Total Quality Management (TQM) and Quality of Higher Education: A Meta-Analysis Study

TQM is a program that provides a structure (framework) and tools for quality management which is very important for the progress of higher education. This study aims to prove and determine the effect of TQM to improve higher education quality in several countries. This study used quantitative meta-analysis method with meta-analysis approach. The aspect of TQM is the independent variable and higher education quality is the dependent variable. The data sources were obtained based on the eligibility criteria: (1) from online database searches from 2012-2021; (2) indexed by Scopus, WoS or Google Scholar; (3) had a value of (r), (t), or (F); and (4) $N \geq 30$. This research uses software JASP 0.8 4.0 version. The results of the analysis of 26 studies show that there was a significant effect of TQM on the quality of higher education in several countries ($z = 7.900$; $p < 0.001$; 95% CI [0.640; 1.069]). The effect of TQM on quality of higher education was in the very strong effect category ($r_{RE} = 0.856$) based on Cohen's criteria effect size. This meta-analysis study's results are reliable since there was no publication bias. So, it can be concluded that the fact that TQM has such a powerful influence is believable. This study can strengthen the theory regarding the application of TQM in higher education because it is proven to affect the quality of higher education.

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Keywords: total quality management, quality of higher education, higher education, meta-analysis, effect study

INTRODUCTION

Higher education is an organization that organizes tertiary schools, which is also one of the barometers of development progress, especially educational development (Schindler et al., 2015). The development of higher education is supported by three strategic policy pillars: (1). equitable distribution and expansion of access to education; (2) improving the quality, relevance, and competitiveness of education graduates; (3) improvement of governance, accountability, and public image of education management (Ryan, 2015). Higher education in the implementation and implementation's quality must refer to the three pillars of development planning policies (Asiyai, 2013). Furthermore, higher education is at the forefront of dealing with environmental changes, where the higher education stage is the last stage of formal education that educates a person to be ready to become a professional in a particular field of expertise, who will later be needed in the world of work (Vykydal et al., 2020; Raza et al., 2015).

Higher education also needs to observe the impact of environmental changes and make changes so that higher education as providers of intellectual assets can compete and meet the quality demanded by society (Schindler et al., 2015). It is in line with the opinion of Al-Omoush et al. (2015), stating that higher education needs to continue to serve education, research, and community service and at the same time develop organizations to deal with current problems and predict the future. In carrying out these roles, a total or comprehensive, structured management system is needed. However, in reality, much higher education has gone out of business due to poor service or was still unfamiliar with

implementing the higher education management system. The research results by Pavlov & Katsamakas (2020) and Joo et al. (2009) explained the causes of the failure of higher education to develop, including: (1) failing to manage finances, including lack of income; (2) stop innovating; (3) lack of anticipation in dealing with competitors.

Higher education management types greatly affects the quality of the higher education itself. However, the reality is that many universities are out of business because of poor higher education management. Several studies have stated that higher education bankruptcies due to poor management exist in various parts of the world (Bruckner, 2017; Pan, 2015; Sazonov, 2015; Hunt & Boliver, 2020; Juliano, 2019; Chandra, 2018). According to Bruckner (2017), the reason for this is because every year the budget for management is always increased but the achievement target is not clear because a grand design is not made.

The whole cause of the failure of higher education above is the primary focus of a managerial system called Total Quality Management. Total Quality Management (TQM) is one of the managerial patterns to respond to the quality improvement. This concept offers a new approach in managing the company and integrity in management, which are the main characteristics of TQM (Zehir et al., 2012). Initially, TQM was developed in industry and business, later translated and applied to TQM adopted by educational institutions (Jabbarzare & Shafighi, 2019). Furthermore, Kumar et al. (2016) stated that many companies have advantages in competition because they implement TQM. TQM is also recognized as a management approach to improve organizational performance and efficiency (Zehir et al., 2012; Idris, 2011). In its implementation, TQM is more dominant towards quality. It is consistent with Sadikoglu & Olcay's (2014) opinion that the application of TQM by an educational institution is also closely related to quality. In addition, TQM provides the basis for quality management and is an alternative in ensuring customer satisfaction.

Moreover, TQM provides a structure (framework) and tools for quality management so that, throughout the operation, there is a continuous effort focused on the quality area groups. The concept of quality-oriented to customer satisfaction in an integrated manner along with rational quality costs should be established as one of the implementation goals of primary business and product planning and performance measurement of the marketing, engineering, production, industrial relations, and service functions of the company (Ayu & Suryaningrum, 2019; Sadikoglu & Olcay, 2014; Kumar et al., 2016). TQM can also be interpreted as a management system that elevates quality as a business strategy and is oriented to customer satisfaction by involving all members. TQM is related to creating a quality culture so that employees and staff can satisfy consumers while being supported by an organizational structure (Idris, 2011; Behara & Gundersen, 2001). In addition, Prajogo & Sohal (2002) defined TQM as a total quality management program that has been widely applied by companies that care about the importance of quality as a tool to achieve competitive advantage. It denotes that organizations implementing TQM seek to make continuous improvements to win the competition in the upcoming global era.

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For this reason, higher education can adopt the principles contained in TQM, in which at least four main areas must be met. First, the application of TQM is to improve administrative and operating functions or, in general, to manage higher education as a whole. Second, TQM is integrated into the curriculum. Third, TQM is used in classroom teaching. Fourth, TQM is employed to manage higher education research activities. Here, the presence of TQM has an impact on conventional management changes. Likewise, it has an impact on the management of higher education. In addition, there are six main challenges studied and managed strategically to apply the TQM concept in the world of higher education, namely regarding the dimensions of quality, customer-focused, leadership, continuous improvement, HR management, and management based on facts (Al-Omoush et al., 2015; Cabacang, 2021; Krymets et al., 2022).

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The emphasis on TQM in higher education is specifically stated in the SPMI (Internal Quality Assurance System). The quality assurance system is a means to encourage the realization of graduates who have high competence. Because the focus of TQM is customer satisfaction, graduates are the primary focus in TQM in higher education. In contrast to the theory above, according to Akbar et al. (2019) and Abuamer (2021), what needs to be considered in the application of TQM are: (1) focusing on customers, both internal and external customers; (2) having a high obsession with quality; (3) using a scientific approach in decision making and problem-solving; (4) having a long-term commitment; (5) requiring teamwork; (6) improving the process continuously; (7) organizing education and training; (8) providing controlled freedom; (9) having a unity of purpose; and (10) the involvement and empowerment of employees. In this study, the aspects of TQM investigated and proven to affect the quality of higher education include (1) customer-focused; (2) total employee involvement; process centered; (3) integrated system; (4) strategy and systematic approach; (5) continuous improvement; (6) fact-based decision making; (7) communications (Pambreni et al., 2019).

Based on the above background, it can be concluded that TQM is the main managerial system in determining the quality of higher education. In order to describe the effect of TQM on the quality of higher education worldwide, a meta-analysis study is needed. This study is the first meta-analysis study to examine the universality of the effect of TQM on higher education in various countries. Therefore, this study aims to prove and determine the magnitude of the effect of TQM on the quality of higher education through a quantitative meta-analysis approach.

METHODS

Research design

This research applied a quantitative method with a meta-analysis approach. Meta-analysis is a statistical technique that combines two or more similar studies to obtain a quantitative blend of data (Mueller et al., 2018; Candra & Retnawati, 2020). Meta-analysis focuses not only on conclusions drawn from various studies but also on data, such as performing operations on variables, effect sizes, and sample sizes. This research focused on the data

and the effect of implementing TQM on the quality of higher education in various countries.

Eligibility Criteria

The research publications reviewed in this study had several criteria, as follows: (1) publications that could be searched in the online international journal search database, such as Google Scholar, Publons, Springer, Eric, Proquest, SAGE, ERIC, and others; (2) publications written in English; (3) publications indexed by Scopus, Web of Science, Thomson Reuters, or at least indexed by Google Scholar; (4) publications had to be related to TQM, and the quality of higher education; (5) publications had to be in the range of 2012-2021; (6) publications had a value of (r), (t), or (F), which explained the effect of TQM on aspects of higher education quality; (7) the sample in the publications studied was $N \geq 30$.

Data Encoding

Data coding was performed by coding the variables used to produce more focused information in calculating the magnitude of the effect of TQM on the quality of higher education. Therefore, the instrument in this meta-analysis was carried out with a coding category (Funa, & Prudente, 2021). The coding of the data in this study was to clearly describe the publications' characteristics used, such as the year of publication, country of origin of the study, publication sample (N), correlation value (r_{xy}), t-value, F-value, and remarks, containing journal accreditation/reputation information. The following table compares 26 studies based on each study's N, r, t, and F values and index.

Table 1
Comparison of 26 Studies Based on N, r-, t-, and F-values

No.	Author	Country	N	r	t	F	Influencing variable	Remarks
1.	Houcine & Sofiane (2018)	Algeria	450	0.534			Customer-focused	Google Scholar
2.	Kelesbayev et al. (2016)	Kazakhstan	224	0.557		99.710	Customer-focused	Thomson Routers
3.	Mestrovic (2017)	Croatia	873	0.704	29.256		Customer-focused	Web of Science
4.	Chandel (2019)	India	360	0.415		74.310	Total employee involvement	Web of Science
5.	Azmy (2019)	Indonesia	100	0.665			Total employee involvement	Web of Science
6.	Byrne & MacDonagh (2017)	Ireland	200	0.047	0.669		Total employee involvement	Web of Science
7.	Bhosalei & Kamashetty (2021)	India	30	0.418	2.433		Total employee involvement	Thomson Routers
8.	Barkhuizen & Mogwere (2014)	South Africa	60	0.057			Total employee involvement	Thomson Routers

9.	Kassahun & Raman (2021)	Ethiopia	320	0.662			Total employee involvement	Google Scholar
10.	Rodrigues et al. (2021)	Portugal	5000K	0.812			Process centered	Scopus
11.	Fathema et al. (2015)	USA	500	0.941			Integrated system	Thomson Routers
12.	Sultan & Wong (2012)	Australia	538	0.840			Integrated system	Scopus
13.	Amir & Dawood (2018)	Baghdad	65	0.350			Strategy and systematic approach	Thomson Routers
14.	Bawais et al. (2020)	Iraq	618	0.318		69.298	Strategy and systematic approach	Web of Science
15.	Nurcahyo et al. (2019)	Indonesia	30	0.978			Strategy and systematic approach	Scopus
16.	Martinez-Arguelles et al. (2013)	Spanish	300	0.831			Continual improvement	Scopus
17.	Lazic et al. (2021)	Serbia	10K	0.826			Continual improvement	Scopus
18.	Haris (2012)	Indonesia	520	0.682			Fact-based decision making	Thomson Routers
19.	Diery et al. (2020)	UK	200	0.553			Fact-based decision making	Scopus
20.	Carr et al. (2021)	USA	307	0.767			Communications	Scopus
21.	Pongton & Suntrayuth (2019)	Thailand	200K	0.697			Communications	Scopus
22.	Cabacang (2021)	Philippines	347	0.567			TQM	Scopus
23.	Alzeaideen (2019)	Jordan	2K	0.975			TQM	Scopus
24.	Almurshide e (2017)	Saudi Arabia	135	0.114	1.320		TQM	Thomson Routers
25.	Al-Salim (2018)	Iraq	52	0.766			TQM	Google Scholar
26.	Msallam et al. (2020)	Palestine	240	0.715	15.769		TQM	Google Scholar

Data Analysis

Meanwhile, data analysis in this study was carried out through the following steps: (1) analysis of the research sample's characteristics; (2) data coding; (3) conversion of t- and F- values to r-correlation values:

$$F = t^2 \quad (1)$$

$$t = \sqrt{F} \quad (2)$$

$$r = \frac{t}{\sqrt{t^2+N-2}} \quad (3)$$

(4) heterogeneity test of effect size; (5) calculating the summary effect or mean effect size; (6) creating forest plots and funnel plots; (7) hypothesis testing; (8) checking for publication bias. In addition, the data analysis used was a meta-analysis of correlation. Effect sizes can be categorized based on Cohen's effect size criteria, starting from values 0 – 1 (Cohen et al., 2020). Meanwhile, the software utilized in this research was JASP 0.8 4.0. For the effect size criteria, Cohen's criteria are presented in Table 2 below.

Table 2
Cohen's Effect Size Criteria

Value	Criteria
< 0 + / -.1	Weak effect
< 0 + / -.3	Modest effect
< 0 + / -.5	Moderate effect
< 0 + / -.8	Strong effect
≥ + / -.8	Very strong effect

RESULTS

Based on 26 research publications with specific criteria analyzed, various r-, t- and F-values were obtained for each study. After the t- and F-values were converted to R-values, the values were tested for heterogeneity. Meanwhile, the heterogeneity test results are shown in Table 3 below.

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Table 3
Heterogeneity Test

	Q	df	p
Omnibus test of Model Coefficients	62.405	1	< .001
Test of Residual Heterogeneity	5498.833	25	< .001

Note. *P*-values are approximate.
Note. The model was estimated using the restricted ML method.

Table 4
Residual Heterogeneity Estimates

		95% Confidence Interval	
	Estimate	Lower	Upper
τ^2	0.298	0.182	0.589
τ	0.546	0.427	0.768
I^2 (%)	99.766	99.617	99.881
H^2	426.685	260.771	841.775

The value of degrees of freedom (df) indicates the number of studies analyzed (N-1). The analysis results showed that the 26 effect sizes of the analyzed studies were heterogeneous. The heterogeneous state was concluded based on the p-value < 0.001; Q = 62.405; τ^2 or $\tau > 0$; I^2 (%) = 99.766, close to 100%. Furthermore, these heterogeneous data indicate that there may be potential to investigate other moderating variables influencing the relationship between TQM and higher education quality. Meanwhile, the analysis results of the summary effect or mean effect size are displayed in Table 5 below.

Table 5
Summary Effect or Mean Effect Size

					95% Confidence Interval	
	Estimate	Standard Error	z	p	Lower	Upper
intercept	0.856	0.108	7.900	< .001	0.644	1.069

Note. Wald test.

The analysis results with random effects revealed that the p-value < 0.01, meaning a significant TQM effect on the quality of higher education. Meanwhile, the size of the estimated standard error states the magnitude of the effect of TQM on the quality of higher education, which was 0.856 [0.644; 1.069]. The estimated standard error value could be grouped into a very strong effect category based on Cohen's criteria effect size. Furthermore, the analysis results of meta-analytical studies could be summarized in presenting the Forest Plot chart. The following is a chart of the forest plots of the 26 analyzed studies.

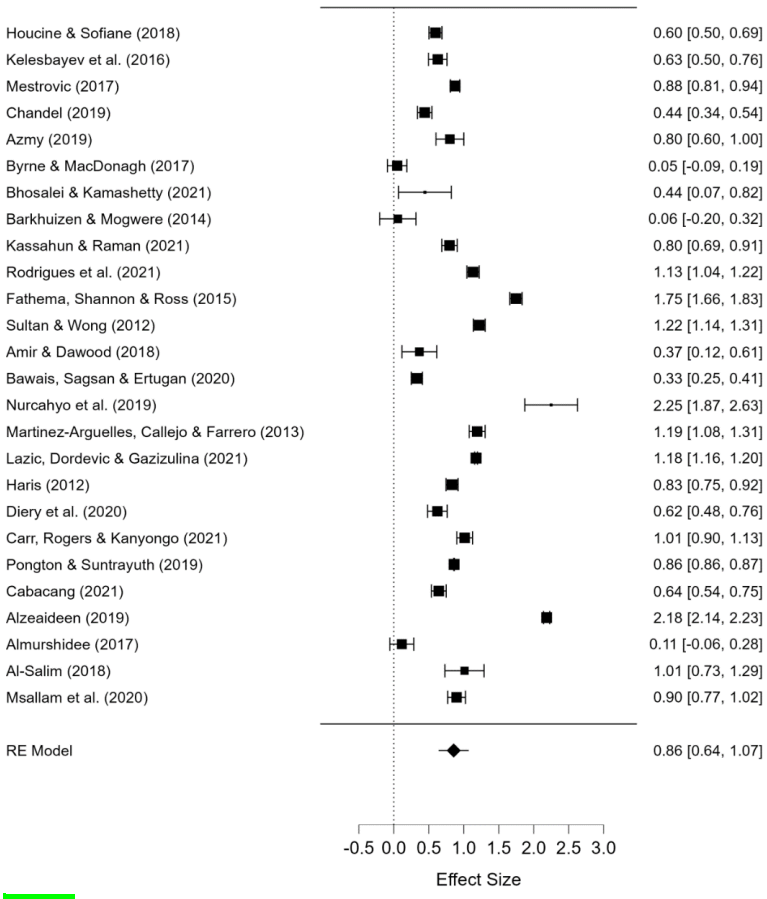

Figure 1
Forest Plot Meta-Analysis

Forest plots generally contain information on the names of the analyzed studies, the effect size value of each study, and the lower and upper limits of the confidence interval. The black plots indicate the magnitude of the effect size. The more the plot is to the right, the greater the effect size value. The larger the plots, the more significant or highly significant. In addition, the RE model with a plot shape in the form of diamonds shows

the summary effect size value of the analyzed studies. In this study, the RE model value was the same as the estimated standard error value, 0.86. Thus, it can be concluded that the forest plot is a summary of the analysis carried out.

Moreover, a good meta-analysis study does not have publication bias in its analysis. To investigate publication bias, data analysis using the Funnel Plot, Egger Test, and Fail-Safe N methods is required. Below, the plotted line represents the value of the summary effect size. The middle line that divides the plotted line is the value that divides the summary effect size obtained. The plot is said to be symmetrical if the distribution of plots showing the effect size values on the right and left of the hemisphere is the same. The following is a funnel plot graph in this meta-analysis study.

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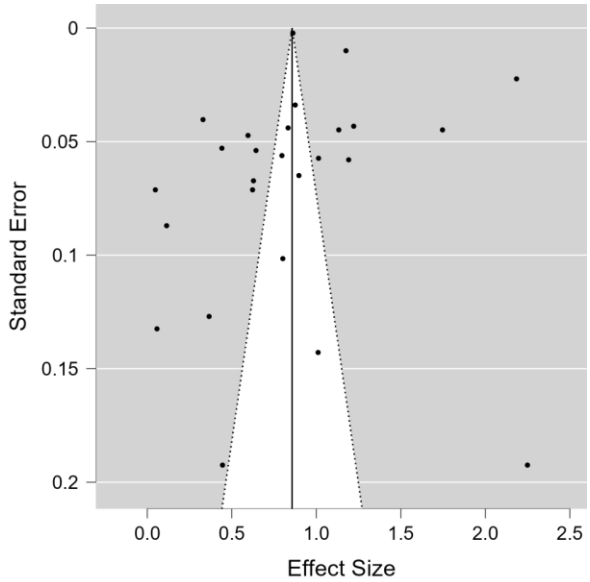

Figure 2
Funnel Plot After Trim-Fill Diagnosis

The Funnel Plot analysis results in Figure 2 depict an irregular distribution of plots so that the researchers had difficulty in concluding the symmetry of the plot. Thus, it was necessary to carry out the Egger Test, and Fail-Safe N. The Egger test results are shown in Table 6.

Table 6
Regression Test for Funnel Plot Asymmetry (Egger's Test)

	z	p
sei	0.499	0.618

The Egger test results in Table 6 show that the p-value was > 0.05, indicating that the Funnel Plot was symmetrical even though the distribution of the plots was not very regular. Thus, it can be concluded that there was no publication bias problem in this meta-analysis study. Publication bias can also be analyzed by looking at the Fail-Safe N value. The following are the Fail-Safe N test results in this meta-analysis study.

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Table 7
Fail-Safe N Test

Fail-Safe N	Target Significance	Observed Significance
297458.000	0.050	< .001

The analysis results of the Fail-Safe N value of the 26 analyzed studies were 297458. This value indicates 297458 studies with publication bias problems or not methodologically well done. Possibly, the 297458 studies were either unreported or unpublished. Meanwhile, the value of Safe N was greater than the value of 5K + 10 = 5(26) + 10 = 140. Thus, the Fail-Safe N test concludes no publication bias problem in this meta-analysis study. In general, based on the publication bias test carried out, the meta-analysis study results can be scientifically justified.

DISCUSSION

Based on the heterogeneity test, the analysis results showed that the 26 effect sizes of the analyzed studies were heterogeneous. The heterogeneous state was concluded based on the p-value < 0.001; Q = 62.405; τ^2 or $\tau > 0$; I^2 (%) = 99.766, close to 100%. If the results of the heterogeneity test are proven to be heterogeneous, the fact is that the estimated research standard being analyzed means that there is a significant difference so that the pooled/summary ES can be interpreted. This heterogeneity test is also a sign that this research can be continued to effect size analysis. This is in line with the opinion of Mueller et al. (2012) which states that meta-analysis research requires knowing the size of heterogeneity first before deciding to draw conclusions based on the fixed-effect model. Juandi et al. (2022) also stated that the research domain analyzed in the meta-analysis should be viewed as heterogeneous. Furthermore, these heterogeneous data indicate that there may be potential to investigate other moderating variables influencing the relationship between TQM and higher education quality.

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Based on the analysis results of 26 studies through this meta-analysis, it was found that TQM had a significant effect on the quality of higher education, as indicated by p-value < 0.01. It is supported by the theory, suggesting that TQM aims to improve quality and identify the best quality measures according to customer expectations in terms of service, product, and customer experience. It, of course, will also increase the company's competitive advantage in the eyes of customers compared to competitors (Rasheed, 2016;

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Topalovic, 2015; Nilsoon et al., 2001). Alghamdi (2018) also argued that the virtue of TQM in improving organizational quality is by streamlining processes, improving proactive work systems, and handling deviations to achieve productivity and process efficiency by identifying and eliminating problems in work processes and systems. Therefore, it is very likely that the application of TQM can improve the quality of higher education.

Meanwhile, the effect size analysis results showed that the effect of TQM on the quality of higher education was very strong (r_{RE} = 0.856). It is reinforced by the theory put forward by Al-Qahtani et al. (2015) that TQM is a system that tends to produce a series of continuous positive changes. TQM is also referred to as quality management that works best to improve the organization's performance, focusing on continuously improving processes and preventing errors (Nilsson et al., 2001; Shahid et al., 2014).

Furthermore, some advantages of applying TQM based on expert theories include (1) saving costs, (2) increasing customer satisfaction, (3) reducing deviations or errors, (4) increasing employee morale, (5) being able to compete, (6) developing a communication system, and (7) progress that is always reviewed regularly (Abuamer, 2021; Asiyai, 2013; Cabacang, 2021; Krymets et al., 2022). *First*, TQM aims to improve quality and identify the best quality measures according to customer expectations in terms of services, promotions, curriculum, quality of lectures, and others. It, of course, will also increase the competitive advantage of higher education in the eyes of customers compared to competitors (Schindler et al., 2015; Abuamer, 2021). *Second*, because the college has better service than other competitors, the short-term effect is that there are fewer customer complaints. Meanwhile, the long-term effect is an increase in service users or students due to increased previous customer satisfaction (Abuamer, 2021; Asiyai, 2013). *Third*, TQM has a strong emphasis on improving quality rather than checking quality in a process. It has the effect of not only reducing the time required to correct errors but also maximizing the work of the team of quality assurance personnel (Vykydal et al., 2020; Ryan, 2015).

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Fourth, the continued and proven success of TQM, particularly due to employee participation in such success, can lead to a marked increase in employee morale. It, in turn, reduces employee turnover and hence reduces the costs of hiring and training new employees (Cabacang, 2021; Krymets, 2022). *Fifth*, TQM is very helpful in understanding competition and developing effective strategies in dealing with competition. Due to the intense competition, the survival of many higher educations has become a vital matter. TQM helps in understanding the customer and education market. It provides an opportunity for higher education to meet the competition by using TQM techniques (Vykydal et al., 2020; Ryan, 2015; Krymets, 2022). *Sixth*, incorrect and inadequate communication systems and inappropriate procedures are obstacles to the development of higher education. Communication barriers result in misunderstandings, poor service quality, duplication of effort, and low morale. Here, TQM techniques bind staff from various sections, departments, and management levels to establish effective communication and interaction (Asiyai, 2013; Cabacang, 2021; Krymets, 2022). *Lastly*,

TQM helps to review the processes needed to develop continuous improvement strategies. The concept of TQM seeking quality improvement must be carried out continuously to meet dynamic challenges (Shahid et al., 2014; Ryan, 2015).

Furthermore, based on the analysis results of the Funnel Plot, Egger Test, and Fail-Safe N, there was no publication bias, indicating that the meta-analysis study carried out is reliable. Publication bias is a type of bias that occurs in published academic research. Usually, it occurs when the experiment results or research study influence whether to publish or distribute a study (Nair, 2019; Joober et al., 2012). Publication bias can also occur in the stages of reference search, sample selection, data analysis, interpretation of analysis results, to the publication of research results (Murad et al., 2018; Sugano & Nabua, 2020).

In addition, Ropovik et al. (2021) explained that publication bias is sometimes caused because researchers tend to overestimate the effect sizes they find. Song (2013) and Juandi et al. (2022) also asserted that publication bias is the tendency of researchers to publish experimental findings with positive results while not publishing other findings when the results are negative or inconclusive. The effect of publication bias is that published studies can be misleading. When information different from published research is unknown, one can draw conclusions using only information from published research (Andrews & Kasy, 2019; Linyu & Lifeng, 2019). Therefore, in this study, three tests were carried out at once to avoid information inconsistency if only one test were performed.

CONCLUSION

From the research results and discussion above, it can be concluded that there was a very strong effect of TQM on the quality of higher education in several countries. Moreover, it can be shown from the effect size of 26 publications proven to be heterogeneous, having an effect size value that could be categorized as a very strong effect. This study concludes from several recent studies and comes from various country backgrounds regarding the effects of TQM on the quality of higher education so that this research can be said to be comprehensive and become a benchmark for the application of TQM in the world of universities. Furthermore, this meta-analysis study's results are reliable since there was no publication bias. Thus, it can be concluded that this study can strengthen the theory regarding the application of TQM in higher education because it is proven to affect the quality of higher education.

There are several recommendations for further research. *First*, the heterogeneity test indicates that there is a possibility of moderator variables affecting the relationship between TQM and the quality of higher education. Therefore, further researchers can combine various possible variables used as moderator variables. *Second*, publication bias in this research was proven to be non-existent, so it shows that the publications under review really described the actual situation. In this study, the research publication characteristics revealed the same sample, namely the higher education side, i.e., staff, lecturers, and students, although from various scientific fields. Related to this, future research can take almost the same theme but is expected to concentrate more on the

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sample of research publications studied, such as at the elementary school, junior high school, senior high school, or non-formal education level. *Third*, higher education can implement TQM to improve the quality of their education.

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Total Quality Management (TQM) and Quality of Higher Education: A Meta-Analysis Study

TQM is a program that provides a structure (framework) and tools for quality management which is very important for the progress of higher education. This study aims to prove and determine the effect of TQM to improve higher education quality in several countries. This study used quantitative meta-analysis method with meta-analysis approach. The aspect of TQM is the independent variable and higher education quality is the dependent variable. The data sources were obtained based on the eligibility criteria: (1) from online database searches from 2012-2021; (2) indexed by Scopus, WoS or Google Scholar; (3) had a value of (r), (t), or (F); and (4) $N \geq 30$. This research uses software JASP 0.8 4.0 version. The results of the analysis of 26 studies show that there was a significant effect of TQM on the quality of higher education in several countries ($z = 7.900$; $p < 0.001$; 95% CI [0.640; 1.069]). The effect of TQM on quality of higher education was in the very strong effect category ($r_{RE} = 0.856$) based on Cohen's criteria effect size. This meta-analysis study's results are reliable since there was no publication bias. So, it can be concluded that this study can strengthen the theory regarding the application of TQM in higher education because it is proven to affect the quality of higher education.

Keywords: total quality management, quality of higher education, higher education, meta-analysis, effect study

INTRODUCTION

Higher education is an organization that organizes tertiary schools, which is also one of the barometers of development progress, especially educational development (Schindler et al., 2015). The development of higher education is supported by three strategic policy pillars: (1). equitable distribution and expansion of access to education; (2) improving the quality, relevance, and competitiveness of education graduates; (3) improvement of governance, accountability, and public image of education management (Ryan, 2015). Higher education in the implementation and implementation's quality must refer to the three pillars of development planning policies (Asiyai, 2013). Furthermore, higher education is at the forefront of dealing with environmental changes, where the higher education stage is the last stage of formal education that educates a person to be ready to become a professional in a particular field of expertise, who will later be needed in the world of work (Vykydal, Folta & Nenadal, 2020; Raza et al., 2015).

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Higher education also needs to observe the impact of environmental changes and make changes so that higher education as providers of intellectual assets can compete and meet the quality demanded by society (Schindler et al., 2015). It is in line with the opinion of Al-Omoush, Alrahahleh & Alabaddi (2015), stating that higher education needs to continue to serve education, research, and community service and at the same time develop organizations to deal with current problems and predict the future. In carrying out these roles, a total or comprehensive, structured management system is needed. However, in reality, much higher education has gone out of business due to poor service or was still unfamiliar with implementing the higher education

management system. The research results by Pavlov & Katsamakas (2020) and Joo, Durband & Grable (2009) explained the causes of the failure of higher education to develop, including: (1) failing to manage finances, including lack of income; (2) stop innovating; (3) lack of anticipation in dealing with competitors. The whole cause of the failure of higher education above is the primary focus of a managerial system called Total Quality Management.

Total Quality Management (TQM) is one of the managerial patterns to respond to the quality improvement. This concept offers a new approach in managing the company and integrity in management, which are the main characteristics of TQM (Zehir et al., 2012). Initially, TQM was developed in industry and business, later translated and applied to TQM adopted by educational institutions (Jabbarzare & Shafighi, 2019). Furthermore, Kumar et al. (2016) stated that many companies have advantages in competition because they implement TQM. TQM is also recognized as a management approach to improve organizational performance and efficiency (Zehir et al., 2012; Idris, 2011). In its implementation, TQM is more dominant towards quality. It is consistent with Sadikoglu & Olcay's (2014) opinion that the application of TQM by an educational institution is also closely related to quality. In addition, TQM provides the basis for quality management and is an alternative in ensuring customer satisfaction.

Moreover, TQM provides a structure (framework) and tools for quality management so that, throughout the operation, there is a continuous effort focused on the quality area groups. The concept of quality-oriented to customer satisfaction in an integrated manner along with rational quality costs should be established as one of the implementation goals of primary business and product planning and performance measurement of the marketing, engineering, production, industrial relations, and service functions of the company (Ayu & Suryaningrum, 2019; Sadikoglu & Olcay, 2014; Kumar et al., 2016). TQM can also be interpreted as a management system that elevates quality as a business strategy and is oriented to customer satisfaction by involving all members. TQM is related to creating a quality culture so that employees and staff can satisfy consumers while being supported by an organizational structure (Idris, 2011; Behara & Gundersen, 2001). In addition, Prajogo & Sohal (2002) defined TQM as a total quality management program that has been widely applied by companies that care about the importance of quality as a tool to achieve competitive advantage. It denotes that organizations implementing TQM seek to make continuous improvements to win the competition in the upcoming global era.

For this reason, higher education can adopt the principles contained in TQM, in which at least four main areas must be met. First, the application of TQM is to improve administrative and operating functions or, in general, to manage higher education as a whole. Second, TQM is integrated into the curriculum. Third, TQM is used in classroom teaching. Fourth, TQM is employed to manage higher education research activities. Here, the presence of TQM has an impact on conventional management changes. Likewise, it has an impact on the management of higher education. In addition, there are six main challenges studied and managed strategically to apply the TQM concept in the world of higher education, namely regarding the dimensions of quality, customer-focused, leadership, continuous improvement, HR management, and

management based on facts (Al-Omoush, Alrahahleh & Alabaddi, 2015; Cabacang, 2021; Krymets et al., 2022).

The emphasis on TQM in higher education is specifically stated in the SPMI (Internal Quality Assurance System). The quality assurance system is a means to encourage the realization of graduates who have high competence. Because the focus of TQM is customer satisfaction, graduates are the primary focus in TQM in higher education. In contrast to the theory above, according to Akbar, Ali & Alam (2019) and Abuamer (2021), what needs to be considered in the application of TQM are: (1) focusing on customers, both internal and external customers; (2) having a high obsession with quality; (3) using a scientific approach in decision making and problem-solving; (4) having a long-term commitment; (5) requiring teamwork; (6) improving the process continuously; (7) organizing education and training; (8) providing controlled freedom; (9) having a unity of purpose; and (10) the involvement and empowerment of employees. In this study, the aspects of TQM investigated and proven to affect the quality of higher education include (1) customer-focused; (2) total employee involvement; process centered; (3) integrated system; (4) strategy and systematic approach; (5) continuous improvement; (6) fact-based decision making; (7) communications (Pambreni et al., 2019).

Based on the above background, it can be concluded that TQM is the main managerial system in determining the quality of higher education. In order to describe the effect of TQM on the quality of higher education worldwide, a meta-analysis study is needed. This study is the first meta-analysis study to examine the universality of the effect of TQM on higher education in various countries. Therefore, this study aims to prove and determine the magnitude of the effect of TQM on the quality of higher education through a quantitative meta-analysis approach.

METHODS

Research design

This research applied a quantitative method with a meta-analysis approach. Meta-analysis is a statistical technique that combines two or more similar studies to obtain a quantitative blend of data (Mueller et al., 2018; Candra & Retnawati, 2020). Meta-analysis focuses not only on conclusions drawn from various studies but also on data, such as performing operations on variables, effect sizes, and sample sizes. This research focused on the data and the effect of implementing TQM on the quality of higher education in various countries.

Eligibility Criteria

The research publications reviewed in this study had several criteria, as follows: (1) publications that could be searched in the online international journal search database, such as Google Scholar, Publons, Springer, Eric, Proquest, SAGE, ERIC, and others; (2) publications written in English; (3) publications indexed by Scopus, Web of Science, Thomson Reuters, or at least indexed by Google Scholar; (4) publications had to be related to TQM, and the quality of higher education; (5) publications had to be in the range of 2012-2021; (6) publications had a value of (r), (t), or (F), which explained the effect of TQM on aspects of higher education quality; (7) the sample in the publications studied was $N \geq 30$.

Data Encoding

Data coding was performed by coding the variables used to produce more focused information in calculating the magnitude of the effect of TQM on the quality of higher education. Therefore, the instrument in this meta-analysis was carried out with a coding category (Funa, & Prudente, 2021). The coding of the data in this study was to clearly describe the publications' characteristics used, such as the year of publication, country of origin of the study, publication sample (N), correlation value (r_{xy}), t-value, F-value, and remarks, containing journal accreditation/reputation information. The following table compares 26 studies based on each study's N, r, t, and F values and index.

Table 1
Comparison of 26 Studies Based on N, r-, t-, and F-values

No.	Author	Country	N	r	t	F	Influencing variable	Remarks
1.	Houcine & Sofiane (2018)	Algeria	450	0.534			Customer-focused	Google Scholar
2.	Kelesbayev et al. (2016)	Kazakhstan	224	0.557		99.710	Customer-focused	Thomson Routers
3.	Mestrovic (2017)	Croatia	873	0.704	29.256		Customer-focused	Web of Science
4.	Chandel (2019)	India	360	0.415		74.310	Total employee involvement	Web of Science
5.	Azmy (2019)	Indonesia	100	0.665			Total employee involvement	Web of Science
6.	Byrne & MacDonagh (2017)	Ireland	200	0.047	0.669		Total employee involvement	Web of Science
7.	Bhosalei & Kamashetty (2021)	India	30	0.418	2.433		Total employee involvement	Thomson Routers
8.	Barkhuizen & Mogwere (2014)	South Africa	60	0.057			Total employee involvement	Thomson Routers
9.	Kassahun & Raman (2021)	Ethiopia	320	0.662			Total employee involvement	Google Scholar
10.	Rodrigues et al. (2021)	Portugal	5000K	0.812			Process centered	Scopus
11.	Fathema, Shannon & Ross (2015)	USA	500	0.941			Integrated system	Thomson Routers
12.	Sultan & Wong (2012)	Australia	538	0.840			Integrated system	Scopus
13.	Amir & Dawood (2018)	Baghdad	65	0.350			Strategy and systematic approach	Thomson Routers
14.	Bawais, Sagsan &	Iraq	618	0.318		69.298	Strategy and systematic	Web of

	Ertugan (2020)					approach	Science
15.	Nurcahyo et al. (2019)	Indonesia	30	0.978		Strategy and systematic approach	Scopus
16.	Martinez-Arguelles, Callejo & Farrero (2013)	Spanish	300	0.831		Continual improvement	Scopus
17.	Lazic, Dordevic & Gazizulina (2021)	Serbia	10K	0.826		Continual improvement	Scopus
18.	Haris (2012)	Indonesia	520	0.682		Fact-based decision making	Thomson Routers
19.	Diery et al. (2020)	UK	200	0.553		Fact-based decision making	Scopus
20.	Carr, Rogers & Kanyongo (2021)	USA	307	0.767		Communications	Scopus
21.	Pongton & Suntrayuth (2019)	Thailand	200K	0.697		Communications	Scopus
22.	Cabacang (2021)	Philippines	347	0.567		TQM	Scopus
23.	Alzeaideen (2019)	Jordan	2K	0.975		TQM	Scopus
24.	Almurshidee (2017)	Saudi Arabia	135	0.114	1.320	TQM	Thomson Routers
25.	Al-Salim (2018)	Iraq	52	0.766		TQM	Google Scholar
26.	Msallam et al. (2020)	Palestine	240	0.715	15.769	TQM	Google Scholar

Data Analysis

Meanwhile, data analysis in this study was carried out through the following steps: (1) analysis of the research sample's characteristics; (2) data coding; (3) conversion of t- and F- values to r-correlation values:

$$F = t^2 \quad (1)$$

$$t = \sqrt{F} \quad (2)$$

$$r = \frac{t}{\sqrt{t^2 + N - 2}} \quad (3)$$

(4) heterogeneity test of effect size; (5) calculating the summary effect or mean effect size; (6) creating forest plots and funnel plots; (7) hypothesis testing; (8) checking for publication bias. In addition, the data analysis used was a meta-analysis of correlation. Effect sizes can be categorized based on Cohen's effect size criteria, starting from values 0 – 1 (Cohen et al., 2020). Meanwhile, the software utilized in this research was JASP 0.8 4.0. For the effect size criteria, Cohen's criteria are presented in Table 2 below.

Table 2
Cohen's Effect Size Criteria

Value	Criteria
< 0 + / -.1	Weak effect
< 0 + / -.3	Modest effect
< 0 + / -.5	Moderate effect

< 0 + / -.8	Strong effect
≥ + / -.8	Very strong effect

RESULTS

Based on 26 research publications with specific criteria analyzed, various r-, t- and F-values were obtained for each study. After the t- and F-values were converted to R-values, the values were tested for heterogeneity. Meanwhile, the heterogeneity test results are shown in Table 3 below.

Table 3
Heterogeneity Test

	Q	df	p
Omnibus test of Model Coefficients	62.405	1	< .001
Test of Residual Heterogeneity	5498.833	25	< .001

Note. *P*-values are approximate.
Note. The model was estimated using the restricted ML method.

Table 4
Residual Heterogeneity Estimates

		95% Confidence Interval	
	Estimate	Lower	Upper
τ^2	0.298	0.182	0.589
τ	0.546	0.427	0.768
I^2 (%)	99.766	99.617	99.881
H^2	426.685	260.771	841.775

The value of degrees of freedom (df) indicates the number of studies analyzed (N-1). The analysis results showed that the 26 effect sizes of the analyzed studies were heterogeneous. The heterogeneous state was concluded based on the p-value < 0.001*;* Q = 62.405; τ^2 or $\tau > 0$; I^2 (%) = 99.766, close to 100%. Furthermore, these heterogeneous data indicate that there may be potential to investigate other moderating variables influencing the relationship between TQM and higher education quality. Meanwhile, the analysis results of the summary effect or mean effect size are displayed in Table 5 below.

Table 5
Summary Effect or Mean Effect Size

					95% Confidence Interval	
	Estimate	Standard Error	z	p	Lower	Upper
intercept	0.856	0.108	7.900	< .001	0.644	1.069

Note. Wald test.

The analysis results with random effects revealed that the p-value < 0.01, meaning a significant TQM effect on the quality of higher education. Meanwhile, the size of the estimated standard error states the magnitude of the effect of TQM on the quality of higher education, which was 0.856 [0.644; 1.069]. The estimated standard error value

could be grouped into a very strong effect category based on Cohen's criteria effect size. Furthermore, the analysis results of meta-analytical studies could be summarized in presenting the Forest Plot chart. The following is a chart of the forest plots of the 26 analyzed studies.

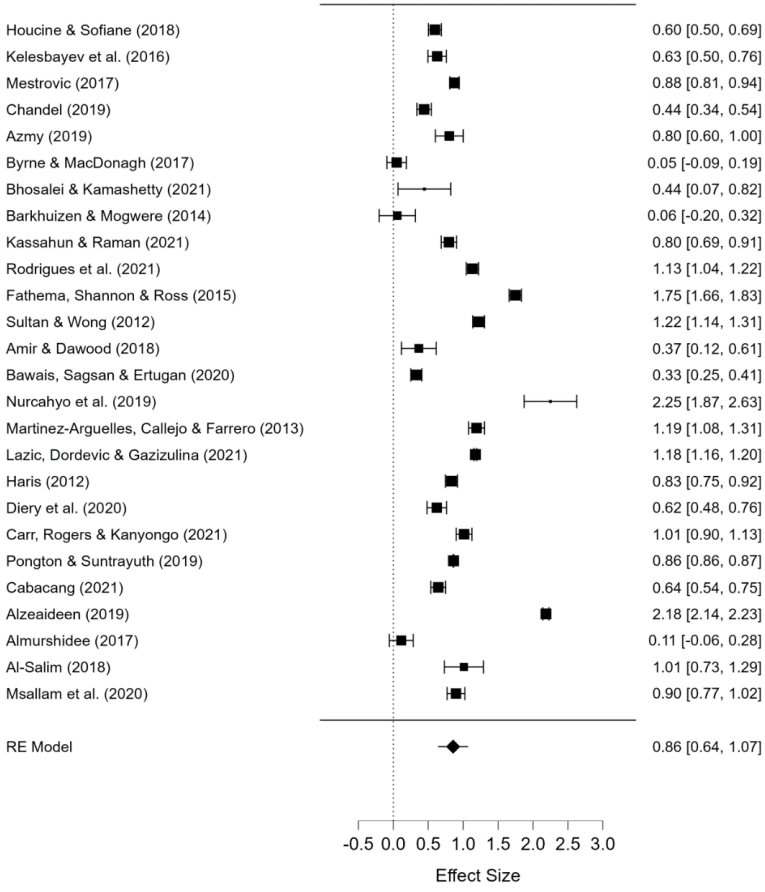

Figure 1
Forest Plot Meta-Analysis

Forest plots generally contain information on the names of the analyzed studies, the effect size value of each study, and the lower and upper limits of the confidence interval. The black plots indicate the magnitude of the effect size. The more the plot is to the right, the greater the effect size value. The larger the plots, the more significant or highly significant. In addition, the RE model with a plot shape in the form of diamonds shows the summary effect size value of the analyzed studies. In this study, the RE model value was the same as the estimated standard error value, 0.86. Thus, it can be concluded that the forest plot is a summary of the analysis carried out.

Moreover, a good meta-analysis study does not have publication bias in its analysis. To investigate publication bias, data analysis using the Funnel Plot, Egger Test, and Fail-Safe N methods is required. Below, the plotted line represents the value of the summary effect size. The middle line that divides the plotted line is the value that divides the summary effect size obtained. The plot is said to be symmetrical if the distribution of plots showing the effect size values on the right and left of the hemisphere is the same. The following is a funnel plot graph in this meta-analysis study.

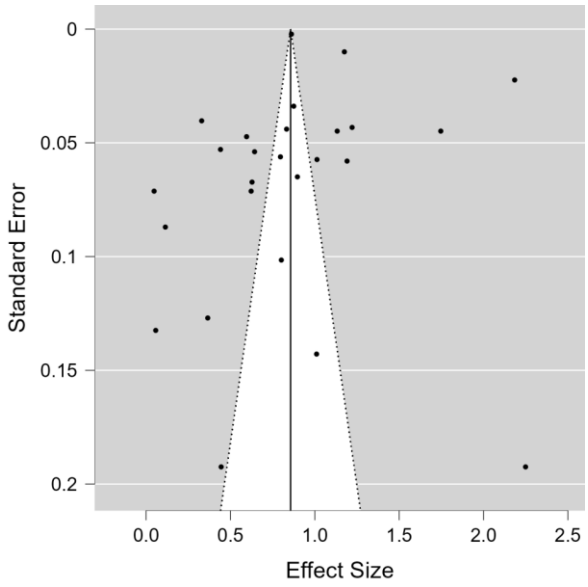

Figure 2
Funnel Plot After Trim-Fill Diagnosis

The Funnel Plot analysis results in Figure 2 depict an irregular distribution of plots so that the researchers had difficulty in concluding the symmetry of the plot. Thus, it was

necessary to carry out the Egger Test, and Fail-Safe N. The Egger test results are shown in Table 6.

Table 6

Regression Test for Funnel Plot Asymmetry (Egger's Test)

	z	p
sei	0.499	0.618

The Egger test results in Table 6 show that the p-value was > 0.05, indicating that the Funnel Plot was symmetrical even though the distribution of the plots was not very regular. Thus, it can be concluded that there was no publication bias problem in this meta-analysis study. Publication bias can also be analyzed by looking at the Fail-Safe N value. The following are the Fail-Safe N test results in this meta-analysis study.

Table 7
Fail-Safe N Test

The analysis results of the Fail-Safe N value of the 26 analyzed studies were 297458. This value indicates 297458 studies with publication bias problems or not methodologically well done. Possibly, the 297458 studies were either unreported or unpublished. Meanwhile, the value of Safe N was greater than the value of 5K + 10 = 5(26) + 10 = 140. Thus, the Fail-Safe N test concludes no publication bias problem in this meta-analysis study. In general, based on the publication bias test carried out, the meta-analysis study results can be scientifically justified.

DISCUSSION

Based on the analysis results of 26 studies through this meta-analysis, it was found that TQM had a significant effect on the quality of higher education, as indicated by p-value < 0.01. It is supported by the theory, suggesting that TQM aims to improve quality and identify the best quality measures according to customer expectations in terms of service, product, and customer experience. It, of course, will also increase the company's competitive advantage in the eyes of customers compared to competitors (Rasheed, 2016; Topalovic, 2015; Nilsoon, Johnson & Gustafsson, 2001). Alghamdi (2018) also argued that the virtue of TQM in improving organizational quality is by streamlining processes, improving proactive work systems, and handling deviations to achieve productivity and process efficiency by identifying and eliminating problems in work processes and systems. Therefore, it is very likely that the application of TQM can improve the quality of higher education.

Meanwhile, the effect size analysis results showed that the effect of TQM on the quality of higher education was very strong (r_{RE} = 0.856). It is reinforced by the theory put forward by Al-Qahtani, Alshehri & Aziz (2015) that TQM is a system that tends to produce a series of continuous positive changes. TQM is also referred to as quality management that works best to improve the organization's performance, focusing on continuously improving processes and preventing errors (Nilsson, Johnson & Gustafsson, 2001; Shahid, Faisal & Aftab, 2014).

Furthermore, some advantages of applying TQM based on expert theories include (1) saving costs, (2) increasing customer satisfaction, (3) reducing deviations or errors, (4) increasing employee morale, (5) being able to compete, (6) developing a communication system, and (7) progress that is always reviewed regularly (Abuamer, 2021; Asiyai, 2013; Cabacang, 2021; Krymets et al., 2022). *First*, TQM aims to improve quality and identify the best quality measures according to customer expectations in terms of services, promotions, curriculum, quality of lectures, and others. It, of course, will also increase the competitive advantage of higher education in the eyes of customers compared to competitors (Schindler et al., 2015; Abuamer, 2021). *Second*, because the college has better service than other competitors, the short-term effect is that there are fewer customer complaints. Meanwhile, the long-term effect is an increase in service users or students due to increased previous customer satisfaction (Abuamer, 2021; Asiyai, 2013). *Third*, TQM has a strong emphasis on improving quality rather than checking quality in a process. It has the effect of not only reducing the time required to correct errors but also maximizing the work of the team of quality assurance personnel (Vykydal, Folta & Nenadal, 2020; Ryan, 2015).

Fourth, the continued and proven success of TQM, particularly due to employee participation in such success, can lead to a marked increase in employee morale. It, in turn, reduces employee turnover and hence reduces the costs of hiring and training new employees (Cabacang, 2021; Krymets, 2022). *Fifth*, TQM is very helpful in understanding competition and developing effective strategies in dealing with competition. Due to the intense competition, the survival of many higher educations has become a vital matter. TQM helps in understanding the customer and education market. It provides an opportunity for higher education to meet the competition by using TQM techniques (Vykydal, Folta & Nenadal, 2020; Ryan, 2015; Krymets, 2022). *Sixth*, incorrect and inadequate communication systems and inappropriate procedures are obstacles to the development of higher education. Communication barriers result in misunderstandings, poor service quality, duplication of effort, and low morale. Here, TQM techniques bind staff from various sections, departments, and management levels to establish effective communication and interaction (Asiyai, 2013; Cabacang, 2021; Krymets, 2022). *Lastly*, TQM helps to review the processes needed to develop continuous improvement strategies. The concept of TQM seeking quality improvement must be carried out continuously to meet dynamic challenges (Shahid, Faisal & Aftab, 2014; Ryan, 2015).

Furthermore, based on the analysis results of the Funnel Plot, Egger Test, and Fail-Safe N, there was no publication bias, indicating that the meta-analysis study carried out is reliable. Publication bias is a type of bias that occurs in published academic research. Usually, it occurs when the experiment results or research study influence whether to publish or distribute a study (Nair, 2019; Joober et al., 2012). Publication bias can also occur in the stages of reference search, sample selection, data analysis, interpretation of analysis results, to the publication of research results (Murad et al., 2018; Sugano & Nabua, 2020).

In addition, Ropovik, Adamkovic & Greger (2021) explained that publication bias is sometimes caused because researchers tend to overestimate the effect sizes they find.

Song (2013) and Juandi, Kusumah & Tamur (2022) also asserted that publication bias is the tendency of researchers to publish experimental findings with positive results while not publishing other findings when the results are negative or inconclusive. The effect of publication bias is that published studies can be misleading. When information different from published research is unknown, one can draw conclusions using only information from published research (Andrews & Kasy, 2019; Linyu & Lifeng, 2019). Therefore, in this study, three tests were carried out at once to avoid information inconsistency if only one test were performed.

CONCLUSION

From the research results and discussion above, it can be concluded that there was a significant effect of TQM on the quality of higher education in several countries. It can be shown from the effect size of 26 publications proven to be heterogeneous, having an effect size value that could be categorized as a very strong effect. Furthermore, this meta-analysis study's results are reliable since there was no publication bias. Thus, it can be concluded that this study can strengthen the theory regarding the application of TQM in higher education because it is proven to affect the quality of higher education.

There are several recommendations for further research. *First,* the heterogeneity test indicates that there is a possibility of moderator variables affecting the relationship between TQM and the quality of higher education. Therefore, further researchers can combine various possible variables used as moderator variables. *Second,* publication bias in this research was proven to be non-existent, so it shows that the publications under review really described the actual situation. In this study, the research publication characteristics revealed the same sample, namely the higher education side, i.e., staff, lecturers, and students, although from various scientific fields. Related to this, future research can take almost the same theme but is expected to concentrate more on the sample of research publications studied, such as at the elementary school, junior high school, senior high school, or non-formal education level. Third, higher education can implement TQM to improve the quality of their education.

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