
**THE IMPACT OF TRANSFORMATIONAL LEADERSHIP
ON PROJECT SUCCESS: THE MEDIATING ROLE OF
TEAMWORK QUALITY IN CONSTRUCTION
INDUSTRY IN EGYPT**

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Abstract:

The construction industry in Egypt faces numerous challenges that demand effective leadership and cohesive teamwork to ensure project success. Multiple studies have emphasized the substantial significance and influence of construction on the Egyptian economy in many aspects. Recently, teamwork quality and leadership style have been the focus of many studies because of their pivotal role in project's success. This study investigates the impact of transformational leadership on project success, with a particular focus on the mediating role of teamwork quality. Drawing on existing literature, which underscores the significant impact of leadership styles on organizational outcomes, this research extends these

findings to the construction field. The empirical study conducted to test the hypotheses regarding the effect of transformational leadership on project success with the mediating effect of TWQ using data from 357 professional team members in the construction industry in Egypt demonstrates that transformational leadership has a strong direct effect on project success. Moreover, the quality of teamwork acts as a critical mediator, further enhancing project outcomes. The results indicate that transformational leadership not only directly contributes to project success but also has an indirect effect through fostering high-quality teamwork. These findings provide valuable insights for construction industry practitioners and highlight the importance of adopting transformational leadership practices to achieve superior project performance. This study advises companies in the construction sector in Egypt to enhance the leadership styles of project managers to achieve optimal project outcomes and improve the cooperation quality of project teams. Keywords: Transformational leadership, Teamwork quality, Project success, construction, Egypt

المخلص:

يواجه قطاع البناء في مصر العديد من التحديات التي تتطلب قيادة فعالة وعمل جماعي متماسك لضمان نجاح المشاريع. وقد أكدت دراسات متعددة على الأهمية الكبيرة والتأثير الملحوظ لقطاع البناء على الاقتصاد المصري في العديد من الجوانب. في الآونة الأخيرة، أصبح التركيز على جودة العمل الجماعي وأسلوب القيادة محور اهتمام العديد من الدراسات بسبب دورهما الحاسم في نجاح المشاريع. تستقصي هذه

الدراسة تأثير القيادة التحويلية على نجاح المشاريع، مع التركيز بشكل خاص على الدور الوسيط لجودة العمل الجماعي. استناداً إلى الأدبيات الحالية التي تؤكد التأثير الكبير لأنماط القيادة على نتائج المنظمات، توسع هذه الدراسة هذه النتائج لتشمل مجال البناء. وتظهر الدراسة التطبيقية التي أجريت لاختبار الفرضيات المتعلقة بتأثير القيادة التحويلية على نجاح المشاريع مع التأثير الوسيط لجودة العمل الجماعي باستخدام بيانات من ٣٥٧ عضواً محترفاً في فرق العمل في صناعة البناء في مصر أن القيادة التحويلية لها تأثير مباشر قوي على نجاح المشاريع. علاوة على ذلك، تعمل جودة العمل الجماعي كوسيط حاسم، مما يعزز من نتائج المشاريع. وتشير النتائج إلى أن القيادة التحويلية لا تساهم فقط بشكل مباشر في نجاح المشاريع، بل أيضاً لها تأثير غير مباشر من خلال تعزيز العمل الجماعي عالي الجودة. تقدم هذه النتائج رؤى قيمة للممارسين في صناعة البناء وتبرز أهمية تبني ممارسات القيادة التحويلية لتحقيق أداء فائق للمشاريع. توصي هذه الدراسة الشركات في قطاع البناء في مصر بتعزيز أساليب القيادة لدى مديري المشاريع لتحقيق أفضل النتائج وتحسين جودة التعاون في فرق العمل

الكلمات الرئيسية: القيادة التحويلية، جودة العمل الجماعي، نجاح المشاريع، البناء، مصر

Introduction

Transformational leadership (TL) and teamwork quality (TWQ) are important determinants of project success (PS) in many domains. Transformational leadership is a leadership style that refers to a consistent and enduring pattern of behavior demonstrated by a leader in their interactions with employees to reach the required performance (Amirul et al., 2012). Project teamwork partially mediates the Transformational leadership and project success relationship in higher education projects (Syed

Muhammad Javed Iqbal et al., 2019). In the construction sector, team performance was proven to mediate the effect of Transformational leadership and project success (H. Saleem et al., 2021). Construction projects entail intricate activities that necessitate synchronization, cooperation, and effective communication among team members (Hansen & Moutray, 2018). Team-building practices and teamwork quality (TWQ) serially mediate the relationship between TL and PS in information system development projects (Hussaini Ali et al., 2021). Given the result of these studies, we can conclude the importance of Transformational leadership in enhancing project success through improved teamwork quality through its six dimensions communication, coordination, and cohesion, effort, balance of member contribution and mutual support, highlighting the need for project managers to the best of their ability adapt the four dimensions of transformational leadership, Idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration.

Extensive research consistently demonstrates the significant influence of project success on the overall success of companies operating in the construction industry. Alzahrani (2013) emphasized the importance of contractors' attributes in determining project success. Safety practices, past performance, and effective resource management were identified as key attributes that contribute to successful project outcomes.

Teamwork quality is the main pathway where leadership can be transformed into project success Iqbal (2019). Research consistently supports the idea that teamwork quality plays a crucial role in the relationship between leadership and project success. Several studies have provided evidence in support of this notion. For instance, Iqbal (2019) and Ali (2021) both found that project teamwork partially mediates the relationship between transformational leadership and project success.

Additionally, Aga (2016) found that team-building, which is a key aspect of teamwork, partially mediates the effect of transformational leadership on project success. This suggests that the leader's ability to foster a cohesive and collaborative team environment can enhance the likelihood of project success.

Effective teamwork in the construction industry continues to be a critical factor for project success, and recent research has shed light on various aspects of collaborative work. The success of construction projects relies on the quality of teamwork, emphasizing mutual improvement and project excellence (Abdullah et al., 2019). Clear objectives, trust, cohesiveness, interdependency, and enthusiasm are recognized as key characteristics of effective teamwork in construction Iqbal (2019). These factors foster improved communication, coordination, and problem-solving among team members, leading to enhanced project performance.

Existing literature on project management emphasizes the critical role of project leadership in achieving project success (Oh, 2019). An organization's ability to establish a supportive project culture, where information is shared, collaboration is encouraged, and conflicts are resolved promptly, fosters effective teamwork and enhances overall project outcomes (Maimun, 2010). In the field of project management, the role of leadership has been extensively studied and recognized as a critical factor influencing project success (Müller et al., 2016).

The objective of this research is to investigate the correlation between transformative leadership and project success in the construction industry in Egypt, and to investigate the mediating role of teamwork quality in this relationship. The study seeks to offer valuable insights and contribute to the existing body of knowledge in this field. Specifically, the study aims to:

Assess the main constructs of the research which are transformational leadership, teamwork quality, and project success. Firstly, the research aims to assess the extent to which transformational leadership practices are employed by project leaders in the construction industry in Egypt. This involves evaluating the leadership behaviors and characteristics exhibited by project leaders, such as inspiring and motivating their teams, fostering a shared vision, and promoting individual development. Secondly, the study aims to measure the level of project success achieved in construction projects in Egypt. This involves

evaluating various dimensions of project success, including meeting project objectives, adhering to budget and schedule constraints, and achieving high-quality deliverables. Thirdly, the research aims to explore the quality of teamwork within construction project teams in Egypt. This involves assessing the effectiveness of team collaboration, communication, coordination, and problem-solving within the context of construction projects.

The study also seeks to investigate the relationship between the constructs which are the relationship between transformational leadership and project success in the construction industry in Egypt. This involves analyzing the extent to which transformational leadership practices positively influence project success outcomes, the mediating role of teamwork quality in the relationship between transformational leadership and project success. This involves understanding how the quality of teamwork within construction project teams mediates the influence of transformational leadership on achieving successful project outcomes and the key dimensions of transformational leadership and teamwork quality that significantly contribute to project success in the construction industry in Egypt. This involves analyzing specific leadership behaviors and teamwork attributes that have a significant impact on project success.

Finally, the research aims to provide practical recommendations for project managers and stakeholders in the construction field in Egypt to enhance project success through the promotion of

transformational leadership and teamwork quality. These recommendations may include strategies for developing and fostering transformational leadership practices, as well as methods for improving teamwork quality within construction project teams.

By addressing the research objectives, this study aims to understand the effect of transformational leadership and teamwork quality on project success in the context of the construction domain in Egypt. By addressing this research problem, the construction industry in Egypt can potentially improve and be competitive in the global market.

1. Method

2.1 population and sample

The sample chosen are professionals who were team members of construction project management in consultant offices, construction companies, and owner agencies in Egypt. These teams are employed by enterprises involved in the development of projects for residential, commercial, and institutional buildings, infrastructure projects, and industrial facility construction. This study is project-specific, meaning the data represents the levels of leadership and teamwork on projects (rather than organization-wide). As such, the data collection tool collects project-based information.

As the Population size is not known for this study, the sample size will be calculated using Sample Size Formula for Estimating

Proportions. A confidence level of 95% and (p) of .5 will be used in the study leading to a target sample of 384. The research questionnaire was published digitally through Google Forms and released amongst professional networks and on professional networks on the Internet, the survey remained open for 40 days before it was closed. Then the collected data was analyzed. 392 responses were returned of which 357 responses were complete and valid for use representing 95.6%. The responses returned were adequate for the nature of this study.

1.2.Data collection tools and procedures

This study relied on primary data collected by a survey instrument measure to test the relationship between Transformational leadership, teamwork quality, and project success on projects in the Egyptian construction industry, data was collected through an online questionnaire sent to The data collection tool was developed based on variables used in previous studies. A questionnaire using likert scale will be obtained to measure the quality of transformational leadership (TL), teamwork quality (TWQ) and Project success. Study participants will be first asked to identify a recent project they were familiar with for assessment. For the subject project, the survey then asks participants to assess the project manager's leadership style, teamwork quality, and final performance for that project.

1.3. Questionnaire design

The survey will be composed of Five sections: 1) personal information, 2) Project information, 3) project manager's transformational leadership, 4) teamwork quality, and 5) Project success. The first section obtains information concerning the respondents and the project. The second section gathers information about the subject project's characteristics. The third section assesses how much the project manager follows transformational leadership. The fourth section of the survey measures the level of team communication, collaboration, and cohesiveness on the subject project. The final section evaluates project success in terms of schedule performance, cost performance, quality performance, and stakeholder satisfaction.

The hypothesis verification method involves three key variables: transformational leadership, teamwork quality, and Project success. To evaluate these Variables, the study used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

1.4. Research Variables and Methods

The assessment of transformational leadership used a 20-item five-point Likert scale that was used by Bilal et al. (2019) and was initially created by Podsakoff et al. (1990). Team members were instructed to document the transformational leader behaviors exhibited by their immediate supervisor. To measure teamwork quality, a questionnaire that uses a fully

standardized questionnaire (five-point answer scale) was used by (Hoegl & Gemuenden, 2001) and by (Oh, 2019) was applied to measure TWQ. That questionnaire has a total of 37 questions divided 10,8,6,4 and 10 questions to measure the following items respectively communication, coordination, the balance of member contribution (BMC), mutual support, effort, and cohesion (Hoegl & Gemuenden, 2001). For project success construct, a questionnaire was developed using work from (Dvir et al., 2003). Success criteria of Project success was measured along three criteria that were applied and validated in previous research by (Shenhar et al., 1997) These criteria are: 1. Meeting planning goals (success at the project manager level) that was measured by 5 questions, 2. End-user benefits (success from the end-user point of view) that was measured by 7 questions and 3. Contractor benefits (success at the contractor's level that was measured by 9 questions.

procedures and analysis technique

The analysis began with descriptive statistics, summarizing dataset features through measures of central tendency and variability (standard deviation). This foundational insight aids understanding before moving to validity and reliability checks of the measurement tool. Regression techniques were then applied to test hypotheses, examining the effects of "Transformational Leadership" (independent variable) on "Project Success" (dependent variable) and "Teamwork Quality" (mediating

variable). Simple regression assessed these direct effects, while multiple regression analyzed the impact of transformational leadership dimensions on both project success and teamwork quality. Finally, path analysis was conducted to explore direct and indirect relationships among the variables.

1.5. Dealing with validity and reliability

This research used a questionnaire that was tested and used in previous work. To assess the validity and reliability of the tool used for measuring sample responses, two key metrics were employed: the internal consistency coefficient, which evaluates the correlation between questionnaire items, and Cronbach's Alpha coefficient, which measures the stability of the items and dimensions of the questionnaire. Cronbach's Alpha Coefficient was used to measure the stability of the content variables, including the independent variable (Transformational Leadership), the mediating variable (Teamwork Quality), and the dependent variable (Project Success).

1.6. Research Model and Hypotheses

Given the previous literature, it's of great importance to investigate the effect of transformational leadership on the success of construction projects and to study the mediating role of teamwork quality.

H1: Transformational leadership positively Influences Teamwork Quality.

H2: Teamwork quality positively Influences Project success.

H3: Transformational leadership positively Influences Project success.

H4: Transformational leadership positively Influences Project success through mediating teamwork quality

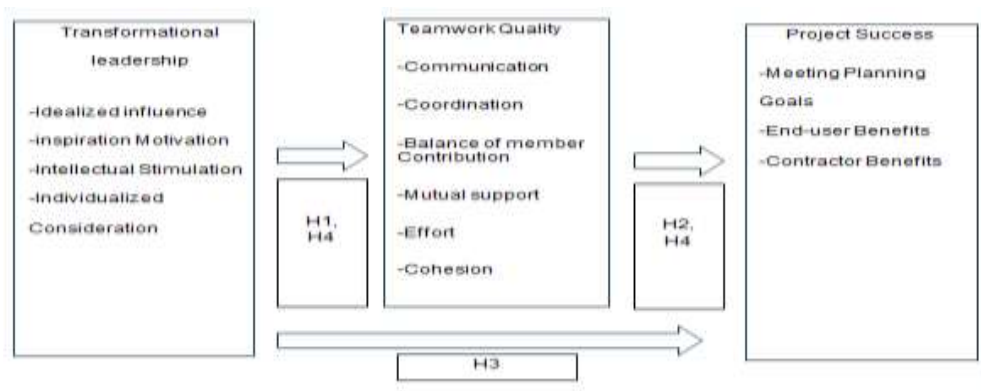


Figure 1. Research model

2. Results

This section illustrates the outcomes of the data collection phase, focusing on the analysis of descriptive statistics from the distributed questionnaire sample to figure out significant conclusions and facilitate comparisons in the study discussion section.

The statistical analysis section uses the correlation and regression analysis for direct relationships and using SEM to

study the indirect effect on the dependent variable, in order to infer the transformational leadership effect on project success through the use of teamwork quality as a mediator.

3.1. Demographic information

Demographic Information: A total of 357 professional team members participated in this survey. Their ages ranged from less than 30 to over 50 years, with 21.6% under 30, 37.3% between 30 and 40, 27.5% between 40 and 50, and 13.7% over 50. In terms of gender, 58.5% were male and 41.5% were female. The positions included 15.1% owners, 41.7% contractors, 10.6% from supervision agencies, and 32.5% consultants Table 1.

Table 1. Demographic information (respondents)

N	Variable	Category	Frequency	Percentage
1	Gender	Male	209	58.5
		Female	148	41.5
2	Age	Less than 30 year	٧٧	٢١.٦
		30 Less than 40 year	١٣٣	٣٧.٣
		40 Less than 50 year	٩٨	٢٧.٥
		More than 50 year	٤٩	١٣.٧
3	Position	Owner	٥٤	١٥.١
		Contractor	١٤٩	٤١.٧
		Supervision agency	٣٨	١٠.٦
		consultant	١١٦	٣٢.٥

Regarding project demographics, the majority of projects were in the building sector (30.5%), followed by industrial (28%), infrastructure (15.4%), and others (26.1%). The installed costs varied, with 54.9% of projects under 10 million. Additionally, 28.6% were new "Greenfield" projects, while 45.4% involved renovations, and 26.1% were expansions Table 2.

Table 2. Demographic information (Projects)

N	Variable	Category	Frequency	Percentage
1	Industry sector	Building	109	30.5
		Industrial	100	28
		Infrastructure	55	15.4
		Others	93	26.1
2	Installed cost	<10 million	196	54.9
		10 <30 Million	67	18.8
		30<60 million	41	11.5
		60<100 million	21	5.9
		>100 million	32	9
3	Initial Site	New "Greenfield"	102	28.6
		Renovation	162	45.4
		Expansion	93	26.1

2.2.Descriptive statistics of key variables

From table 3, it is clear that the general trend of the study sample is on a dimension (Transformational leadership), indicating that it is towards the (Agreement), with a mean of (3.51), and the Std. Deviation (0.68), with Relative importance (70.27%). The most Agreementl dimensions are, (Inspirational

motivation), (Idealized influence), (Intellectual stimulation), (Individual consideration), with Relative importance (71.51%), (70.45%), (69.95%), (69.19%), respectively.

Table 3. Descriptive Statistical of the dimensions of (Transformational leadership)

N	dimensions	Mean	Std. Deviation	Relative importance	Rank
1	Idealized influence	3.52	0.77	70.45%	2
2	Inspirational motivation	3.57	0.74	71.51%	1
3	Intellectual stimulation	3.49	0.76	69.95%	3
4	Individual consideration	3.45	0.79	69.19%	4
T		3.51	0.68	70.27%	

From table 4, it is clear that the general trend of the study sample is on a dimension (Teamwork Quality), indicating that it is towards the (Agreement) and (neutral), with mean of (3.42), and the Std. Deviation (0.49), with Relative importance (68.47%).

The most important dimensions are, (Mutual Support), (Cohesion), (Coordination),(Effort), (Communication), (Balance of Member Contributions), with Relative importance (71.06%), (69.81%), (69.50%), (67.63%), (66.78%),(66.31%), respectively.

Table 4. Descriptive Statistical of the dimension (Teamwork Quality)

N	dimensions	Mean	Std. Deviation	Relative importance	Rank
1	Communication	3.33	0.63	66.78%	5
2	Coordination	3.47	0.65	69.50%	3
3	Balance of Member Contributions	3.31	0.72	66.31%	6
4	Mutual Support	3.55	0.67	71.06%	1
5	Effort	3.38	0.70	67.63%	4
6	Cohesion	3.49	0.55	69.81%	2
T		3.42	0.49	68.47%	

From table 5, it is clear that the general trend of the study sample is on a dimension (Project Success), indicating that it is towards the (Agreement), with a mean of (3.54), and the Std. Deviation (0.62), with Relative importance (70.96%).

The most important dimensions are, (End-user benefits), (Meeting planning goals), and contractor benefits), with Relative importance (73.40%), (71.35%),(and 68.12%), respectively.

Table 5. Descriptive Statistical of the dimension (Project Success)

N	dimensions	Mean	Std. Deviation	Relative importance	Rank
1	Meeting planning goals	3.56	0.73	71.35%	2
2	End-user benefits	3.67	0.76	73.40%	1
3	Contractor benefits	3.40	0.66	68.12%	3
T		3.54	0.62	70.96%	

3.3 Validity and Reliability Analysis

To assess the validity and reliability of the tool used for measuring sample responses, two key metrics were employed: the internal consistency coefficient, which evaluates the correlation between questionnaire items, and the Cronbach's Alpha coefficient, which measures the stability of the items and dimensions of the questionnaire. Cronbach's Alpha Coefficient was used to measure the stability of the content variables, including the independent variable (Transformational Leadership), the mediating variable (Teamwork Quality), and the dependent variable (Project Success). Shown in table 6

Table 6. Results of the Reliability test

Main Dimensions	Reliability	Validity
Independent variable (Transformational leadership). x		
Idealized influence	.841	.917
Inspirational motivation	.797	.892
Intellectual stimulation	.812	.901
Individual consideration	.839	.915
Total: Transformational leadership x	.828	.909
Mediating (Teamwork Quality) m		
Communication	.854	.924
Coordination	.738	.859
Balance of Member Contributions	.762	.872
Mutual Support	.841	.917
Effort	.790	.889
Cohesion	.826	.908
Total: Teamwork Quality m	.857	.925
Dependent (Project Success) y		

Meeting planning goals	.872	.933
End-user benefits	.811	.901
Contractor benefits	.769	.876
Total: The Project Success y	.820	.914
Total Effect	.863	.928

The reliability and validity of the questionnaire used in the study "The Impact of Transformational Leadership on Project Success: The Mediating Role of Teamwork Quality in the Construction Industry in Egypt" were assessed using Cronbach's alpha coefficient. The overall Cronbach's alpha coefficient for the study was found to be 0.863, indicating a high degree of reliability. This high reliability positively impacts the validity (self-honesty) of the study, which was recorded at 0.928.

1. The value of Cronbach's alpha coefficient for the dimensions of Transformational Leadership (x) ranged between 0.797 and 0.841.
2. The value of Cronbach's alpha coefficient for the dimensions of Teamwork Quality ranged between 0.738 and 0.854.
3. The value of Cronbach's alpha coefficient for the dimensions of Project Success ranged between 0.769 and 0.872.

The Cronbach's alpha coefficient values for all dimensions are greater than 70%, indicating a high degree of internal consistency for all questionnaire items. This high internal consistency suggests that the measures used in the study are

reliable, allowing us to confidently rely on the responses to achieve the study's objectives and analyze the results.

Measuring internal consistency

From table 7, it is clear that the correlation coefficients for each dimension of transformational leadership, teamwork quality, and Project Success with their total scores are significant at a level of less than 0.01, ranging from 0.615 to 0.876. This indicates the validity and consistency of the study tools.

Table 7. Internal Consistency Using Pearson Correlation for Transformational Leadership Dimensions

Main Dimensions	Pearson Correlation	SIG.
Independent variable (Transformational leadership). x		
Idealized influence	.876**	Less than 0.01
Inspirational motivation	.715**	Less than 0.01
Intellectual stimulation	.659**	Less than 0.01
Individual consideration	.730**	Less than 0.01
Mediating (Teamwork Quality) m		
Communication	.805**	Less than 0.01
Coordination	.721*	Less than 0.05
Balance of Member Contributions	.675**	Less than 0.01
Mutual Support	.798**	Less than 0.01
Effort	.742**	Less than 0.01
Cohesion	.610**	Less than 0.01
Dependent (Project Success) y		
Meeting planning goals	.873**	Less than 0.01
End-user benefits	.615**	Less than 0.01
Contractor benefits	.724**	Less than 0.01

Note: **Correlation is significant at the 0.01 level.

Note: *Correlation is significant at the 0.05 level.

3.4 Hypothesis Testing

Statistical method used: The (correlation coefficient) of Pearson correlation is used to measure the direction and the strength of the relationship between independent and dependent, Mediator variables, if the level of significance is less than (0.05) it indicates the presence of a significant relationship and if the significance level is greater than (0.05) this indicates that there is no statistically significant relationship. This test was made on the hypothesis of the study.

H₁:(Transformational leadership) x significantly and positively influences (Teamwork Quality) m.

H₂: (Teamwork Quality) m significantly and positively influences (Project Success) y.

H₃:(Transformational leadership) x significantly and positively influences (Project Success) y.

H₄:(Transformational leadership) x significantly and positively influences Project Success y through (Teamwork Quality) m

From the above table it is clear that There is significant positive relationship between Dimensions " The impact of Transformational leadership on Project Success the Mediating role of Teamwork Quality in construction industry in Egypt ", The value of Pearson correlation coefficient is ranging between (0.698 : 0.728) at p-value (level of significant less than) (.01).

Table 8. Correlation between " The impact of Transformational leadership on Project Success the Mediating role of Teamwork Quality in construction industry in Egypt " by using Pearson correlation

Dimensions	x TL	m- TQ	y- PS
x- Transformational leadership	-		
m Teamwork Quality	.728**		
y- Project Success	.698**	.713**	

**** Significant level 0.01**

H₁:(Transformational leadership) x significantly and positively influences (Teamwork Quality) m.

Variables of the hypothesis are transformational leadership and teamwork quality. Simple line regression will be used to examine the relationship between the two variables.

From the above table it is clear that There is a significant positive relationship between (Transformational leadership) and (Teamwork Quality), which reached the correlation coefficient (0.728) at a level significantly less than (0.01). coefficient of determination was 53 % which means the independent variable (Transformational leadership) explains (53%) of the total change in the Mediating variable (Teamwork Quality), which is significant.

The results of the previous table confirmed the existence of a significant impact of all dimensions of (Transformational

leadership) on (Teamwork Quality) according to the Test (t) equal (٢٠.٠١٠), where the level of indication is less than 0.01.

To test the quality of the conciliation model as a whole, (F-test) was used, where the value of the test is (400.396), which is significant at a level less than (0.0١), which indicates the quality of the impact significance of the regression model on (Teamwork Quality).

Given the previous findings Teamwork Quality = 1.577 + .728 Transformational leadership

We accept the statistical alternative hypothesis that "There is an Effect of Transformational Leadership on Teamwork Quality ". As in table 9.

Table 9. Effect of Transformational leadership on Teamwork Quality "simple Linear Regression"

Independent variables	β	t. test		F. test		r	R ²
		Value	Sig.	Value	Sig.		
constant	1.577	١٦.٧٨٠	0.01**	400.396	**٠.٠١٠	.728	53%
Transformational leadership	.525	٢٠.٠١٠	0.01**				

** Significant level 0.01

The effect of the dimensions of TL on teamwork quality showed the following equation: Teamwork Quality $m = 1.574 + 0.269$ Inspirational motivation $x_2 + 0.193$ Individual consideration $x_4 + 0.187$ Intellectual stimulation $x_3 + 0.172$ Idealized influence x_1 .

H₂: (Teamwork Quality) m significantly and positively influences (Project Success) y.

Variables of the hypothesis are teamwork quality and project success. Simple line regression will be used to examine the relationship between the two variables.

From the above table, There is a significant positive relationship between Teamwork Quality and Project Success, with a correlation coefficient of 0.713 at a significance level of less than 0.01.

coefficient of determination was 50.8 % which means the mediating variable, Teamwork Quality, explains 50.8% of the total variation in the dependent variable, Project Success, which is significant.

The results confirm a statistically significant impact of all dimensions of Teamwork Quality on Project Success, as evidenced by the t-test value of 19.140, with a significance level of less than 0.01.

The quality of the regression model was assessed using the F-test, which yielded a value of 366.337, significant at a level of less than 0.01. This indicates the significant impact of the regression model on Project Success.

Given the previous findings $\text{Project Success} = 0.502 + 0.713 \text{ Teamwork Quality}$

Based on these findings, we accept the statistical alternative hypothesis that “There is an effect of Teamwork Quality on Project Success. As in table 10.

Table 10. Effect of the "Teamwork Quality on Project Success" Using simple Linear

Independent variables	β	t. test		F. test		r	R ²
		Value	Sig.	Value	Sig.		
constant	0.502	3.124	0.01**	366.337	**..001	.713	50.8%
Teamwork Quality m	0.890	19.14	0.01**				

** Significant level 0.01

The effect of the dimensions of TWQ on PS showed the following equation: Project Success (y) = 0.489 + 0.304 (Communication) (m1) + 0.260 (Mutual Support) (m4) + 0.228 (Cohesion) (m6) + 0.192 (Coordination) (m2).

H₃:(Transformational leadership) x significantly and positively influences (Project Success) y

From the above table There is a significant positive relationship between Transformational Leadership and Project Success, with a correlation coefficient of 0.698 at a significance level of less than 0.01.

The independent variable, Transformational Leadership, explains 48.8% of the total variation in the dependent variable, Project Success, which is significant.

The results confirm a statistically significant impact of all dimensions of Transformational Leadership on Project Success,

as evidenced by the t-test value of 18.386, with a significance level of less than 0.01.

To test the overall quality of the regression model, the F-test was used. The test yielded a value of 338.038, which is significant at a level of less than 0.01, indicating the strong impact significance of the regression model on Project Success.

The regression equation is as follows: Project Success = 1.337 + 0.698 Transformational Leadership

Based on these findings, We accept the statistical alternative hypothesis there is an Effect of "Transformational leadership on Project Success ". as in table 11.

Table 11. Effect of "Transformational Leadership on Project Success" simple Linear Regression

Independent variables	β	t. test		F. test		r	R ²
		Value	Sig.	Value	Sig.		
constant	1.337	10.91	0.01**	338.038	** .001	.698	48.8%
TL x	.629	18.38	0.01**				

** Significant level 0.01

The effect of the dimensions of TL on PS showed the following equation: Project Success = 1.317 + 0.337 Idealized Influence (x1) + 0.216 Inspirational Motivation (x2) + 0.138 Intellectual Stimulation (x3).

H₄:(Transformational leadership) x significantly and positively influences Project Success y through (Teamwork Quality) m

Model 1

The Research Hypotheses variables are divided to:

a- Observed Endogenous Variables: include dependent variable Project Success (Meeting planning goals y1, End-user benefits y2, Contractor benefits y3", and mediating variable Teamwork Quality (Communication m1, Coordination m2 , Balance of Member Contributions m3 , Mutual Support m4 , Effort m5 , Cohesion m6).

b- Observed Exogenous Variables: Include independent variable Transformational leadership "Idealized influence x1, Inspirational motivation x2, and Intellectual stimulation x3 , Individual consideration x4 " .

Evaluating the coefficients of the structural model for interpreting relationships:

Regression weights for model 1

Table 12. Estimates of the coefficients of the structural model "The indirect effect of Transformational leadership on Project Success through the mediation of Teamwork Quality"

Path			Estimate	S.E	C.R.	P-Value	Sig.
Communication m1	←	Idealized influence x1	0.131	0.052	2.493	0.013**	Sig.
	←	Inspirational motivation x2	.258	.054	4.747	.001**	Sig.
	←	Intellectual stimulation x3	.024	.058	0.420	.674	Not Sig.
	←	Individual consideration x4	.190	.053	3.566	.001**	Sig.
Coordination m2	←	Idealized influence x1	.052	.063	1.819	.013**	Sig.
	←	Inspirational motivation x2	.191	.066	2.908	.004**	Sig.
	←	Intellectual stimulation x3	.109	.070	1.560	.019*	Sig.
	←	Individual consideration x4	.086	.064	1.341	.180	Not Sig.
Balance of Member Contributions m3	←	Idealized influence x1	.049	.072	.684	.494	Not Sig.
	←	Inspirational motivation x2	.145	.075	1.946	.022**	Sig.
	←	Intellectual stimulation x3	.183	.080	2.297	.012**	Sig.
	←	Individual consideration x4	.052	.073	1.704	.041**	Sig.
Mutual Support m4	←	Idealized influence x1	.182	.056	3.240	.001**	Sig.
	←	Inspirational motivation x2	.181	.058	3.107	.002**	Sig.
	←	Intellectual stimulation x3	.107	.062	1.725	.085	Not Sig.
	←	Individual consideration x4	.173	.057	3.024	.002**	Sig.

Effort m5	←	Idealized influence x1	.110	.064	1.724	.045**	Sig.
	←	Inspirational motivation x2	.181	.066	2.732	.006**	Sig.
	←	Intellectual stimulation x3	.167	.071	2.356	.018**	Sig.
	←	Individual consideration x4	.112	.065	1.722	.085	Not Sig.
Cohesion m6	←	Idealized influence x1	.139	.049	2.846	.004**	Sig.
	←	Inspirational motivation x2	.080	.050	1.580	.014**	Sig.
	←	Intellectual stimulation x3	.139	.054	2.572	.010**	Sig.
	←	Individual consideration x4	.112	.050	2.252	.024**	Sig.
Meeting goals y1	←	Communication m1	.291	.060	4.891	.001**	Sig.
	←	Coordination m2	.049	.049	1.993	.021**	Sig.
	←	Balance of Member Contributions m3	.061	.043	1.415	.057**	Sig.
	←	Mutual Support m4	.078	.063	1.245	.013**	Sig.
	←	Effort m5	.015	.049	.313	.754	Not Sig.
	←	Cohesion m6	.131	.064	2.039	.041**	Sig.
	←	Idealized influence x1	.196	.061	3.196	.001**	Sig.
	←	Inspirational motivation x2	.079	.066	1.205	.028**	Sig.
	←	Intellectual stimulation x3	.100	.067	1.484	.038**	Sig.
	←	Individual consideration x4	.193	.056	3.475	.001**	Sig.
End-user benefits y2	←	Communication m1	.136	.063	2.146	.032**	Sig.
	←	Coordination m2	.008	.052	.143	.886	Not Sig.
	←	Balance of Member Contributions m3	.043	.046	.935	.050**	Sig.
	←	Mutual Support m4	.281	.059	4.749	.001**	Sig.
	←	Effort m5	.007	.052	.138	.891	Not Sig.
	←	Cohesion m6	.125	.068	1.832	.047**	Sig.
	←	Idealized influence x1	.222	.065	3.412	.001**	Sig.
	←	Inspirational motivation x2	.128	.070	1.837	.046**	Sig.

	←	Intellectual stimulation x3	.051	.071	.708	.479	Not Sig.
	←	Individual consideration x4	.031	.067	.468	.640	Not Sig.
Contractor benefits y3	←	Communication m1	.138	.052	2.647	.008**	Sig.
	←	Coordination m2	.091	.042	2.151	.031**	Sig.
	←	Balance of Member Contributions m3	.045	.037	1.215	.024**	Sig.
	←	Mutual Support m4	.039	.048	1.812	.017**	Sig.
	←	Effort m5	.035	.042	.847	.397	Not Sig.
	←	Cohesion m6	.376	.055	6.869	.001**	Sig.
	←	Idealized influence x1	.196	.051	3.862	.001**	Sig.
	←	Inspirational motivation x2	.000	.056	.001	.999	Not Sig.
	←	Intellectual stimulation x3	.029	.057	.505	.614	Not Sig.
	←	Individual consideration x4	.066	.053	1.239	.015**	Sig.

****Significant at the (0.05) level**

Effect of Transformational Leadership on Teamwork Quality:

Idealized influence (x1) and Inspirational motivation (x2) have a strong positive effect on Communication (m1), Coordination (m2), Mutual Support (m4), Effort (m5), and Cohesion (m6) at a significance level of less than 0.05.

Intellectual stimulation (x3) has no significant effect on Communication (m1) but positively affects Coordination (m2), Balance of Member Contributions (m3), Effort (m5), and Cohesion (m6) at a significance level of less than 0.05.

Individual consideration (x4) positively impacts Communication (m1), Balance of Member Contributions (m3), Mutual Support (m4), and Cohesion (m6) but does not significantly affect Coordination (m2) or Effort (m5).

Effect of Teamwork Quality on Project Success:

Communication (m1) and Cohesion (m6) strongly positively impact Meeting planning goals (y1) and End-user benefits (y2) at a significance level of less than 0.05.

Coordination (m2), Balance of Member Contributions (m3), and Mutual Support (m4) positively affect Meeting planning goals (y1), End-user benefits (y2), and Contractor benefits (y3) at a significance level of less than 0.05.

Effort (m5) does not significantly impact Meeting planning goals (y1), End-user benefits (y2), or Contractor benefits (y3).

Effect of Transformational Leadership on Project Success:

Idealized influence (x1) and Inspirational motivation (x2) have a positive effect on Meeting planning goals (y1), End-user benefits (y2), and Contractor benefits (y3) at a significance level of less than 0.05.

Intellectual stimulation (x3) and Individual consideration (x4) positively impact Meeting planning goals (y1) and Contractor benefits (y3) but show varying effects on End-user benefits (y2).

Goodness of fit for model 1

Chi Square is (398.839) which is normal in the condition of large sample size.

The goodness of fit index (GFI) was (0.813), (For the saturated model a perfect 1)

The root mean square error of approximation (RMSEA) is (0.071), the test is significant which indicated that the data had an acceptable fit with the hypothesized model so that we can rely on the hypothesized model to investigate our hypothesis.

According to the preceding results, we can conclude that Transformational leadership positively Influences Project Success through the mediation of Teamwork Quality. As in table 13.

Table 13. Quality Assessment Criteria of the Structural Model 1

Ser.	Indicators	value
1	Chi square	398.839
2	The goodness of fit index GFI	0.813
3	The root mean square error of approximation RMSEA	0.071

Model 2

Path analysis to test the indirect effect of Transformational leadership on Project Success through the mediation of Teamwork Quality:

- a- Observed Endogenous Variables: include dependent variable Project Success, and Teamwork Quality.
- b- Observed Exogenous Variables: Include independent variable Transformational leadership.

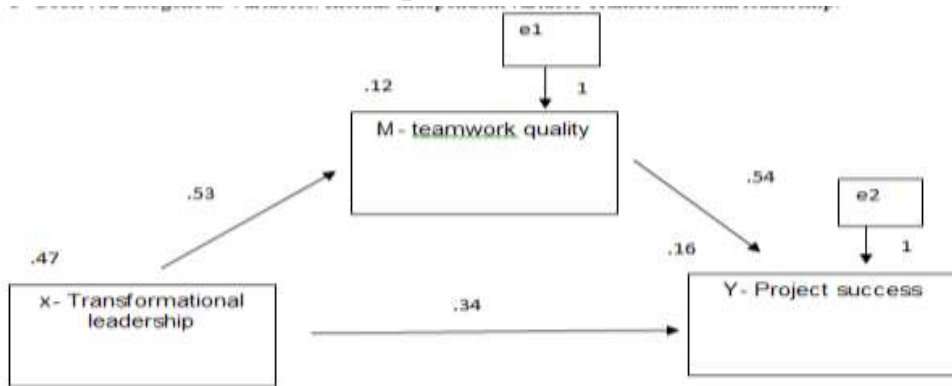


Figure 2. Model 1

Evaluating the coefficients of the structural model for interpreting relationships:

Regression weights

Effect of Transformational leadership on Teamwork Quality:

- Transformational leadership X, has a positive significant effect on Teamwork Quality M, with significance level less than (0.05), and the value of the critical path (C.R.), (20.038).

Effect of Teamwork Quality on Project Success:

- Teamwork Quality M, has a positive significant effect on Project Success Y, with significance level less than (0.05), and the value of the critical path (C.R.), (8.635).

Effect of Transformational leadership on Project Success:

- Transformational leadership X, has a positive significant effect on Project Success Y, with a significance level less than (0.05), and the value of the critical path (C.R.), (7.594). data provided in table 14.

**Table 14. Estimates of the coefficients of the structural model
"The indirect effect of Transformational leadership on Project
Success through the mediation of Teamwork Quality"**

Path			Estimate	S.E	C.R.	P-Value	Sig.
Teamwork Quality M	←	Transformational leadership X	0.525	0.026	20.04	0.001**	Sig.
Project Success Y	←	Teamwork Quality M	0.542	0.063	8.635	0.001**	Sig.
	←	Transformational leadership X	0.344	0.045	7.594	0.001**	Sig.

****Significant at the (0.05) level**

Goodness of fit model 2

Table 15 shows the quality assessment criteria of the structural model 2.

- Chi Square is (0.001)
- The goodness of fit index (GFI) was (0.999), (For the saturated model a perfect 1)
- The root mean square error of approximation (RMSEA) is (0.803). The test is significant which indicated that the data

had an acceptable fit with the hypothesized model so that we can rely on the hypothesized model to investigate our hypothesis.

According to the preceding results, we can conclude that Transformational leadership positively Influences Project Success through the mediation of Teamwork Quality.

Table 15. Quality Assessment Criteria of the Structural Model 2

Ser.	Indicators	value
1	Chi square	0.001
2	The goodness of fit index GFI	0.999
3	The root mean square error of approximation RMSEA	0.073

From Table 16 we can conclude that regarding the Direct effects The results were satisfactory and all of them were positive effects, as there is a direct effect between (Transformational leadership) and (Teamwork Quality) with a value of 0.525, there is a direct effect between (Transformational leadership) and (Project Success) with a value of 0.344, there is a direct effect between (Teamwork Quality) and (Project Success) with a value of 0.542

And regarding the Indirect effects There is an indirect effect between (Transformational leadership) and (Project Success) with a value of 0.285

Regarding the total effect.

Total effect between (Teamwork Quality) and (Transformational leadership) 0.525

Total effect between (Project Success) and (Teamwork Quality) 0.542

Thus, the total effect between (Transformational leadership) and (Project Success) is 0.629

From this, the effect of the independent variable on the dependent variable becomes clear through the mediator. With the presence of the mediator variable, the effect between Transformational leadership and Project Success increased from (0.344) to (0.629).

Table 16. Path analysis results for research variables

Standard effects	Variables	Transformational leadership	P-Value	Sig.	Teamwork Quality	P-Value	Sig.
Direct effect	Teamwork Quality	0.525	0.001*	Sig.	-	-	-
	Project Success	0.344	0.001*	Sig.	0.542	0.001*	Sig.
Indirect effects	Teamwork Quality	-	-	-	-	-	-
	Project Success	0.285	0.001*	Sig.	-	-	-
Total effects	Teamwork Quality	0.525	0.001*	Sig.	-	-	-
	Project Success	0.629	0.001*	Sig.	0.542	0.001*	Sig.

***Significant at the (0.05) level**

The total direct and indirect standard effects between the study variables can be explained as:

3.5. Statistical conclusion

This research aims at studying how construction projects effectiveness can be improved by enhancing project manager's leadership style and teamwork quality. 35^v construction professionals were included in the study from different positions such as contractors, consultants, and owners who were part of construction teams worked at green field, renovation and expansion projects ranging from less than 10 millions to more than 100 million EGP. The study collected data related to completed projects through an online survey and used correlation, regression and SEM to analyze the data. The result on the study showed a strong direct effect of the transformational leadership style on project success through mediating variable teamwork quality. The study suggests that companies working in the construction field in Egypt should emphasis on the leadership skills of their project managers in order to get better results in the projects.

4. Discussion

The objective of this study is to clarify the correlation between leadership, teamwork, and project performance from the standpoint of project management through the utilization of empirical data analysis. Our results clearly demonstrate the importance of transformational leadership captured through its four facets inspirational motivation, individual consideration, intellectual stimulation, and idealized influence in improving the quality of

effectiveness of the team and finally enhancing the performance of project success. The result provided by this research supports the work done by many researchers in many domains.

To be able to prove that conclusion, first, the relationship between transformational leadership and teamwork quality was examined. Through data analysis, the result showed a positive strong effect of all four transformational leadership dimensions on teamwork quality. This result is consistent with the work done by many researchers (Alegebeleye & Kaufman, 2022; Cha et al., 2015).

The second relationship that was studied in this research is the correlation between transformational leadership and Project success. The result presented a strong direct relationship effect on project success, this conclusion is consistent with the findings of new studies (Tahir Raza et al., 2024; H. Saleem et al., 2021). Recent studies have consistently demonstrated a positive relationship between transformational leadership and project success in various sectors. Transformational leadership has been found to directly impact project success (Tahir Raza et al., 2024; H. Saleem et al., 2021). and indirectly through mediating factors such as team performance (H. Saleem et al., 2021) ,

The study also investigated the relationship between teamwork quality and project success and found a strong direct effect on teamwork quality on project success. Prior work done on the same point demonstrates the same result, for example (Hoegl & Gemuenden, 2001) developed a comprehensive TWQ construct.

Given the previous findings, there is consensus between researchers that a strong positive correlation between teamwork quality (TWQ) and project success exists.

Finally, This study found that there is a mediating role of Teamwork quality on the relationship between transformational leadership and project success, which is also consistent with prior work. Studies suggest that transformational leadership (TL) has a positively impact on project success (PS) through mediating variable teamwork quality. Teamwork quality has been found to be a significant influencer on this relationship (Hussaini Ali et al., 2021; Syed Muhammad Javed Iqbal et al., 2019). According to (Hussaini Ali et al., 2021). TL improves communication, collaboration, and cohesion among team members, resulting in excellent project outputs.

5. Conclusion

The answers to the research questions from the analysis of the data collected were as follows

- What is the effect of transformational leadership on Teamwork quality?

The alternative hypothesis that transformational leadership has a positive strong effect on teamwork quality was accepted. There is a strong positive effect of all of Inspirational motivation x2, Individual consideration x4, Intellectual stimulation x3, and

Idealized influence x1 on Teamwork Quality at a significance level less than 5%.

- What is the effect of transformational leadership on Project success?

The alternative hypothesis that transformational leadership has a positive strong effect on project success was accepted. it was found that the independent variables Idealized Influence (x1), Inspirational Motivation (x2), and Intellectual Stimulation (x3) have a significant effect on Project Success at a significance level of less than 0.05.

However, Individual Consideration (x4) does not have a significant effect on Project Success

- What is the effect of Teamwork quality on project success?

The alternative hypothesis that teamwork quality has a positive strong effect on project success was accepted. it was found that the mediating variables Communication (m1), Mutual Support (m4), Cohesion (m6), and Coordination (m2) had a significant effect on Project Success at a significance level of less than 0.05.

However, Balance of Member Contributions (m3) and Effort (m5) showed no significant effect on Project Success.

- What is the mediating role of Teamwork quality on the relationship between transformational leadership and project success?

The alternative hypothesis that there is a mediating role of Teamwork quality on the relationship between transformational leadership and project success was accepted.

However, it was noted that Intellectual stimulation (x3) has no significant effect on Communication (m1). Individual consideration (x4) does not significantly affect Coordination (m2) or Effort (m5). Also, Effort (m5) does not significantly impact Meeting planning goals (y1), End-user benefits (y2), or Contractor benefits (y3). Intellectual stimulation (x3) and Individual consideration (x4) showed have no significant effect on End-user benefits (y2).

Building on the findings and acknowledging the limitations of this study, several avenues for future research are suggested to further explore the relationships between Transformational Leadership, Teamwork Quality, and Project Success in construction projects. Future research should explore the applicability of this study's findings in various industries and geographical regions. The construction industry in Egypt, where this study was conducted, has its own unique characteristics, which might not be present in other sectors or regions. By examining different contexts, researchers can determine whether the positive relationship between Transformational Leadership and Project Success through Teamwork Quality is consistent across various settings, or if industry-specific or cultural factors significantly impact these relationships. Alternatively, while this study focused on

Transformational Leadership, future research could expand the scope by exploring the effects of other leadership styles, such as transactional, servant, or authentic leadership, on Teamwork Quality and Project Success. Transactional leadership, with its focus on rewards and penalties, or servant leadership, which emphasizes serving the team, could have different impacts on teamwork dynamics and project outcomes. Another possible future research is the refinement to the data collection method. Given the reliance on self-reported data in this study, which can introduce biases such as social desirability or recall bias, future research should incorporate objective performance metrics and mixed-methods approaches to enhance the robustness of the findings. By combining quantitative data with qualitative insights from interviews, focus groups, or case studies, researchers can obtain a richer understanding of how leadership and teamwork interact to drive project success. Furthermore, Future studies should consider exploring other potential mediating or moderating variables in the relationship between leadership and project success. While this study highlighted the role of Teamwork Quality as a mediator, other factors such as organizational culture, team diversity, project complexity, or technological adoption could also influence the strength or direction of the observed relationships.

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