	6-10	,144	,083	,414	-,08	,37
	11-15	-,053	,085	,970	-,29	,18
	21 and over	,001	,067	1,000	-,18	,18
21 and over	0-5	,131	,055	,124	-,02	,28
	6-10	,142	,068	,225	-,04	,33
	11-15	-,055	,071	,938	-,25	,14
	16-20	-,001	,067	1,000	-,18	,18

*The mean difference is significant at the 0.05 level.

5. Discussion

The purpose of this research study was to investigate the level of knowledge of executives (Heads/Directors/Deputy Principals) of school units (Kindergartens, Primary Schools, Junior High Schools, High Schools-Lyceums) from all over Greece for the fourth industrial revolution (4IR).

The results of the survey indicate that school executives in the sample possess limited knowledge of the Fourth Industrial Revolution (4IR) and its associated emerging technologies—namely Artificial Intelligence, the Internet of Things, Augmented Reality, Big Data, Blockchain Technology, Cybersecurity, Robotics and Automation, and Cloud Technologies. The mean response scores ranged from 1.51 to 2.47, reflecting a generally low level of familiarity and understanding. In contrast, participants demonstrated a higher level of knowledge regarding Information and Communication Technologies (ICT) (M = 3.04), Social Media (M = 3.09), and Smart Interactive Whiteboards (M = 2.64). These findings are consistent with those of Panagiotopoulos (2021), whose study of 233 Primary Education teachers in the Region of Western Greece (PDE) revealed moderate levels of knowledge concerning the Fourth Industrial Revolution. The majority (56.5%)

of the research sample have not attended courses or seminars on Technology and the 4th Industrial Revolution (4th Industrial Revolution). A finding that is also confirmed in the study by Moloi and Mhlanga (2021) of 145 principals of public and private schools in South Africa, which showed that only a small proportion of participants had knowledge about the 4th Industrial Revolution and emerging technologies.

In contrast, the findings of a study by Letuma (2023), conducted on a sample of 505 Primary and Secondary School Principals from two South African provinces, revealed a high level of knowledge about the Fourth Industrial Revolution (4IR), particularly in areas such as Information and Communication Technologies (ICT) and the use of Interactive Whiteboards. However, the study also highlighted the need for further knowledge in emerging fields such as Artificial Intelligence, Automation, and 3D Printing. Similar results were reported by Awodiji and Naicker (2023) in their study of public and private school principals in Nigeria. While school leaders were found to possess a sufficient level of knowledge about 4IR, the authors emphasized the need for enhanced knowledge and skills in areas including 3D Printing, Artificial Intelligence, Automation, and Smart Boards.

Furthermore, the present study identified statistically significant differences in school executives' knowledge of 4IR based on demographic variables such as gender, additional academic qualifications, type of school, and years of service in leadership roles.

Gender influences participants' knowledge of 4IR. Specifically, men have a higher degree of knowledge (mean=2.32) than women (mean=2.24).

The respondents' additional studies have an impact on their knowledge of the 4th Industrial Revolution. Those who have a master's degree ($p=0.025<0.05$) or those who have a doctorate ($p=0.001<0.05$) present a greater degree of knowledge about 4IR and emerging technologies than those who do not have additional studies. In another study (Panagiotopoulos, 2021) on teachers of the PE of the PDE, the effect of gender and additional studies do not demonstrate statistically significant differences with knowledge about 4IR. This differentiation may be due to the fact that the survey concerns purely Primary School teachers and does not concern teachers of Kindergartens, Junior High Schools and High Schools-Lyceums. Also, the samples of the two surveys (Teachers-School Unit Executives) are different.

Regarding the influence of gender on knowledge about the 4th International Governance (4IR), the results of the relevant existing research also differ. In the research of Awodiji & Naicker (2023) and Letuma (2023), no statistically significant differences between men and women are demonstrated. However, in another research study (Hammond et al., 2020), it is found that technology, as one of the important features of the 4IR, concerns men more, with women being less involved. With regard to the type of school unit, Kindergarten Heads demonstrated a significantly lower level of knowledge about the 4IR and emerging technologies compared to both Primary School Principals ($p=0,000<0.05$) and Junior High School Principals ($p=0.000<0.05$).

Finally, those with more years of service as school administrators ["11-15" ($p=0.004<0.05$) or "16-20" ($p=0.019<0.05$)] show a higher degree of knowledge about 4IR and emerging technologies than those with fewer years of service (0-5) as school administrators. These findings differ from those of Panagiotopoulos (2021) in teachers of the PE of the PDE where their years of service do not show a statistically significant difference in their knowledge of 4IR.

6. Recommendations

The 4th Industrial Revolution refers to a period of technological developments that profoundly affect society and the economy. School Principals should be able to know and understand new technologies such as artificial intelligence, automation, augmented reality, Internet of Things, etc., through their training. They should develop communication and leadership skills needed to manage school organizations in an era of rapid change. To enhance creativity and critical thinking, to promote the creativity and competences of teachers and students.

They need to be educated and trained to design and manage technological infrastructures in schools, to create retraining plans for teachers to integrate new technologies into teaching, to develop community cooperation and to be aware of the impact of technological changes on the labour market and the skills required.

7. Conclusion

This study examined the level of knowledge among school heads in Greece regarding the Fourth Industrial Revolution (4IR) and emerging technologies. The findings revealed that school executives possess limited knowledge of advanced technologies such as Artificial Intelligence, the Internet of Things, Robotics, and Cybersecurity. In contrast, participants demonstrated greater familiarity with foundational tools, including basic Information and Communication Technologies (ICT), Social Media, and Interactive Whiteboards. Notably, the majority of respondents reported not having participated in relevant training programs.

Comparative international studies present both similar and divergent findings, with some indicating higher levels of knowledge among school leaders in other countries. Furthermore, the analysis showed that demographic factors—such as gender, level of education, additional academic qualifications, and years of professional experience—significantly influence 4IR knowledge. Specifically, male participants, those with postgraduate degrees, and more experienced school executives exhibited higher levels of familiarity with emerging technologies.

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

About the Author(s)

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