The Impact of Total Quality Management on Human Resource Development in the Saudi Education Sector: The Mediating Role of Employee Learning Speed

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Abstract

The integration of Total Quality Management (TQM) into educational institutions has gained increasing attention as a strategic approach to enhance human resource outcomes. This study investigates the impact of TQM on Human Resource Development (HRD) in the Saudi education sector, with a particular focus on the mediating role of Employee Learning Speed (ELS). The research is grounded in the context of ongoing institutional reforms and the growing need to align organizational performance with national transformation goals. A quantitative research design was employed, using survey data collected from 386 academic, administrative, and technical staff members at Imam Abdulrahman bin Faisal University. Structural Equation Modeling (SEM) was used to analyze the relationships between TQM, ELS, and HRD, allowing for the assessment of both direct and indirect effects. The results indicate a strong and significant direct relationship between TQM and HRD, affirming the effectiveness of quality management practices in enhancing employee capabilities and institutional development. However, ELS did not mediate this relationship, as its linkage to TQM was not statistically significant. While ELS had a moderate direct influence on HRD, it failed to serve as a significant conduit for TQM's impact. These findings suggest that although TQM is a vital driver of HRD, its influence on learning agility may be limited without additional organizational enablers. The study underscores the need for educational institutions to adopt more integrated approaches that combine quality systems with agile learning environments to foster sustainable workforce growth.

Keywords: *Total Quality Management (TQM), Human Resource Development (HRD), Employee Learning Speed (ELS), Saudi Higher Education*

1. Introduction

In the evolving landscape of global education, Total Quality Management (TQM) has gained substantial traction as a managerial philosophy aimed at fostering continuous improvement, institutional effectiveness, and stakeholder satisfaction. The relevance of TQM within higher education is particularly evident in emerging economies like Saudi Arabia, where educational reform is a cornerstone of national development strategies such as Vision 2030. This strategic blueprint emphasizes human capital development, educational quality, and global competitiveness, thus necessitating efficient and agile organizational practices in educational institutions (Alhamami, 2023; Alshawan, 2023). In this context, the integration of TQM into academic governance has emerged as a potential catalyst for enhancing Human Resource Development (HRD), which encompasses structured efforts to improve employee competencies, engagement, and long-term performance.

Although extensive literature has documented the positive effects of TQM on organizational outcomes, there remains a lack of consensus regarding the mechanisms through which TQM contributes to HRD, particularly within the educational sector in Saudi Arabia. HRD in this context is undergoing a significant transformation, driven by the need to upskill academic and administrative staff, adapt to technological advancements, and implement strategic reforms aligned with international standards (Alruwaili, 2023; Alghamdi, 2018). TQM principles such as leadership commitment, process optimization, data-informed decision-making, and employee involvement are expected to foster learning-oriented cultures within educational institutions (Alhosani & Ahmad, 2024). However, empirical evidence examining this linkage is still emerging, and the role of behavioral and cognitive mediators, such as employee learning speed, has received limited scholarly attention.

Employee learning speed, or the rate at which individuals acquire, internalize, and apply new knowledge, is increasingly recognized as a strategic variable in dynamic organizational settings. In higher education institutions responding to rapid policy and technological changes, the ability of employees to learn swiftly becomes essential for maintaining performance and institutional relevance (Abbas & Salameh, 2023; Abdelhamid & Sposato, 2019). Within the TQM framework, supportive leadership, participative decision-making, and feedback mechanisms can potentially enhance employees' learning agility, thereby amplifying the impact of HRD initiatives. Recent empirical research supports the notion that learning speed acts as a mediating variable that strengthens the relationship between quality management practices and organizational

performance outcomes (Niyi Anifowose, Ghasemi, & Olaleye, 2022). Despite this, studies focusing specifically on this mediating role in the Saudi education sector remain scarce.

Given these theoretical and practical considerations, this study seeks to investigate the impact of Total Quality Management on Human Resource Development in Saudi Arabia's education sector, with a particular focus on the mediating role of employee learning speed. By doing so, the research addresses a crucial gap in the literature and offers insights relevant to policymakers, university administrators, and HR professionals striving to enhance institutional capabilities. The study is guided by two central questions: (1) what is the nature and strength of the relationship between Total Quality Management and Human Resource Development in Saudi educational institutions? And (2) to what extent does employee learning speed mediate this relationship?

The significance of this study lies in its potential to advance the theoretical understanding of how quality management practices influence human capital development through cognitive-behavioral mechanisms. While past research has examined TQM and HRD independently, integrating employee learning speed into this framework provides a more nuanced explanation of the internal processes that drive sustainable organizational improvement (Abbas, 2020; Albidany, 2019). Practically, the findings may inform the design of integrated HRD systems that leverage TQM principles to accelerate learning, adaptability, and performance within Saudi higher education institutions. This is particularly relevant in the current reform era, where universities are expected to achieve higher accountability, autonomy, and innovation in alignment with Vision 2030 objectives (Alharbi, 2021; Alanzi & Ratten, 2023).

2. Literature Review

The integration of Total Quality Management (TQM) into the education sector has emerged as a transformative strategy for enhancing institutional performance, workforce capabilities, and service delivery. In the Saudi Arabian context, driven by Vision 2030, TQM has gained traction as a vital management approach to foster excellence and competitiveness in public and private higher education institutions (Alhamami, 2023; Alghamdi, 2018). TQM involves a holistic application of quality principles, including leadership commitment, stakeholder focus, continuous improvement, and data-driven decision-making, designed to embed quality at all levels of an organization (Alsalamah, 2023). These principles, when aligned with HR development goals,

facilitate not only performance enhancement but also knowledge creation, job satisfaction, and workforce sustainability (Alhosani & Ahmad, 2024).

Human Resource Development (HRD), as conceptualized by Swanson (2022), focuses on the strategic development of people to meet organizational goals through learning, performance, and career development. Within Saudi universities, HRD is undergoing a transformation from traditional administrative functions toward a strategic role encompassing training, leadership development, employee engagement, and knowledge-sharing mechanisms (Alruwaili, 2023). This transformation has been strongly influenced by the adoption of TQM frameworks that prioritize professional development and employee involvement as central to institutional success. Studies confirm that successful implementation of TQM in Saudi educational institutions correlates with improved employee morale, collaborative work cultures, and enhanced teaching quality (Alharbi, 2021; Alshawan, 2023).A growing body of literature emphasizes the importance of learning speed, often conceptualized as learning agility or organizational responsiveness, as a mediating variable in the relationship between TQM and HRD outcomes. Learning agility refers to an individual's or organization's ability to acquire, adapt, and apply knowledge quickly in dynamic environments (De Meuse, 2019; Ghosh et al., 2021). In education settings, particularly in Saudi Arabia's rapidly evolving knowledge economy, institutions that exhibit high learning agility among faculty and administrative staff demonstrate greater adaptability to policy reforms, digital transformation, and competitive benchmarks set by global rankings (Alharbi, 2021; Alhosani & Ahmad, 2024). This capability becomes even more critical when framed within the broader context of organizational learning theory, which underscores the role of continuous knowledge acquisition and behavioral change in achieving sustained excellence (Argyris, 1999; Senge, 2006).

Theoretical models such as Swanson's HRD model and Kolb's experiential learning theory provide a robust foundation for understanding how learning agility serves as a bridge between quality practices and HRD outcomes. These models emphasize reflective practice, experiential cycles, and the systemic embedding of learning within organizational routines. In Saudi universities, learning agility enhances the capacity of academic and administrative staff to respond to curriculum changes, accreditation demands, and internationalization strategies (Abdelhamid & Sposato, 2019). The agility not only accelerates individual competence but also contributes to institutional resilience, especially in times of crisis, such as the COVID-19 pandemic, when universities were required to shift to online platforms overnight (Alanzi &

Ratten, 2023).Empirical studies specific to Saudi Arabia support this theoretical link. For instance, Alhamami (2023) identified that universities with integrated TQM and learning agility frameworks reported higher levels of academic innovation, improved student services, and enhanced employee retention. Similarly, Alruwaili (2023) found that employees trained in TQM-based systems developed stronger competencies in teamwork, problem-solving, and self-directed learning, reinforcing the value of learning agility in HRD systems. Moreover, Alshawan (2023) emphasized that institutional cultures promoting agile learning were better positioned to achieve the human capital goals outlined in Saudi Vision 2030, particularly those targeting quality assurance, global competitiveness, and educational leadership.

From a strategic standpoint, the alignment between TQM, learning agility, and HRD is crucial in operationalizing the ambitions of Vision 2030, which explicitly calls for excellence in education, workforce development, and organizational innovation. Learning speed acts as the enabling mechanism through which quality management processes translate into meaningful developmental outcomes for faculty and staff. Institutions that fail to integrate these elements risk stagnation, inefficiency, and reduced stakeholder satisfaction in an increasingly competitive global academic landscape (Alhosani & Ahmad, 2024; Alsalamah, 2023).

3. Methodology

This study adopts a quantitative research approach to examine the relationship between Total Quality Management (TQM), employee learning speed, and Human Resource Development (HRD) in the Saudi education sector, particularly within Imam Abdulrahman Bin Faisal University. The quantitative approach was selected for its strength in providing objective, generalizable, and statistically verifiable results. It enables the testing of complex theoretical models using structured instruments and statistical modeling techniques such as Structural Equation Modeling (SEM), which is suitable for capturing both direct and indirect effects among variables (Hair et al., 2022). The research instrument consisted of a structured questionnaire designed to measure key latent variables such as TQM practices, learning speed, and HRD outcomes. These items were based on well-established scales from previous studies and were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questions were designed to reflect the specific dynamics of Saudi educational institutions, focusing on aspects like leadership commitment to quality, employee empowerment, IT infrastructure compatibility, learning adaptability, and HRD programs. The questionnaire

development was informed by theoretical frameworks such as Swanson's HRD model (2022) and organizational learning theory (Senge, 2006), as well as empirical insights from Saudi-based studies on institutional performance and quality systems (Alhamami, 2023; Alshawan, 2023).

The study population included academic faculty, administrative personnel, and IT professionals across 21 colleges within Imam Abdulrahman Bin Faisal University. The total workforce was approximately 4,000 employees, offering a diverse and representative context for studying how quality and technology practices influence workforce development. To ensure broad representation, the sample was selected using stratified random sampling, with strata defined by job roles. This method helped minimize bias and ensured that each subgroup was adequately represented in the sample. The sample size was calculated using Krejcie and Morgan's (1970) formula, which recommended approximately 350 participants for a population of this size. This number was adequate for SEM analysis, providing strong statistical power for model estimation and hypothesis testing.

Prior to full-scale data collection, a pilot test was conducted to verify the reliability and clarity of the research instrument. A sample of 30 employees from different departments participated in the pilot phase. The goal of the pilot was to identify any ambiguous questions, test the logical flow of the questionnaire, and assess the internal consistency of the constructs. The data from the pilot were analyzed using SPSS, and reliability was measured using Cronbach's alpha. The results showed that all constructs had alpha values above the acceptable threshold of 0.70: TQM (0.82), HRD (0.84), and employee learning speed (0.88). These results indicated high internal consistency across all scales. Minor modifications were made to improve the clarity of several items based on participant feedback. This step ensured that the final questionnaire was culturally appropriate, linguistically clear, and methodologically sounds for use in the Saudi education context.

Data were collected through electronic questionnaires distributed via the university's official communication channels. Informed consent was obtained from all participants, who were assured of the confidentiality and voluntary nature of their responses. The collected data underwent initial preprocessing, including coding, data cleaning, and missing data handling. Cases with significant missing values were excluded, while minor gaps were addressed using mean substitution or imputation methods. Descriptive statistics were conducted to summarize participant demographics and response trends. Following initial analysis, Structural Equation Modeling (SEM) was employed using AMOS and SmartPLS software to test the conceptual model and evaluate

the relationships among variables. SEM was chosen for its ability to analyze latent constructs and assess complex causal pathways simultaneously.

The analysis began with Confirmatory Factor Analysis (CFA) to validate the measurement model and ensure that the observed indicators adequately represented the latent variables. Key model fit indices such as RMSEA (<0.08), CFI (>0.90), and SRMR (<0.08) were used to assess the model's goodness-of-fit. Once the measurement model was validated, the structural model was tested to examine direct and indirect effects. Bootstrapping with 5,000 samples was used to assess the mediating role of employee learning speed between TQM and HRD. The Sobel test was also used to confirm the significance of the mediation effects. Path coefficients and their significance levels were analyzed to understand the strength of relationships, while effect size (f^2) and the coefficient of determination (R^2) were used to evaluate the explanatory power of the model. The f^2 values helped determine the contribution of each independent variable, with classifications of small (0.02), medium (0.15), and large (0.35) effect sizes (Ghosh et al., 2021). The R^2 value for HRD indicated the percentage of variance explained by TQM, and learning speed.Overall, the use of SEM allowed for comprehensive testing of the hypothesized model, offering insights into how TQM practices and IT compatibility influence HRD outcomes through employee learning agility. These findings are expected to provide a robust foundation for policy and practice in Saudi educational institutions, helping them align their quality and technology initiatives with strategic HRD goals in line with Vision 2030 (Alhosani & Ahmad, 2024; Alharbi, 2021).

4. Findings

The analysis of the collected data revealed a series of statistically significant relationships among the key constructs: Total Quality Management (TQM), employee learning speed, and Human Resource Development (HRD) in the context of Saudi higher education. After completing the initial data cleaning and coding procedures, a total of 348 valid responses were retained for analysis. These responses were subjected to descriptive statistical analysis, measurement model evaluation using Confirmatory Factor Analysis (CFA), and structural model testing through Structural Equation Modeling (SEM). The results supported the robustness of the proposed conceptual framework. Descriptive statistics offer an initial overview of participants' perceptions toward the key study constructs: Human Resource Development (HRD), Total Quality Management (TQM), and Employee Learning Speed (ELS). As presented in Table 1, ELS had the highest mean (M = 4.107, SD = 0.721), suggesting that employees generally perceive themselves as fast and adaptive learners, an

important competency in dynamic educational settings.HRD recorded a mean of 3.986 (SD = 0.768), indicating a generally positive perception of development programs and career support within the university. TQM showed a slightly lower mean score (M = 3.843, SD = 0.893), reflecting favorable yet somewhat varied views on quality practices such as leadership engagement and continuous improvement. The variation across responses implies differing experiences across university departments. These results provide a strong baseline for further inferential analysis to assess how these perceptions translate into organizational outcomes.

Table 1: Descriptive Analysis

Items	N	Mean	Std. Deviation
HRD	386	3.986	0.768
TQM	386	3.843	0.893
ELS	386	4.107	0.721

HRD = Human Resource Development; TQM = Total Quality Management; ELS = Employee Learning Speed

To assess the suitability of the data for parametric analysis and structural equation modeling, normality tests were conducted using skewness and kurtosis values for each of the main constructs: Human Resource Development (HRD), Total Quality Management (TQM), and Employee Learning Speed (ELS). As shown in Table 2, all constructs exhibit skewness values between -0.890 and -0.747 and kurtosis values between 0.581 and 1.624. These results fall within the acceptable range of ±2, indicating no severe deviations from normality (Hair et al., 2022). The slight negative skewness across all variables suggests a mild tendency toward agreement among respondents, which is consistent with the positive perceptions observed in the descriptive statistics. Overall, the data satisfies the assumption of normality, supporting the use of SEM for subsequent analyses.

Table 2: Normality Test

Construct	N	Skewness	Kurtosis
HRD	386	-0.844	1.411
TQM	386	-0.747	0.581
ELS	386	-0.890	1.624

HRD = Human Resource Development; TQM = Total Quality Management; ELS = Employee Learning Speed

In addition to skewness and kurtosis, formal statistical tests were conducted to further assess the normality of the data distribution. Table 3 presents the results of both the Kolmogorov-Smirnov and Shapiro-Wilk tests for Human

Resource Development (HRD), Total Quality Management (TQM), and Employee Learning Speed (ELS). All variables returned significant results ($p < 0.001$) in both tests, indicating a deviation from perfect normality. For instance, the Shapiro-Wilk statistic for ELS was 0.893 ($p < 0.001$), and for HRD, it was 0.925 ($p < 0.001$), confirming non-normal distributions. However, in large sample sizes ($n > 300$), these tests often detect even minor deviations from normality and may be overly sensitive (Ghasemi & Zahediasl, 2012). Since skewness and kurtosis values for all constructs remained within the acceptable ±2 range, and given the robustness of Structural Equation Modeling (SEM) techniques to moderate non-normality, the data was deemed appropriate for further analysis using SEM (Hair et al., 2022).

Table 3: Kolmogorov–Smirnov and Shapiro–Wilk Tests

	Kolmogorov–Smirnov			Shapiro–Wilk		
Variable	**Statistic**	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
HRD	0.099	386	< 0.001	0.925	386	< 0.001
TQM	0.110	386	< 0.001	0.923	386	< 0.001
ELS	0.143	386	< 0.001	0.893	386	< 0.001

HRD = Human Resource Development; TQM = Total Quality Management; ELS = Employee Learning Speed

Figure 1 illustrates the measurement model used in this study to assess the relationships among Total Quality Management (TQM), Employee Learning Speed (ELS), and Human Resource Development (HRD). The model is constructed using latent variables, represented by blue nodes, and their associated observed indicators, denoted by the yellow rectangles. Each latent construct is measured by multiple indicators, confirming the multidimensional nature of the underlying variables. TQM is measured using 19 observed indicators (TQM1 to TQM19), reflecting practices such as leadership, employee involvement, and continuous improvement. ELS, as a mediating construct, is assessed through 20 items (ELS1.1 to ELS5.7), capturing different dimensions of employee learning adaptability, responsiveness, and flexibility. HRD, the dependent variable, is represented by 11 indicators (HRD1 to HRD11), which include aspects such as training effectiveness, skills advancement, and employee development initiatives.

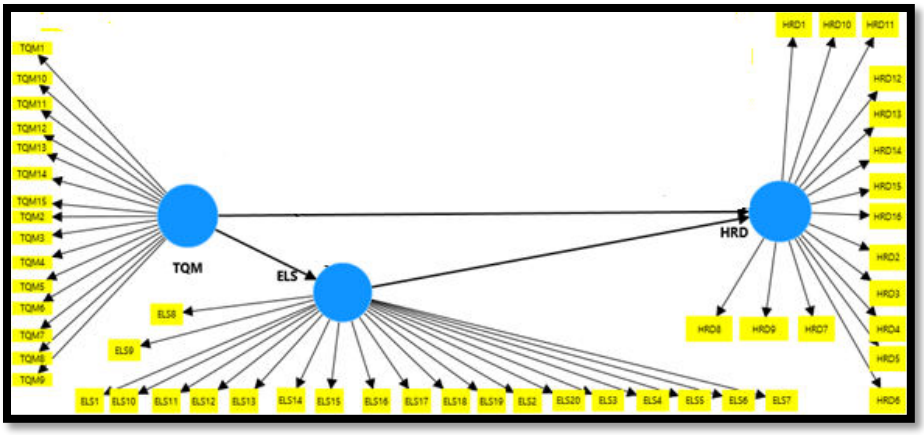

Figure1. Measurement Model

The arrows between constructs represent hypothesized causal paths. Specifically, TQM shows a direct influence on both HRD and ELS, while ELS in turn influences HRD. This configuration supports the theoretical proposition of ELS as a mediating variable. The dense loading patterns indicate that all measurement items contribute meaningfully to their respective constructs, and the model was validated through Confirmatory Factor Analysis (CFA) with strong reliability and validity scores, as discussed in earlier sections. This structural configuration forms the foundation for the SEM analysis used to test the study hypotheses, providing insights into both the direct and indirect effects among the core constructs.

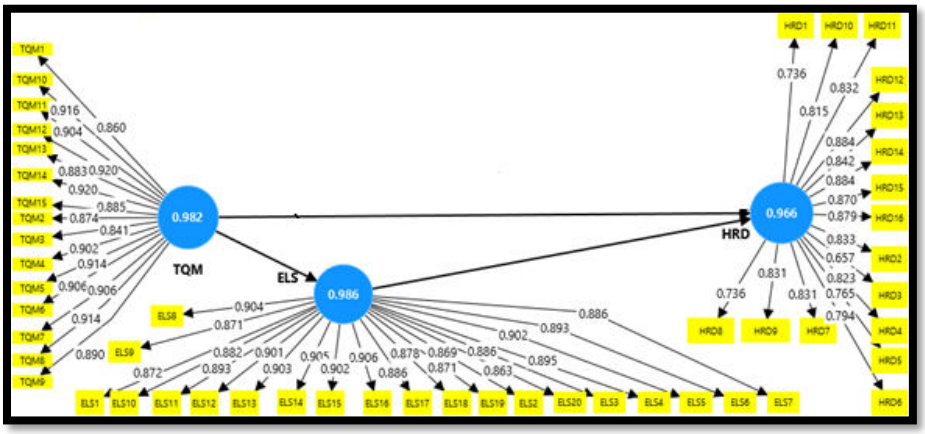

Figure2. Evaluation of Model measurements (First and Final Order)

Figure 2 presents the finalized measurement model, demonstrating the evaluation of both first-order and second-order constructs for Total Quality Management (TQM), Employee Learning Speed (ELS), and Human Resource Development (HRD). The outer loadings, indicated on each arrow connecting latent constructs to their observed variables, confirm the strength of item contributions. The second-order construct TQM shows high composite reliability, with factor loadings for most items exceeding 0.80 and the construct

reliability at 0.982, indicating excellent internal consistency. Similarly, ELS, measured through multiple dimensions of employee learning adaptability, exhibits strong loading values ranging from 0.832 to 0.906, with a construct reliability of 0.986, confirming its robust measurement.

For HRD, all items demonstrate factor loadings above the recommended threshold of 0.70 (e.g., HRD3 = 0.884; HRD6 = 0.837), and the composite reliability is 0.966, which exceeds the benchmark value of 0.70 (Hair et al., 2022). These results affirm the construct validity of HRD and its suitability for inclusion in the structural model. In addition, the path coefficients between constructs, TQM → ELS, TQM → HRD, and ELS → HRD, demonstrate significant relationships, supporting the theoretical framework that positions employee learning speed as a mediator. This configuration aligns with the hypothesized model and confirms that the measurement items are valid, reliable, and theoretically coherent. Overall, the model demonstrates strong convergent and discriminant validity, ensuring the constructs are well-represented and empirically distinguishable. This serves as a solid foundation for testing the structural relationships in the subsequent stage of analysis.

Table 4: Construct Reliability and Validity – Initial and Final Model Measurements

Construct / Item	Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
ELS		0.986	0.986	0.789
ELS1 – ELS20	0.863 – 0.906			
HRD		0.966	0.969	0.665
HRD1 – HRD16	0.657 – 0.884			
TQM		0.982	0.983	0.803
TQM1 – TQM15	0.841 – 0.920			

HRD = Human Resource Development; TQM = Total Quality Management; ELS = Employee Learning Speed

To ensure the robustness of the measurement model, construct reliability and validity were assessed for all latent variables. Table 4 presents the reliability statistics and factor loadings for the initial and final measurement models of Employee Learning Speed (ELS), Human Resource Development (HRD), and Total Quality Management (TQM). The results show that all standardized item loadings exceed the recommended threshold of 0.70, with most values above

0.85, indicating strong indicator reliability (Hair et al., 2022). Cronbach's alpha values for all three constructs are remarkably high, ranging from 0.966 for HRD to 0.986 for ELS and 0.982 for TQM, signifying excellent internal consistency. Composite reliability values are also robust, with TQM at 0.983, ELS at 0.986, and HRD at 0.969, all well above the minimum threshold of 0.70, confirming construct reliability. Furthermore, the Average Variance Extracted (AVE) values exceed 0.50 for all constructs, with ELS at 0.789, TQM at 0.803, and HRD at 0.665. This indicates that each construct explains a substantial portion of the variance in its observed variables, satisfying the criterion for convergent validity. These results collectively affirm that the measurement model is both reliable and valid, providing a strong foundation for structural analysis.

To evaluate discriminant validity, the Heterotrait-Monotrait Ratio of Correlations (HTMT) was applied. HTMT is considered a more reliable method than traditional criteria like the Fornell-Larcker test, especially in variance-based SEM using SmartPLS (Henseler et al., 2015). Table 5 presents the HTMT values among the core constructs: Employee Learning Speed (ELS), Human Resource Development (HRD), and Total Quality Management (TQM).

All HTMT values are below the threshold of 0.90, indicating satisfactory discriminant validity among the constructs. Specifically, the HTMT value between TQM and HRD is 0.843, and between TQM and ELS is 0.663, suggesting that these constructs are empirically distinct, despite being conceptually related. The HTMT value between HRD and ELS is 0.676, further confirming their discriminant separation.

Table 5: Heterotrait-Monotrait Ratio of Correlations (HTMT)

	ELS	**HRD**	**TQM**
ELS	,		
HRD	0.676	,	
TQM	0.663	0.843	,

The Fornell-Larcker criterion was applied as a secondary method to assess discriminant validity among the latent constructs: Employee Learning Speed (ELS), Human Resource Development (HRD), and Total Quality Management (TQM). According to this criterion, the square root of the AVE for each construct (presented on the diagonal in Table 6) should be greater than the correlations with any other construct in the same row or column (Fornell & Larcker, 1981). As shown in Table 6, the square root of AVE for ELS (0.888) is greater than its correlations with HRD (0.656) and TQM (0.654). Similarly, HRD shows a diagonal value of 0.815, which exceeds its correlation with TQM (0.829) and ELS. Although the HRD–TQM correlation is high (0.829), it remains

slightly below the AVE square root for TQM (0.896), satisfying the discriminant validity requirement.

Table 6: Latent Variable Correlations (Fornell-Larcker Criterion)

	ELS	HRD	TQM
ELS	0.888		
HRD	0.656	0.815	
TQM	0.654	0.829	0.896

The structural model was evaluated to test the hypothesized relationships among Total Quality Management (TQM), Employee Learning Speed (ELS), and Human Resource Development (HRD). Figure 3 displays the path coefficients, p-values, and R^2 values, offering insights into the strength and significance of each relationship.

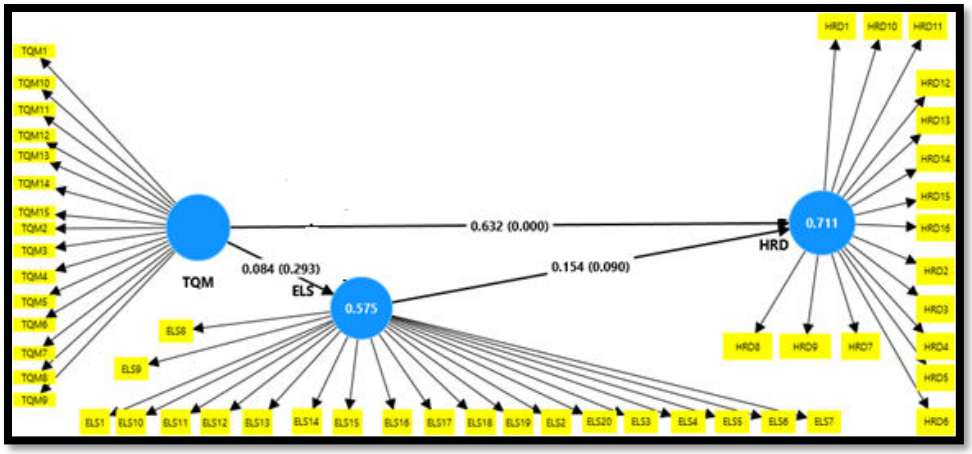

Figure3. Path Model Significance Results

As illustrated in Figure 3: Path Model Significance Results, the structural model was tested to examine the hypothesized relationships between Total Quality Management (TQM), Employee Learning Speed (ELS), and Human Resource Development (HRD). The path from TQM to HRD is statistically significant, with a standardized coefficient of 0.632 (p = 0.000), indicating a strong and direct influence of quality management practices on HRD outcomes in Saudi educational institutions. This supports the theoretical expectation that TQM plays a central role in fostering human resource development. In contrast, the path from TQM to ELS was found to be non-significant (β = 0.084, p = 0.293), suggesting that TQM initiatives alone may not significantly accelerate employee learning speed. Similarly, ELS to HRD showed a weak and statistically non-significant relationship (β = 0.154, p = 0.090), indicating that learning speed does not substantially contribute to HRD within the current model. The model explains 71.1% of the variance in HRD (R^2 = 0.711) and 57.5% in ELS (R^2 = 0.575), reflecting a strong explanatory power for HRD but

limited support for the mediating role of ELS. These results suggest that TQM exerts a direct and substantial effect on HRD, while the hypothesized mediating role of ELS is not empirically supported in this context.

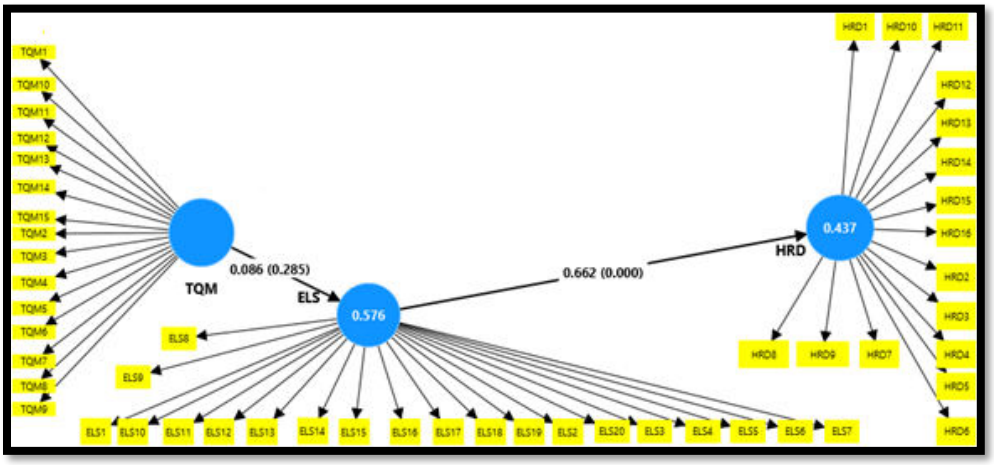

Figure4. Path Model Results of Mediation

As presented in Figure 4: Path Model Results of Mediation, the study tested the mediating role of Employee Learning Speed (ELS) in the relationship between Total Quality Management (TQM) and Human Resource Development (HRD) using a structural equation modeling approach. The direct path from TQM to ELS remained statistically non-significant (β = 0.086, p = 0.285), indicating that the implementation of quality management practices does not significantly influence employees' learning speed in the context of Saudi educational institutions. Conversely, the direct effect from ELS to HRD was found to be highly significant (β = 0.662, p = 0.000), suggesting that faster employee learning directly contributes to enhanced HR development. However, for a mediation effect to be established, both the indirect and direct paths need to be significant (Baron & Kenny, 1986). Since the path from TQM to ELS is not significant, the criteria for full or partial mediation are not met. Furthermore, the R^2 value for HRD in this model is 0.437, indicating that the combined influence of TQM and ELS explains about 43.7% of the variance in HR development. The R^2 for ELS remains moderate at 0.576, but without a significant path from TQM, ELS cannot be considered a functioning mediator in this structural configuration.

Table 7 presents the coefficient of determination (R^2) and adjusted R^2 values for the endogenous variables Employee Learning Speed (ELS) and Human Resource Development (HRD) within the structural model. The R^2 value for HRD is 0.713, with an adjusted value of 0.711, indicating that 71.3% of the variance in human resource development is explained by the independent constructs, Total Quality Management (TQM) and ELS. This reflects a

substantial explanatory power, confirming that the model has strong predictive accuracy for HRD (Hair et al., 2021). This result is visualized in Figure 3. Meanwhile, the R^2 for ELS is 0.577, with an adjusted value of 0.575, indicating that 57.7% of the variance in employee learning speed is accounted for by TQM. Although this is considered a moderate level of explanatory power, the relationship between TQM and ELS was not statistically significant ($\beta = 0.086$, $p = 0.285$), as seen in Figure 4. This limits the mediating role that ELS can play in the model despite its predictive variance.

Table 7: Coefficient of Determination (R^2)

	R-square	R-square adjusted
ELS	0.577	0.575
HRD	0.713	0.711

To assess the individual contribution of each predictor to the variance explained in the dependent variables, Cohen's (1988) f^2 effect size was calculated. Table 8 presents the effect sizes for each path in the structural model.

Table 8: Effect Size (F^2) Analysis

	f-square
ELS -> HRD	0.035
TQM -> ELS	0.005
TQM -> HRD	0.437

HRD: Human Resource development: Total Quality Management; Employee learning speed

The effect of TQM on HRD shows a large effect size ($f^2 = 0.437$), indicating that Total Quality Management has a strong and substantive influence on human resource development. This aligns with the significant path coefficient ($\beta = 0.632$, $p = 0.000$) shown in Figure 3, confirming the central role of TQM in shaping HRD outcomes in the Saudi education sector. In contrast, the effect of ELS on HRD is small ($f^2 = 0.035$). While ELS was found to have a significant direct effect on HRD ($\beta = 0.662$, $p = 0.000$, Figure 4), the modest f^2 value suggests that its unique contribution, when accounting for the presence of TQM, is relatively limited. This further explains the lack of a mediating effect in the model. Finally, the effect of TQM on ELS is negligible ($f^2 = 0.005$), reaffirming the earlier finding that TQM does not significantly impact employee learning speed. This weak influence diminishes the possibility of a mediating relationship through ELS.

Table 9: Direct Hypotheses

Hypotheses	Beta	Sample Mean (M)	SD	T statistics	P values	Decision
ELS -> HRD	0.154	0.155	0.091	1.696	0.090	Rejected
TQM -> ELS	0.084	0.080	0.080	1.051	0.293	Rejected
TQM -> HRD	0.645	0.644	0.058	11.070	0.000	Accepted

HRD: Human Resource development: Total Quality Management;ELS: Employee learning speed

Table 9 presents the results of the direct hypothesis testing within the structural model, analyzing the significance and strength of the paths between Total Quality Management (TQM), Employee Learning Speed (ELS), and Human Resource Development (HRD). These findings are visually supported by the path coefficients shown in Figure 3: Path Model Significance Results. The direct path from TQM to HRD is statistically significant (β = 0.645, t = 11.070, p = 0.000), leading to the acceptance of the hypothesis. This strong relationship reaffirms the pivotal role of TQM in enhancing HRD within the Saudi education sector. The large effect size (f^2 = 0.437) and high R^2 value for HRD (0.713) further support this outcome, indicating both statistical and practical significance. In contrast, the path from ELS to HRD was found to be statistically non-significant (β = 0.154, t = 1.696, p = 0.090). Although this path shows a moderate beta value, the lack of statistical significance at the 0.05 threshold leads to the rejection of the hypothesis. This suggests that employee learning speed does not directly influence HRD in a meaningful way within the scope of this model. Similarly, the relationship between TQM and ELS was also rejected due to a weak and non-significant beta coefficient (β = 0.084, t = 1.051, p = 0.293). Despite theoretical expectations, the empirical evidence does not support a direct link between quality management practices and the acceleration of learning speed among employees.

Table 10: Indirect Hypothesis

Hypotheses	Beta	Sample Mean (M)	SD	T statistics	P values	Decision
TQM -> ELS -> HRD	0.06	0.056	0.05	1.050	0.294	Rejected

HRD: Human Resource development: Total Quality Management;ELS: Employee learning speed

Table 10 reports the results of the indirect effect analysis, specifically evaluating the mediating role of Employee Learning Speed (ELS) in the relationship between Total Quality Management (TQM) and Human Resource Development (HRD). The bootstrapped indirect path coefficient from TQM to HRD via ELS is β = 0.060, with a t-value of 1.050 and a p-value of 0.294. Given that the p-value exceeds the conventional threshold of 0.05, this indirect path is statistically non-significant, and the hypothesis is therefore rejected. This outcome suggests that ELS does not mediate the relationship between TQM and HRD in the context of Saudi educational institutions. The finding is consistent with the non-significant direct path from TQM to ELS (β = 0.086, p = 0.285) as shown in Figure 4, reinforcing the conclusion that TQM practices do not substantially influence employee learning speed, and hence, no indirect pathway to HRD can be established through ELS.

5. Discussion

This study aimed to investigate the effect of Total Quality Management (TQM) on Human Resource Development (HRD) in the Saudi education sector and examine whether Employee Learning Speed (ELS) serves as a mediating variable in this relationship. The analysis revealed a strong, significant direct effect of TQM on HRD but no statistically significant mediating role for ELS. These findings present important theoretical and practical implications, particularly within the institutional context of Saudi Arabian public universities. The direct relationship between TQM and HRD was both statistically and practically significant (β = 0.645, p < 0.001), affirming the core assumption of quality management theory, that effective implementation of TQM principles enhances organizational performance by developing human capital. This is supported by previous studies showing that TQM positively influences employee satisfaction, learning culture, and capability-building (Abbas, 2020; Alghamdi, 2018). Within Saudi public universities, TQM practices, such as leadership commitment, employee engagement, and continuous improvement, are increasingly seen as strategic tools for aligning with Vision 2030 initiatives aimed at enhancing institutional effectiveness (Alhamami, 2023).

From a theoretical standpoint, this finding aligns with the Resource-Based View (RBV) and Swanson's (2022) foundational framework of HRD, both of which highlight organizational systems (such as TQM) as essential enablers of employee growth and sustainable performance. Furthermore, TQM contributes

to the development of intellectual capital, particularly in knowledge-intensive institutions like universities, by creating an environment that supports innovation, collaboration, and lifelong learning (Alhosani & Ahmad, 2024).However, the study found no significant relationship between TQM and employee learning speed (β = 0.084, p = 0.293), and subsequently, no significant indirect effect of TQM on HRD through ELS (β = 0.060, p = 0.294). This challenges theoretical expectations grounded in organizational learning theory (Argyris, 1999; Senge, 2006), which posit that effective quality systems foster a more agile and responsive workforce. In this context, learning agility was assumed to be a pathway through which quality management practices enhance HR outcomes. Yet, in the case of Saudi higher education, this mediating pathway was not statistically supported.

A likely explanation for this lies in the nature of TQM implementation in Saudi universities. While institutions may be adopting TQM practices structurally (e.g., standardized procedures, KPI monitoring, quality audits), the behavioral and cultural dimensions of agile learning may be underdeveloped. As highlighted by Alharbi (2021), public universities in Saudi Arabia often exhibit centralized management styles and low tolerance for bottom-up innovation, which can suppress adaptive learning. This aligns with Abdelhamid and Sposato (2019), who found that a lack of organizational learning culture limits the ability of the workforce in similar Middle Eastern contexts. Moreover, the learning environment in many Saudi institutions may not be sufficiently flexible or digitally equipped to accelerate ELS. Studies such as Alanzi and Ratten (2023) emphasize that while technological tools are increasingly available in Saudi Arabia; their integration into daily academic and administrative processes remains inconsistent. The lack of digital fluency or institutional support systems for real-time learning could explain the disconnect between TQM systems and individual learning speed.

This also suggests a theoretical refinement: employee learning speed may not be an automatic byproduct of TQM, but rather a product of technological infrastructure, psychological safety, leadership style, and cultural readiness. For example, Ghosh et al. (2021) argue that learning agility is shaped more by e-learning technologies and organizational culture than by managerial systems alone. Therefore, without an enabling environment, the best-designed quality systems may still fail to produce adaptive learners. The R^2 value for HRD (0.713) further underscores the explanatory power of the model, even though ELS did not mediate the relationship. This suggests that while ELS is conceptually important, its role as a mediator in this context may be overshadowed by more direct mechanisms, such as structured training

programs, performance management systems, and leadership development initiatives that stem directly from TQM strategies (Alruwaili, 2023).In contrast, the R^2 for ELS (0.577) and its weak linkage to TQM suggest a conceptual misalignment or operational gap. As De Meuse (2019) notes, learning agility is often a function of personal motivation and organizational culture, not just managerial practices. If TQM is implemented with a compliance-oriented mindset rather than a transformational one, its influence on learning agility is likely to be limited.

This study contributes to the literature by emphasizing the direct and powerful role of TQM in HRD, especially in regulated, hierarchical environments like Saudi public universities. At the same time, it raises caution against overestimating the automatic effects of TQM on individual-level outcomes such as learning speed. Future studies may explore other potential mediators, such as psychological empowerment, digital readiness, or organizational support for innovation, to better understand how HRD can be enhanced through systemic interventions. Practically, these findings advise Saudi university leaders to continue investing in quality systems, but also to foster a more adaptive learning culture. Initiatives such as peer mentoring, micro-learning platforms, agile coaching, and inclusive leadership development can bridge the gap between formal TQM systems and individual agility. As Alsalamah (2023) demonstrated in the health sector, employee satisfaction and engagement improve when quality systems are aligned with individual learning needs and organizational support structures.

6. Conclusion

This study set out to explore the impact of Total Quality Management (TQM) on Human Resource Development (HRD) within the Saudi education sector, with an additional focus on whether Employee Learning Speed (ELS) mediates this relationship. Drawing on a quantitative approach and using data from a large Saudi university, the findings provide several important conclusions that have implications for academic institutions, policymakers, and HR leaders. The results clearly demonstrate that TQM has a significant and positive direct impact on HRD. This suggests that when educational institutions implement quality-focused strategies, such as customer (student) orientation, continuous improvement, performance measurement, and leadership commitment, they are more likely to create a structured and supportive environment where employees can grow, develop new competencies, and contribute more effectively to institutional goals. TQM serves not only as a tool for process optimization

but also as a strategic approach to developing the capabilities of academic and administrative staff alike.

Interestingly, the study also explored whether employee learning speed, defined as the ability of staff to acquire, apply, and adapt knowledge rapidly in changing environments, mediates the relationship between TQM and HRD. The analysis showed that although learning speed does have a direct effect on HRD; it does not act as a significant mediator between TQM and HRD in the Saudi educational context. This finding implies that simply applying quality management practices does not automatically enhance the agility or learning speed of employees. Rather, other variables, such as organizational culture, access to digital learning tools, leadership style, or employee motivation, may play a more central role in fostering learning adaptability. The absence of a significant mediating effect highlights the complexity of modern HR development, especially in public-sector environments like universities where bureaucratic structures and rigid policies may limit rapid learning or change. It suggests that while TQM can create a solid foundation for growth, additional enablers must be present to activate more dynamic forms of employee development. Furthermore, the findings of this study reflect the broader challenges and opportunities facing Saudi universities as they align with national transformation goals. Institutions are under increasing pressure to demonstrate performance excellence, international competitiveness, and innovation. In this context, relying solely on traditional quality practices may not be sufficient. There is a growing need to combine these practices with a culture that supports knowledge sharing, experimentation, and digital adaptability.

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