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Impact of Teachers' Demographics on Total Quality Management Parameters—The Case of Primary Education

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Abstract: The purpose of this paper is to highlight the application of TQM in primary education (PE) by exploring teachers' views and, more specifically, by examining the impact of their demographic data on their attitude towards TQM. A study was conducted among teachers in Greek public primary schools with the aim being to investigate their views on seven TQM parameters. The study used a structured questionnaire that was positively evaluated for validity and reliability. In total, 2088 completed questionnaires were collected, and non-parametric tests were employed. The results reveal statistically significant differences among groups of respondents based on gender, job–position, educational level, age, and years of experience in PE, as well as geographical location of the school. The study provides real-time empirical evidence of TQM in PE, enriching the existing literature, which lacks empirical and validated data from the PE level. The data revealed by the study indicate differences in perception of the TQM concept and its application among the participants, and their response should be further analysed to explore the reasons that generate them and, thus, facilitate the initiation of TQM practices within a PE school environment.

Keywords: quality of education; total quality management; TQM; Greece; education management; primary education; school

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1. Introduction

The provision of education has long been perceived as a significant public good and an asset for society, irrespective of prevailing political and social circumstances or the evolution of society [1]. The accumulation of human capital makes an important contribution to social development and economic growth, alongside an even more important contribution to the abilities, overall personality, and potential human development of the educated individuals [2,3]. Quality issues in both products and services have been an important object of research for a long time among both academics and practitioners; however, it was only in the twentieth century that quality was made a management area per se and given high priority [4–6].

According to Brown [7], topics related to quality management were an area of focus in examination and implementation in the 1980s. Dereli et al. [8] discuss the increasing attention that the service industry has paid over the last decade to quality management theories, with an intense focus being placed on ISO and similar quality certifications. Indeed, Dahlgaard-Park et al. [9] report an increasing number of academic papers on topics within the overall quality category and find that quality management research has reached a certain level of maturity. Thus, the emphasis is shifting toward the core values necessary to create a quality and business excellence culture, rather than to techniques and tools alone. Total Quality Management (TQM) is defined as management direction that improves organizational performance and customer satisfaction through a process of continuous improvement. According to Deming [10], if an organization decides to commit to TQM, it must involve all of its members in a vigorous transformation of the organizational culture

to achieve the necessary improvements in products, services, and processes, as it is the human factor that makes the difference.

TQM applications can be found in both the manufacturing and service sectors; explorations of this concept in the education sector have recently increased, in particular in the past few decades [11,12], focusing mainly on higher education; primary and secondary education have not received the same level of attention [13,14]. Lei and Zhu [15] state that although TQM has been widely applied in higher education quality management and that a more mature theoretical system has been formed and tested in practice, the application of TQM in primary and secondary education is still inadequate. This statement is true even though primary and secondary education offers extensive social returns, in excess of those provided in higher education, indicating the need to identify and develop solutions for the early years of education [13,16,17]. Given the benefits attributed to TQM implementation that have been reported in the literature, the conclusion readily presents itself, i.e., that TQM can offer remedies to the problem for quality faced at early levels of education. In addition, if academics and practitioners identify the factors that affect the extent to which TQM is being implemented at the school level, if at all, this understanding can offer considerable benefits, providing a basis for the improvement and enhancement of education. Thus, the current status of TQM implementation at the primary education (PE) can be identified by investigating the impact of demographic data on a set of TQM parameters that are explored further in the following section. The research question that governs the present research is defined as follows:

> *RQ: Are there any statistically significant differences among the views of the different groups (defined by gender, age, work experience, etc.) of teachers and school principals with regard to various parameters of TQM implementation in PE schools?*

This study investigates the PE environment in Greece, where schools, unlike those in other countries, have restricted autonomy or potential for decision-making and incentives due to the centralized education system, which is recognized as the main supplier of educational activities and resources [18]. The primary aim of this study is to investigate teachers' views with regard to various aspects of TQM application within the Greek PE setting and map their responses according to their demographic data. This study, thus, embraces and enhances the prevailing literature by exploring levels of TQM implementation in PE and providing practitioners and scholars with valuable insights. It, furthermore, offers empirical evidence at an educational level, i.e., PE, which is vital in improving the quality of the educational system, since PE aims to support a broad-based development of students by putting emphasis on their social, emotional, and cultural skills [19].

The remainder of this paper consists of a literature review on education and TQM, a presentation of the methodology developed, and findings and discussion. The last section presents the conclusions of the research, its limitations, and avenues for future research.

2. Education and TQM

Scholarly literature has examined quality- and TQM-related subjects [6,20–22] in both the manufacturing and service sectors, as well as in education [23–26]. This attention could be justified as being a consequence of customers' increased requirements, which, together with the philosophy of continuous improvement, are core values of TQM. A historical survey undertaken by Weckenmann et al. [27] identifies four major shifts in concepts of quality management over the last 100 years. In the fourth and current paradigm, concepts of quality management attracted interest from sectors and areas in which competition is not direct but self-improvement is sought, such as education, public administration, and health care. Ansmann and Seyfried [28] indicate that quality management was an integral factor driving management reforms in public sector organizations over the past few decades, whereas Lunenburg [29] examines the implementation of TQM in schools. The latter approach is maintained by Díaz and Martínez-Mediano [30], who elaborate on the application of quality management systems in schools in Spain following effective implementation at the higher education level.

A number of authors have examined and discussed TQM and its potential applicability in education [26,30–32]. Gupta and Kaushik [33] note the importance of quality management in education, considering it to be critical in ensuring skilled graduates and emphasizing the dangers of quality unawareness, while Venkatraman [11] notes the crucial role of quality of education in the competitive environment. In addition, Fauzi et al. [34] suggest that implementing the TQM concept can increase the quality of school education services. Scholars have also studied quality and student satisfaction in the education environment in the context of customer expectation and satisfaction [35,36]. Teeroovengadum et al. [37] state that service quality and the concepts of loyalty and customer satisfaction are rarely used in assessing education; at best, they have been treated as ad hoc elements in higher education that add value to an institution, but not as essential components. Sweis et al. [12] also find that the majority of studies examine service quality in higher education, noting the lack of research measuring service quality at the school level. In the same vein, Yusuf [38] studies the effect of TQM on the quality of higher education by means of a quantitative meta-analysis approach and recommends the implementation of similar studies at various levels of education i.e., elementary schools, junior high schools, senior high schools, or non-formal education levels. In this context, Soria-García and Martínez-Lorente [39] explore the perception of secondary school students with reference to TQM and perceived service quality. The crucial role of TQM in achieving quality in schools is also stressed by the study of Juharyanto et al. [40], which revealed a significant effect of the implementation of TQM on improving general school quality. In the following section, the most important TQM parameters in education that were identified in the scholarly literature are discussed.

Parameters of TQM in Education

Principles and critical factors for successfully implementing TQM in education have been reported extensively in the literature, with the bulk of work concentrating on higher education [23,26,41–43]. More recently, some work has been performed regarding the role of TQM in primary/secondary education [14,16,30,32], although there are only a few developed scales in use in empirical contexts to measure TQM-related subjects [32,44]. Indeed, Hrnčiar and Madzík [45] indicate that the scholarly literature on TQM and its application in education focuses more on theory and places less emphasis on empirical studies, with such research at the school level being even more limited. The principles of leadership, continuous improvement, education and training, teamwork, and school culture are encountered in the majority of publications on the subject [13,16,42,46].

Despite the benefits that can be derived from successful application of TQM in education, several obstacles have been reported [13,26,47]. The use of TQM concepts in education has been questioned, as they were mainly developed for use in industry [13,14,44]. These critiques are supported by various arguments, including attention paid to the terminology that TQM adopts (i.e., that of the customer and the product) [48,49], as well as the fact that educational organizations are more dynamic and complex than most manufacturing environments [50], leading to the question of the transferability of TQM concepts to the educational environment [51]. Other, more specific limitations discussed in the literature include lack of mutual awareness among both managerial and educational professionals, as well as a culture and mentality of resistance to change in both groups [39,52]. The need for effective change management and a culture that can allow TQM implementation was also highlighted by Töremen et al. [17] and Cheng and Yau [53]. Similarly, Pourrajab et al. [47] find that strong confidence in the current regime could increase resistance to change, noting that this issue can be remedied via full awareness and understanding of the benefits of TQM. As Doherty [54] notes, quality and TQM continue to be subjects of debate, furthermore claiming that to develop TQM in education entails action beyond superficial application of TQM techniques and TQM-related language. Indeed, it will require determination, intellectual effort, and lateral thinking.

The obstacles presented in the previous paragraph set the framework for the obvious question: why should an educational institution be prompted to follow TQM, i.e., what

are the reasons for adopting this methodology. The answer again comes from the scholarly literature, where a significant number of studies identified both improvements and benefits deriving from implementing TQM in education in both explicit and implicit ways, with the latter examples indicating areas of improvement through tacit knowledge gained over years of application [16,32,49]. In TQM, all members of an organization are encouraged to contribute to decision-making and participate in constant training programs. Education professionals who receive regular training frequently develop successful teaching skills, become empowered, and are able to increase the quality of both teaching and decision-making. Thakkar et al. [55] show that educational institutions can receive benefits from TQM in the same way as any industrial or service organization. Mehta et al. [56] find that TQM can provide mechanisms to cope with market challenges and stakeholder expectations, among other benefits. Cost savings, process improvements, and student satisfaction have also been reported as derived from the application of TQM in education [24,57,58]. According to Pourrajab et al. [47], the implementation of TQM in education may be associated with educational reform, while Psomas and Antony [26] report that the implementation of TQM can guide educational institutions to improve their performance and produce success.

Another area of research in the literature considers the conditions that form a good setting for TQM adoption. Several actions have been described as required for TQM application, including leadership commitment, understanding stakeholders' needs, customer–student focus, availability of necessary human and financial resources, employee training, actions toward self-evaluation, and benchmarking [16,52]. Improvement should be treated as a process, rather than as a specific event. Such action requires planning, systematization, and constant evaluation to ensure that it can identify evidence of change and added value [13,42].

The scholarly literature examined the role that school principals and teachers play in the implementation of TQM. For example, the important role that school leadership plays in successful TQM implementation has been the subject of much discussion [16,17,32,34,59,60]. Indeed, it has been extensively reported that cultural transformation can only happen with the involvement of the high-level management officials [30,61]. School principals are viewed as the key to enabling the empowerment of employees, embracing team spirit, and imposing education and training actions to enhance teaching and learning [14,16,30]. Conversely, it is often observed that school principals resist the changes that TQM aims to introduce into the school environment and may prevent their associates and teachers from recognizing the advantages that TQM can bring [62]. Equally, teachers may be inclined to apply TQM to their school environment [14,32]. For this reason, it is vital to properly introduce TQM via training and education actions to allow teachers to grasp the necessary knowledge of TQM [32,47]. Lastly, non-human resources (school facilities, infrastructure, curricula, books, teaching methods, legislative frameworks, and so on) are reported in the literature as factors that can improve and enhance or direct TQM implementation [53,63]. According to Sebola and Malema [64], a lack of physical infrastructure impacts the implementation of quality management systems. Ngware et al. [65] further indicate that the purchase of further teaching and learning materials (i.e., laboratory apparatus and chemicals) can motivate teachers and make them feel that their work environment encourages the delivery of quality services.

According to Bouranta et al. [16], the application of TQM at the school level is still at a nascent stage, a sentiment that is supported by further review of the literature. This issue, in combination with the lack of empirical results regarding the application of TQM in PE, led to the present research, which was conducted to explore the impact of teachers' demographic data on specific TQM parameters.

3. Methodology–Questionnaire Development

This study employed a quantitative approach. A questionnaire was developed that covered the following parameters, as identified by the review of the literature of the previous section: (1) TQM principles; (2) obstacles to TQM implementation; (3) reasons for

adopting TQM; (4) conditions for adopting TQM; (5) contributions of school principals and (6) teachers; and (7) non-human resources in relation to the implementation of TQM. Each parameter was analysed to create meaningful questions. For example, the TQM principles parameter included questions that investigated the application of long-term vision and quality policy, participation and teamworking at all levels, continuous improvement, emphasis on preventing problems and errors, and the development of a quality culture. The final questionnaire consisted of 37 questions. Questions were close-ended, with respondents being asked to indicate their preference on a 5-point Likert scale (1 indicated strong disagreement and 5 indicated strong agreement). Further questions explored the demographic characteristics of the respondents (i.e., age, tenure, gender, school location, etc.), as is illustrated in Table 1. An analytical description of the questionnaire and methodology followed can be found in Sfakianaki et al. [66].

Table 1. Participants characteristics.

Characteristics	Number of Responses	%
Gender		
Male	891	42.7
Female	1197	57.3
Age		
Under 29	108	5.2
30–39	305	14.6
40–49	609	29.2
50–59	1035	49.6
Over 60	31	1.5
Years of Service		
1–5	88	4.2
6–10	219	10.5
11–20	511	24.5
21–30	951	45.5
31–35	319	15.3
Education		
Pedagogy Studies	2088	100
Other bachelor's degree	1101	52.7
Master's degree	606	29.0
PhD degree	101	4.8
Position		
School Principal	736	35.2
Assistant School Principal	106	5.1
Teacher	1246	59.7
If in management positions how many years		
1–4	447	38.8
5–8	352	30.5
9–12	213	18.5
Over 12	141	12.2
School Location		
Urban (over 10,000 inhabitants)	1127	54.0
Semi-urban (up to 9999 inhabitants)	477	22.8
Rural (up to 1999 inhabitants)	484	23.2

3.1. Empirical Data

Empirical data were collected from public schools in all regions of Greece, employing cluster sampling due to the extensive geographic dispersion of the sample [67]. To ensure the homogeneity of the sample and, thus, its reliability coefficient, only respondents with a pedagogical degree were eligible to participate. Thus, the final sample did not include respondents with a specialized degree in their field of study, such as information technology, music, or foreign languages. Both teachers and school principals were selected to respond. The percentage benchmark for responses was set to 8–10%, forming a range between 1968 and 2549 respondents, according to the Greek Ministry of Education [68]. The questionnaire was disseminated via email, and email reminders were sent out in a systematic order to participants until the desired number of completed surveys were achieved. Initially, 2800 questionnaires were sent, and 2088 responses were collected, giving a response rate of 75% and a final sample that corresponds adequately to the benchmark originally set. The survey was executed before the onset of the COVID-19 pandemic in Greece, specifically in the period 2016–2020.

3.2. Validity

The validity of the questionnaire was investigated in four stages. The first stage included discussions and interviews with 10 school principals and 10 teachers, all of whom were familiar with TQM and helped to develop the questions, to ensure that all important elements were captured and all questions were clear and easy to understand. During the second stage, 15 researchers [69] with an interest in TQM criticized the questions [67], suggesting if and which items should be removed. The third stage included the pilot use of the questionnaire [70], which resulted in further improvements and led to the final form of the questionnaire. The final stage involved the construct validity of the questionnaire through the use of Principal Component Analysis (PCA) with varimax rotation: the Kaiser–Meyer–Olkin (KMO) value was 0.931, and Bartlett's test of sphericity was $0.00 < 0.05$. This analysis exhibited considerable loadings (over 0.4) to the vast majority of the questions [71]. Consequently, the Rotated Component Matrix criterion was also employed. The final stage led to the elimination of items, which were reduced to a total of 37 and distributed among the 7 parameters of the instrument. Cronbach's α values were measured for all parameters to ensure reliability [71,72]. In all cases, values were greater than 0.7 [73], being specifically between 0.808 and 0.931, which indicates that all parameters were measured in a meaningful way.

3.3. Descriptive Statistics

Mean values (M) and standard deviations (SD) were calculated for all factors (Table 2). For a majority of factors, the respondents expressed adequate levels of agreement with answers within the same range of the 5-point Likert scale (range of M: 3.22–3.73). Interestingly, higher levels of agreement were communicated regarding the parameter of reasons for adopting TQM (M = 4.12). However, the contribution of non-human resources to TQM implementation was less prominent, with respondents expressing their dissatisfaction with the implementation of the specific parameter (M = 2.68). Standard deviations (SD) were relatively low in all cases, thus demonstrating low dispersion (range of SD = 0.68–0.87).

Table 2. Parameters' means and standard deviations.

Parameters	Mean (M)	Standard Deviation (SD)
1. TQM principles	3.25	0.80
2. Obstacles to TQM implementation	3.66	0.81
3. Reasons for adopting TQM	4.12	0.70
4. Conditions for adopting TQM	3.22	0.82
5. Contribution of school principals to TQM implementation	3.73	0.87
6. Contribution of teachers to TQM implementation	3.47	0.75
7. Contribution of non-human resources to TQM implementation	2.68	0.68

4. Findings

4.1. Impact of Demographic Data on TQM Parameters

The level of significance was set at 1% ($p < 0.01$), that is, findings falling below this threshold are statistically significant, meaning that a non-random difference and a relationship is established between the independent (e.g., gender) and dependent variables (e.g., TQM principles) [74,75]. The effect size is measured via the Eta Squared (η^2) test. A normality test was also performed to determine whether the data set followed a normal distribution [76]. As N > 50, the Kolmogorov–Smirnov test was performed to check the normal distribution, in other words, whether the data collected came from a normally distributed population [77]. In our case, in the Kolmogorov–Smirnov test, $p = 0.000$ ($p < 0.05$), thus indicating a lack of normality and that non-parametric tests, such as Mann–Whitney and Kruskal–Wallis tests, had to be employed. The Mann–Whitney test is used for cases where the independent variable takes two values, whereas the Kruskal–Wallis test is used for those cases where the independent variable takes more than two values [78].

4.2. Gender Analysis

In the gender analysis, the independent variable took two values; thus, the Mann–Whitney test was employed, the results of which are presented in Table 3. More specifically:

- Statistically significant differences are observed to represent values of males, who claim to a greater extent than females that: TQM principles are applied at schools ($M_M = 3.32$ $SD_M = 0.77$ vs. $M_F = 3.19$ $SD_F = 0.82$ $U = 486{,}196.0$ $p < 0.01$); the school principals can contribute to TQM implementation ($M_M = 3.81$ $SD_M = 0.82$ vs. $M_F = 3.66$ $SD_F = 0.89$ $U = 482{,}509.5$ $p < 0.01$); and teachers can contribute to TQM implementation ($M_M = 3.54$ $SD_M = 0.72$ vs. $M_F = 3.42$ $SD_F = 0.77$ $U = 484{,}057.5$ $p < 0.01$).
- Statistically significant differences are observed in mean values between female respondents and males, showing more strongly among the former group that there are obstacles to TQM implementation ($M_M = 3.60$ $SD_M = 0.77$ vs. $M_F = 3.77$ $SD_F = 0.83$ $U = 481{,}089.0$ $p < 0.01$).

Table 3. Differences in perception between male and female respondents.

Parameters	Gender						Eta Squared (η^2)
	Male		Female				
	M	SD	M	SD	U	*p*	
1. TQM principles	3.32	0.77	3.19	0.82	**486,196.000**	**0.001**	0.007
2. Obstacles to TQM implementation	3.60	0.77	3.70	0.83	**481,089.000**	**0.000**	0.004
3. Reasons for adopting TQM	4.08	0.73	4.15	0.68	515,156.500	0.178	0.002
4. Conditions for adopting TQM	3.23	0.84	3.20	0.80	514,461.000	0.166	0.000
5. Contribution of school principals to TQM implementation	3.81	0.82	3.66	0.89	**482,509.500**	**0.000**	0.007
6. Contribution of teachers to TQM implementation	3.54	0.72	3.42	0.77	**484,057.500**	**0.000**	0.008
7. Contribution of non-human resources to TQM implementation	2.69	0.70	2.67	0.66	524,580.000	0.521	0.004

Bold numbers indicate cases with statistically significant differences ($p < 0.01$).

4.3. Position Analysis

In the position analysis, the independent variable also took two values too, and, thus, the Mann–Whitney test was used (Table 4), producing the following results:

- Statistically significant differences were found between values reported by school principals and deputy school principals, who tended to report larger values, and those of teachers, who tended to report lower values.
- TQM principles are applied at schools (M_{SP} = 3.66 SD_{SP} = 0.65 vs. M_T = 2.97 SD_T = 0.78 U = 258,062.5 $p < 0.01$), with the necessary conditions that TQM can be adopted (M_{SP} = 3.30 SD_{SP} = 0.83 vs. M_T = 3.16 SD_T = 0.81 U = 475,337.5 $p < 0.01$), school principals can contribute to TQM implementation (M_{SP} = 4.09 SD_{SP} = 0.63 vs. M_T = 3.48 SD_T = 0.91 U = 305,209.5 $p < 0.01$), teachers can contribute to TQM implementation (M_{SP} = 3.65 SD_{SP} = 0.70 vs M_T = 3.35 SD_T = 0.76 U = 400,148.5 $p < 0.01$), and non-human resources can contribute to TQM implementation (M_{SP} = 2.84 SD_{SP} = 0.67 vs. M_T = 2.57 SD_T = 0.66 U = 395,414.0 $p < 0.01$).
- Statistically significant differences were seen between teachers, who reported greater values, and school principals and deputy school principals, who reported less agreement with the presence of obstacles to TQM implementation (M_{SP} = 3.45 SD_{SP} = 0.80 vs. M_T = 3.79 SD_T = 0.78 U = 382,956.5 $p < 0.01$).

Table 4. Differences in perception between teachers and school principals and deputy principals.

Parameters	Position						Eta Squared (η^2)
	Teacher		School Principal/& Deputy Principal				
	M	SD	M	TA	U	*p*	
1. TQM principles	2.97	0.78	3.66	0.65	**258,062.500**	**0.000**	0.173
2. Obstacles to TQM implementation	3.79	0.78	3.45	0.80	**382,956.500**	**0.000**	0.044
3. Reasons for adopting TQM	4.12	0.71	4.12	0.70	523,796.000	0.954	0.000
4. Conditions for adopting TQM	3.16	0.81	3.30	0.83	**475,337.500**	**0.000**	0.007
5. Contribution of school principals to TQM implementation	3.48	0.91	4.09	0.63	**305,209.500**	**0.000**	0.120
6. Contribution of teachers to TQM implementation	3.35	0.76	3.65	0.70	**400,148.500**	**0.000**	0.057
7. Contribution of non-human resources to TQM implementation	2.57	0.66	2.84	0.67	**395,414.000**	**0.000**	0.084

Bold numbers indicate cases with statistically significant differences ($p < 0.01$).

4.4. Postgraduate Studies Analysis

The Mann–Whitney test was selected in this analysis (Table 5) because the independent variable took two values. Statistically significant differences among mean values of the following factors are observed:

- Statistically significant differences in mean values were seen between those who had received a master's/doctorate degree, who support the claims, and those who had not, who report lower agreement with the claims that TQM principles are applied in schools (M_Y = 3.42 SD_Y = 0.79 vs M_N = 3.16 SD_N = 0.79 U = 383,406.0 $p < 0.01$), school principals can contribute to TQM *implementation* (M_Y = 3.81 SD_Y = 0.93 vs. M_N = 3.68 SD_N = 0.83 U = 422,733.0 $p < 0.01$), and non-human resources can contribute to TQM implementation (M_Y = 2.74 SD_Y = 0.70 vs. M_N = 2.65 SD_N = 0.66 U = 440,409.500 $p < 0.01$).
- Statistically significant differences were seen between those respondents who had not received a master's/doctorate degree and those who had received such a degree, such that the former group had greater agreement with the idea that there are obstacles to TQM implementation (M_Y = 3.58 SD_Y = 0.81 vs. M_N = 3.69 SD_N = 0.80 U = 444,742.0 $p < 0.01$).

Table 5. Differences in perception between respondents who have a master's/PhD and those that do not have such a degree.

Parameters	Master's Degree/PhD						Eta Squared (η^2)
	Yes		No				
	M	SD	M	SD	U	*p*	
1. TQM principles	3.42	0.79	3.16	0.79	**383,406.000**	**0.000**	0.024
2. Obstacles to TQM implementation	3.58	0.81	3.69	0.80	**444,742.000**	**0.001**	0.004
3. Reasons for adopting TQM	4.17	0.70	4.09	0.71	459,033.500	0.023	0.003
4. Conditions for adopting TQM	3.23	0.88	3.21	0.79	475,061.000	0.312	0.000
5. Contribution of school principals to TQM implementation	3.81	0.93	3.68	0.83	**422,733.000**	**0.000**	0.004
6. Contribution of teachers to TQM implementation	3.40	0.84	3.51	0.70	461,054.500	0.037	0.002
7. Contribution of non-human resources to TQM implementation	2.74	0.70	2.65	0.66	**440,409.500**	**0.000**	0.006

Bold numbers indicate cases with statistically significant differences ($p < 0.01$).

4.5. Age Analysis

In this analysis, the independent variable took more than two values, and for this reason, we used the Kruskal–Wallis test. To examine which age categories were statistically significantly different, we employed the Bonferroni correction for pairwise comparisons of categories. Table 6 indicates that there are statistically significant differences between the mean values of the following age groups:

- The age group 50–59 agreed to a greater extent than the 40–49 age group with the propositions that TQM principles are applied in schools ($M_{50–59} = 3.32$ $SD_{50–59} = 0.82$ vs. $M_{40–49} = 3.15$ $SD_{40–49} = 0.75$ $p < 0.01$) and non-human resources can contribute to TQM implementation in schools ($M_{50–59} = 2.74$ $SD_{50–59} = 0.66$ vs. $M_{40–49} = 2.61$ $SD_{40–49} = 0.65$ $p < 0.01$).
- The 40–49 40–49 and 50–59 age groups agreed more than the below 29 age group ($M_{40–49} = 3.78$ $SD_{40–49} = 0.76$ and $M_{50–59} = 3.64$ $TA_{50–59} = 0.80$ vs. $M_{\text{below }29} = 3.37$ $SD_{\text{Below29}} = 0.83$ $p < 0.01$), and the 40–49 age group agreed more than the 30–39 age group ($M_{40–49} = 3.78$ $SD_{50–59} = 0.76$ vs. $M_{30–39} = 3.54$ $SD_{30–39} = 0.88$ $p < 0.01$), that there are obstacles to TQM implementation in schools.
- The 30–39 age group agreed less than the 40–49 age group that there are reasons for adopting TQM in schools ($M_{30–39} = 4.03$ $SD_{30–39} = 0.71$ vs. $M_{40–49} = 4.18$ $TA_{40–49} = 0.70$ $p < 0.01$).
- The below 29 age group agreed less than the 40–49 and 50–59 age groups, and the 30–39 age group agreed less than the 50–59 age groupthat there are conditions for adopting TQM in schools ($M_{\text{Below29}} = 3.00$ $SD_{\text{Below29}} = 0.79$ vs. $M_{40–49} = 3.24$ $SD_{40–49} = 0.77$ and $M_{50–59} = 3.26$ $SD_{50–59} = 0.83$ $p < 0.01$) ($M_{30–39} = 3.08$ $SD_{30–39} = 0.88$ vs. $M_{50–59} = 3.26$ $SD_{50–59} = 0.83$ $p < 0.01$).
- Finally, the 50–59 age group agreed to a greater extent than the 30–39 and 40–49 age groups that the school principal can contribute to TQM implementation in schools ($M_{50–59} = 3.85$ $TA_{50–59} = 0.80$ vs $M_{30–39} = 3.53$ $TA_{30–39} = 0.96$ και $M_{40–49} = 3.62$ $TA_{40–49} = 0.90$ $p < 0.01$).

4.6. School Location Analysis

The independent variable took more than two values; therefore, the Kruskal–Wallis test was employed. According to Table 7, there was a statistically significant difference in the mean values of the following location groups:

- To a greater extent than those from semi-urban areas, teachers from rural areas claim that TQM principles are applied in schools ($M_R = 3.32$ $SD_R = 0.81$ vs. $M_{SU} = 3.18$ $SD_{SU} = 0.75$ $p < 0.01$).

Table 6. Differences in perception among age groups.

Parameters	Age												Eta Squared (η^2)
	Below 29		30–39		40–49		50–59		Over 60				
	M	SD	M	SD	M	SD	M	SD	M	SD	$X^2(4)$	*p*	
1. TQM principles	3.13	0.74	3.22	0.83	**3.15**	**0.75**	**3.32**	**0.82**	3.31	0.63	22.957	**0.000**	**0.009**
2. Obstacles to TQM implementation	**3.37**	**0.83**	**3.54**	**0.88**	**3.78**	**0.76**	**3.64**	**0.80**	3.65	0.70	34.932	**0.000**	0.008
3. Reasons for adopting TQM	4.05	0.72	**4.03**	**0.71**	**4.18**	**0.70**	4.11	0.70	4.34	0.50	17.437	**0.002**	0.001
4. Conditions for adopting TQM	**3.00**	**0.79**	**3.08**	**0.88**	**3.24**	**0.77**	**3.26**	**0.83**	3.23	0.79	19.580	**0.001**	0.006
5. Contribution of school principals to TQM implementation	3.67	0.89	**3.53**	**0.96**	**3.62**	**0.90**	**3.85**	**0.80**	3.72	0.59	42.521	**0.000**	0.021
6. Contribution of teachers to TQM implementation	3.47	0.80	3.34	0.83	3.45	0.74	3.52	0.72	3.50	0.69	11.576	0.021	0.007
7. Contribution of non-human resources to TQM implementation	2.59	0.71	2.62	0.74	**2.61**	**0.65**	**2.74**	**0.66**	2.71	0.60	20.641	**0.000**	0.019

Bold numbers indicate cases with statistically significant differences ($p < 0.01$).

Table 7. Differences in perception among the three location groups.

Parameters	School Location								Eta Squared (η^2)
	Rural		Semi-Urban		Urban				
	M	SD	M	SD	M	SD	$X^2(2)$	*p*	
1. TQM Principles	**3.32**	**0.81**	**3.18**	**0.75**	3.25	0.82	9.726	**0.008**	0.003
2. Obstacles to TQM implementation	3.62	0.85	3.72	0.81	3.64	0.79	6.065	0.048	0.002
3. Reasons for adopting TQM	4.09	0.73	4.20	0.65	4.10	0.71	8.584	0.014	0.004
4. Conditions for adopting TQM	3.22	0.86	3.24	0.76	3.20	0.82	0.582	0.748	0.000
5. Contribution of school principals to TQM implementation	3.78	0.87	3.79	0.77	3.68	0.90	5.008	0.082	0.004
6. Contribution of teachers to TQM implementation	3.55	0.74	3.50	0.69	3.43	0.78	8.740	0.013	0.005
7. Contribution of non-human resources to TQM implementation	2.72	0.68	2.62	0.62	2.69	0.69	5.683	0.058	0.002

Bold numbers indicate cases with statistically significant differences ($p < 0.01$).

4.7. Years of Service Analysis

As above, the Kruskal–Wallis Test was adopted. Table 8 shows the statistically significant differences among the mean values. More specifically:

- Teachers with 31–35 years of service agreed to a greater extent than teachers with 1–10 and 11–30 years of service that TQM principles are applied in schools ($M_{31–35} = 3.46$ $SD_{31–35} = 0.84$ vs. $M_{1–10} = 3.16$ $SD_{1–10} = 0.82$ and $M_{11–30} = 3.22$ $SD_{11–30} = 0.78$ $p < 0.01$), school principals can contribute to TQM implementation $M_{31–35} = 3.88$ $SD_{31–35} = 0.80$ vs. $M_{1–10} = 3.62$ $SD_{1–10} = 0.95$ and $M_{11–30} = 3.71$ $SD_{11–30} = 0.85$ $p < 0.01$), teachers can contribute to TQM implementation ($M_{31–35} = 3.63$ $SD_{31–35} = 0.72$ vs $M_{1–10} = 3.39$ $SD_{1–10} = 0.80$ και $M_{11–30} = 3.45$ $SD_{11–30} = 0.74$ $p < 0.01$), and that non-human resources can contribute to TQM implementation ($M_{31–35} = 2.80$ $SD_{31–35} = 0.69$ vs $M_{1–10} = 2.57$ $SD_{1–10} = 0.70$ και $M_{11–30} = 2.67$ $SD_{11–30} = 0.66$ $p < 0.01$).
- Teachers with 11–30 years of service agree to a greater extent than teachers with 1–10 and 31–35 years of service that there are obstacles to TQM implementation in schools ($M_{11–30} = 3.71$ $SD_{11–30} = 0.80$ vs. $M_{1–10} = 3.46$ $SD_{1–10} = 0.84$ και $M_{31–35} = 3.58$ $SD_{31–35} = 0.78$ $p < 0.01$).

Table 8. Differences in perception among the different years of service groups.

Parameters	Years of Service								Eta Squared (η^2)
	1–10		11–30	31–35	1–10				
	M	SD	M	SD	M	SD	$X^2(2)$	*p*	
1. TQM principles	**3.16**	**0.82**	**3.22**	**0.78**	**3.46**	**0.84**	34.267	**0.000**	0.013
2. Obstacles to TQM implementation	**3.46**	**0.84**	**3.71**	**0.80**	**3.58**	**0.78**	29.271	**0.000**	0.013
3. Reasons for adopting TQM	**4.00**	**0.75**	**4.14**	**0.69**	4.13	0.72	11.161	**0.004**	0.005
4. Conditions for adopting TQM	3.08	0.85	3.24	0.80	3.25	0.86	8.153	0.017	0.004
5. Contribution of school principals to TQM implementation	**3.62**	**0.95**	**3.71**	**0.85**	**3.88**	**0.80**	18.424	**0.000**	0.007
6. Contribution of teachers to TQM implementation	**3.39**	**0.80**	**3.45**	**0.74**	**3.63**	**0.72**	18.798	**0.000**	0.013
7. Contribution of non-human resources to TQM implementation	**2.57**	**0.70**	**2.67**	**0.66**	**2.80**	**0.69**	17.431	**0.000**	0.016

Bold numbers indicate cases with statistically significant differences ($p < 0.01$).

4.8. Management Position Analysis

Table 9 provides the results of the Kruskal–Wallis test demonstrating the statistically significant differences among responses by the research participants who have served in management positions during their career, whether as school principals or deputy school principals:

- Teachers with 1–4 years' experience in management positions agree to a lesser extent than teachers with 5–8, 9–12, and over 12 years' experience in management positions that TQM principles are applied in schools $M_{1–4} = 3.30$ $SD_{1–4} = 0.78$ vs $M_{5–8} = 3.62$ $SD_{5–8} = 0.71$ $M_{9–12} = 3.72$ $SD_{9–12} = 0.62$ και $M_{over12} = 3.61$ $SD_{over12} = 0.75$ $p < 0.01$), school principals can contribute to TQM implementation ($M_{1–4} = 3.67$ $TA_{1–4} = 0.89$ vs. $M_{5–8} = 4.05$ $TA_{5–8} = 0.72$ $M_{9–12} = 4.11$ $SD_{9–12} = 0.66$ and $M_{over12} = 3.86$ $SD_{over12} = 0.85$ $p < 0.01$), and teachers can contribute to TQM implementation ($M_{1–4} = 3.47$ $SD_{1–4} = 0.79$ vs. $M_{9–12} = 3.70$ $SD_{9–12} = 0.70$ and $M_{over12} = 3.58$ $SD_{over12} = 0,76$ $p < 0.01$).
- Teachers with 1–4 years' experience in management positions agree to a lesser extent than teachers with 5–8 and 9–12 years' experience that there are conditions for adopting TQM ($M_{1–4} = 3.08$ $SD_{1–4} = 0.85$ vs. $M_{5–8} = 3.33$ $SD_{5–8} = 0.83$ and $M_{9–12} = 3.31$ $SD_{9–12} = 0.80$ $p < 0.01$).

Table 9. Differences in perception among management positions groups with different lengths of experience.

Parameters	Years in Management Positions										Eta Squared (η^2)
	1–4		5–8		9–12		Over 12				
	M	SD	M	SD	M	SD	M	SD	$X^2(2)$	*p*	
1. TQM principles	**3.30**	**0.78**	**3.62**	**0.71**	**3.72**	**0.62**	**3.61**	**0.75**	56.746	**0.000**	0.052
2. Obstacles to TQM implementation	3.53	0.81	3.48	0.80	3.44	0.79	3.53	0.78	2.936	0.402	0.002
3. Reasons for adopting TQM	4.02	0.72	4.15	0.65	4.11	0.73	4.09	0.70	6.080	0.108	0.006
4. Conditions for adopting TQM	**3.08**	**0.85**	**3.33**	**0.83**	**3.31**	**0.80**	3.23	0.83	19.849	**0.000**	0.018
5. Contribution of school principals to TQM implementation	**3.67**	**0.89**	**4.05**	**0.72**	**4.11**	**0.66**	**3.86**	0.85	58.231	**0.000**	0.053
6. Contribution of teachers to TQM implementation	**3.47**	**0.79**	3.56	0.75	**3.70**	**0.70**	**3.58**	**0.76**	12.141	**0.007**	0.016
7. Contribution of non-human resources to TQM implementation	2.72	0.68	2.81	0.72	2.86	0.66	2.85	0.68	6.854	0.077	0.026

Bold numbers indicate cases with statistically significant differences ($p < 0.01$).

5. Discussion

This study examined the impact of demographic data on a set of TQM parameters that outline the application of TQM in PE. Based on these parameters, a valid and reliable questionnaire was developed. Furthermore, this study explored the relationship between the identified TQM parameters and the demographic data collected.

The majority of the findings of the parameters and their items are in agreement with similar studies in the scholarly literature. For example, the TQM principles parameter and its significance regarding the culture of the school environment are discussed widely and variously [17,39,58], highlighting principles such as continuous improvement and the importance of commitment. In the same vein, the obstacles to TQM implementation parameter was also investigated in our questionnaire. This specific parameter was largely criticized in previous studies because of the changes required for TQM implementation and the resistance to change that was observed [16,54,58]. The contribution of leadership (e.g., principals) and teachers to TQM implementation has also been widely discussed. As Catling [79] emphasizes, strong leadership and commitment to the priorities of school development reinforce high-quality PE. Communicating the TQM philosophy to school principals through training and by including quality goals in their evaluation processes can certainly help their development [80]. In turn, school principals should encourage the participation of their employees in decision-making in their schools [14]. Employees' collaboration can help teachers become more co-operative, sharing their experience and knowledge and making suggestions for improvements and ways of augmenting teaching quality and the overall school organization [13,65].

The impact of the TQM parameters appeared to vary with certain demographic data. With respect to **gender analysis**, males supported the assertions that TQM principles are applied in schools and that school principals and teachers can contribute to TQM implementation and generally form a more positive attitude towards TQM, while female respondents were more likely to believe that there were obstacles to TQM implementation. This latter finding is in agreement with Pourrajab et al. [47], who also identified more resistance to change in female teachers than male teachers. This observation is certainly an interesting finding for further study and justifies the belief that female teachers hold a less favorable position toward TQM.

In terms of the **position analysis**, we observe that school principals and deputy school principals agree to a greater extent than teachers that TQM principles are applied in schools, TQM can be adopted under certain conditions, and school principals, teachers and non-human resources factors contribute to TQM implementation. On the other hand, teachers take a stronger position toward the existence of obstacles to TQM implementation than school principals and deputy school principals. An overall observation, therefore, is that school principals and their deputies lean more positively towards TQM than teachers. This finding may be associated with the lack of proper education and training of teachers on the subject. As Sebola and Malema [64] maintain, teachers have limited knowledge of the subject of quality. Ocham and Okoth [81] report on the motivation gained by the teachers when they are supported by the school principals', which consequently enhances performance. According to Sulaiman et al. [61], involving employees in quality improvement should be a top priority for those who strive to promote TQM initiative efforts.

In terms of **postgraduate studies**, respondents with a master's/doctorate degree believe that TQM principles are applied in schools and school principals and non-human resources can contribute to TQM implementation to a greater extent than those who do not have a postgraduate degree. On the other hand, respondents without postgraduate degrees express more concerns regarding the obstacles to TQM implementation. It would have been interesting to know what the position of either group would be toward the contribution of teachers to TQM implementation; however, the findings do not show statistically significant differences; thus, no conclusions can be drawn.

Direct comparisons based on **age** are more complicated due to the different groups into which the respondents are divided. Nonetheless, the following findings are worth discussing: those in the age group of 50–59 years agree to a greater extent than other groups that TQM principles are applied in schools and both human (school principals and teachers) and non-human resources can contribute to TQM implementation. The same age group, together with the 40–49 years age group, agrees to a greater extent than the below 29 age group that there are obstacles to TQM implementation in schools. This observation is an

interesting finding, as it shows that teachers with significant working experience have understood and acknowledged TQM and the benefits derived from its implementation, although they also express concern regarding the obstacles encountered, as is reported in other studies [32].

In regard to **school location analysis**, although the findings are quite narrow, it is interesting to note that teachers in rural areas believe to a greater extent than teachers from semi-urban areas that TQM principles are applied in schools. A question raised here concerns whether the percentage of schools examined (approximately 50% from urban areas) may impact this finding. Apart from that issue, another justification for the perceptions of the rural schools' teachers may lie in the more casual and flexible attitudes that the specific teachers have, being quite detached from the central administration authorities, whereas in the case of semi-urban schools, relationships within the school environment may be more formal [82].

It is worth noting that teachers with over 30 **years of experience** agree more than teachers with less working experience that TQM principles are applied in schools and both human (school principals and teachers) and non-human resources can contribute to TQM implementation. Interestingly, teachers with 11–30 years of service agree to a greater extent than teachers with 1–10 and 31–35 years of service that there are obstacles to TQM implementation in schools. The former finding can be justified based on the deep tacit knowledge that teachers gain over their careers, which clearly, after 30 years of service, has reached its maximum and offers a certain sentiment of feasibility, showing willingness to adopt TQM. The latter finding is again justified because the middle group with 11–30 years of service has not yet reached the same level of maturity, but still has more experience than the teachers with 1–10 years of service, who form a group that is still learning.

The findings of the experience analysis read well and are in accordance with the findings of the age analysis presented above, further confirming the validity of the research. Interestingly, however, the findings of this analysis are not in conformity with Pourrajab et al. [47], who claim that there is no significant difference in resistance to the implementation of TQM based on teachers' years of experience. Even further, the work by Töremen et al. [17], in contrast to the findings of the present work, claims that the teachers with vast experience have a more negative opinion of TQM practices than teachers who have less experience but are more active, energetic, and willing to make changes.

The **management position analysis** is certainly positive, in that the majority of teachers with some experience of working in management positions (over 4 years) believe that TQM principles have applicability at the school level and, even more importantly, school principals can contribute to TQM implementation. This finding is in agreement with published literature on the subject that supports the view that leadership needs to be committed to TQM not only at at the educational sector but also in manufacturing and service industries to ensure successful implementation [16,52]. Of equal importance is the finding that teachers with some experience of working in management positions (over 4 years) believe that teachers can contribute to TQM implementation [14,32,47]. Both findings, apart from confirming the existing literature, in practical terms acknowledge the contribution of human resources to TQM applicability. It is also worth noting that this realization comes with years of practice in management position analysis, meaning that it takes time to acknowledge and appreciate the benefits that can be derived from TQM application.

Given that few studies have been conducted on the actual implementation of TQM in PE, there is a clear need for further analyses to establish the basis against which the improvements and changes in PE schools that the implementation of TQM can bring can be measured, together with a collection of empirical data.

In summary, some results of this study support previous reports in the literature, whereas others do not directly correspond to the findings of any previous studies; these findings may provide significant new insights, adding value to the existing information and identifying directions for future research.

6. Conclusions

This study explored the perceptions of school principals and teachers on TQM implementation at PE level. The context of the study was the Greek PE system, which is quite centralized in both form and structure. A total of 2088 responses to the valid and reliable questionnaire that was developed were collected. Seven TQM parameters were identified, which were examined through the lenses of the demographic data of the respondents. This provided new, interesting, and valuable insights and awareness regarding the PE field. The present study, therefore, makes a useful contribution to the scientific and professional community, as it provides evidence of the impact of demographic data on the TQM parameters identified.

One of the strongest points of the present study is, undisputedly, the magnitude of the sample (N = 2088), which examines a wide geographical dispersion and collects data from different stakeholders, including school principals and teachers. As a result, empirical data were provided regarding the impact of demographic data that are difficult to gather or identify in the existing scholarly literature. If we were to isolate the most important findings, we would highlight the more positive position of male than female respondents toward TQM implementation and the fact that school principals seem to have greater agreement than the teachers with respect to the TQM parameters identified (such as TQM principles, conditions for adopting TQM, contribution of school principals, teachers, and non-human resources to TQM implementation), while it is quite clear that teachers acknowledge more clearly than the school principals the existence of obstacles to TQM implementation. Respondents with postgraduate degrees acknowledged more than respondents with no postgraduate degree the TQM parameters identified and, in particular, the importance of school principals and non-human resources contribution to TQM implementation. Non-postgraduate degree respondents stated their concerns regarding the obstacles that surround TQM implementation. Respondents in the 40–49 and 50–59 age groups had a more positive view of TQM, although they acknowledged potential obstacles. Interestingly, the majority of teachers with some working experience in management positions (over 4 years) believed that TQM principles have applicability at the school level and that school principals and teachers can contribute to TQM implementation.

From the above findings, as a further explanation, we underline the importance of the contribution of both school principals and teachers to TQM implementation that respondents have pointed out. Such findings, apart from confirming previous studies, acknowledge, in practical terms, the contribution of human resources to TQM application. Weckenmann et al. [27] further argue that in the quality management journey, even greater importance can be assigned to employees than the use of machines or other technical components, stressing that the organization will be measured by its actions, and this approach includes not only its sustainability but also its reliability, honesty, and treatment of its employees. Another statement that derives quite effortlessly from the findings is that mature age groups and respondents with experience in management position show a good appreciation of TQM and its applicability.

This study, despite its useful and interesting findings, clearly has a number of limitations that need to be taken into consideration. With respect to the TQM parameters identified and included in the survey, despite the thorough review of the literature and the content validity process that was applied, there may be other additional important parameters that were not included. Moreover, although the sample (N = 2088) was significantly large in size, further sampling could improve the study, whereas examining additional countries, apart from Greece, at the PE level would help to remedy the single origin of data. Given that the present research took place before the COVID-19 pandemic, it is certainly worth performing further research in the post-pandemic era to compare the findings and produce useful conclusions. In addition, a comparative analysis between primary and secondary education data following a similar study into secondary schools is also suggested for future research. Finally, further analysis can be conducted to justify the

more positive position of male than female respondents toward TQM implementation and justify differences between the experienced and non-experienced school principals.

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