

The role of information technology governance in achieving competitive advantage in the Yemeni telecommunications sector



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Abstract This study aims to explore the role of information technology governance (ITG) in achieving competitive advantage in the Yemeni telecommunications sector. The study adopted a quantitative approach using analytical and descriptive methodologies. The study population, with a total of 806 individuals, consists of six organizations representing the sector of the Yemeni telecommunications industry, and the data were collected via a questionnaire tool distributed among a sample of 271 participants selected through stratified random sampling on the basis of the Krejcie and Morgan model. To ensure the accuracy of the collected data, validity and reliability tests were conducted for the study tool (the questionnaire) to verify its suitability where Pearson correlation coefficients were calculated for each dimension of the ITG and the Competitive advantage and the overall score of the variable; the Cronbach's alpha test was also performed. The key findings indicate that the level of ITG in the Yemeni telecommunications sector was high, whereas the level of competitive advantage was fairly high. Additionally, there is a statistically significant role of ITG in achieving competitive advantage in this sector. The study concluded that the Yemeni telecommunications sector is committed to implementing ITG, reinforcing its importance in enhancing performance and gaining a competitive advantage. The study recommends enhancing awareness among leaders in the sector about ITG through practical strategies; establishing a specialized committee under the Ministry of Telecommunications and Information Technology to develop a guide for ITG implementation; and reviewing and implementing existing policies and strategies to support sustainable competitive advantage within the sector.

Keywords: strategic alignment, value addition, resource management, risk management, cost, quality

1. Introduction

Since the contemporary world is dynamic and characterized by increased interconnectedness and rapid technological advancement, competitive advantage has emerged as a top priority for organizational development and survival across industries (Al-Azab, 2022). The fact that global markets are open only raises this necessity since organizations must differentiate themselves from others, both domestically and internationally (AL-Matari, 2017). In this respect, competitive advantage refers to the capacity of an organization to create superior value by implementing distinctive strategies that are difficult for competitors to imitate within similar timeframes and through the same methods.

The pervasive influence of information and communication technology (ICT) has fundamentally transformed the operational landscape for organizations, and isolated operations are becoming increasingly impossible. To manage this complex environment and remain competitive in an open world trade economy, organizations must strategically adopt and manage their ICT assets. Consequently, achieving sustainable competitive advantage has drawn significant global attention, fueled by forces such as globalization, economic integration, and overall adoption of market liberalization policies (Ismail, 2011).

The role of IT as a key enabler of sustainable business development has increased the stakes in its effective management and governance. IT investment at the strategic level in the contemporary global digital economy is no longer an option but rather a necessity in facilitating competition and innovation. In this context, effective information technology governance (ITG) processes are now just as critical as overall organizational management. While IT management is typically concerned with operational efficiencies and near-term objectives, ITG takes a broader and longer-term perspective to map IT performance and transformation to evolving business needs and stakeholder expectations (Grembergen & Haes, 2018). In drawing this distinction, the paper highlights the essential function of the ITG to position IT investments to make a strategic impact in support of the overall aspirations and competitive position of the enterprise.

The Yemeni information technology and telecommunications industry is a strategic sector of national infrastructure, an essential driver of economic growth, and generates significant direct and indirect employment through its intricate connections



with other sectors (Deep Root Consulting et al., 2021). As a profit-making service sector, it endeavors to present a broad range of high-quality telecommunication and IT services to all segments of Yemeni society, aiming to keep up with global technological advancements and know-how in the field.

However, recent reports indicate that the performance of the Yemeni telecommunications and information technology sector has been significantly impacted by exceptional circumstances within the country (Deep Root Consulting et al., 2021). The protracted conflict has resulted in considerable financial losses and missed opportunities for the sector. Furthermore, the industry faces a confluence of critical challenges, including an inadequate legal and institutional framework; fragmentation within public sector institutions; insufficient separation of political, regulatory, and operational functions; reliance on fragile infrastructure; restricted access to specific regions for essential maintenance; diminishing financial returns; and increasing government fees, all within a context of rising poverty and reduced purchasing power (Deep Root Consulting et al., 2021).

Given these intricate difficulties, Yemen's telecommunication industry urgently requires strategic initiatives and policy agreements to advance, catch up with rapidly emerging technologies, and reinstate competitiveness in delivering high-quality services. The fact that the industry has diverse and competitive organizations presents a positive dynamic with potential societal gains aligns with the basic principles of good ITG. As emphasized by the ISACA, a key benefit of implementing robust ITG is the achievement of competitive advantage and the creation of value through the practical and innovative application of corporate information technology (AL-Kurabi, 2020).

Effective ITG involves maintaining, managing, and overseeing an organization's IT performance to optimize resource utilization and reduce internal and external threats. It also encompasses strategic and scientific planning for IT infrastructure growth (Hunaiber, 2022). This study is unique among existing studies in that it is a contemporary study in the Republic of Yemen on the subject of ITG, employing the latest COBIT framework, COBIT 2019. This study aims to investigate how this new framework can be strategically used to provide sustainable competitive advantage in the context of the rapidly evolving Yemeni telecommunications sector.

In addition, this research seeks to provide practical recommendations, probable solutions, and strategic proposals to resolve the key challenges and obstructions confronting organizations within the Yemeni telecom sector concerning the adoption of ITG and the realization of sustainable competitive advantage.

Therefore, this study is guided by the principal research question: What is the role of ITG in achieving competitive advantage in the Yemeni telecommunications sector? This broad question is then defined through the following subquestions:

1. What is the level of competitive advantage achieved in the Yemeni telecommunications sector?
2. What is the level of implementation of information technology governance in the Yemeni telecommunications sector?

1.1. Hypothesis

A study conducted by Ahmed and Al-Saeedi (2019) demonstrated that the adoption of ITG embodies the principles of performance excellence, providing a genuine institutional dimension. The implementation of ITG has played a crucial role in reshaping the competitive landscape among universities, enabling the institution in question to achieve competitive advantages. Moreover, through effective practices in value governance, organizations can increase their competitiveness and potential profitability.

Additionally, the findings of the study by Hashim and Al-Saeedi (2020) indicate that ITG influences consumers' perceptions of trust in the services they receive. This suggests that the banks examined in the study need to leverage ITG to enhance customer trust and secure a competitive advantage. This study also recommended the implementation of ITG activities and processes to optimize operations, highlighting its significant impact on improving performance and enhancing competitiveness in global markets.

In light of the above, the central hypothesis can be formulated as follows (H0): There is no statistically significant role for ITG, along with its dimensions (strategic alignment of IT, value addition, resource management, performance measurement, and risk management), in achieving competitive advantage in the Yemeni telecommunications sector. This hypothesis leads to the following subhypotheses, as illustrated in the conceptual model in Figure 1:

- (H01): There is no statistically significant role for the strategic alignment of IT in achieving competitive advantage in the Yemeni telecommunications sector.
- (H02): There is no statistically significant role for value addition in achieving competitive advantage in the Yemeni telecommunications sector.
- (H03): There is no statistically significant role for resource management in achieving competitive advantage in the Yemeni telecommunications sector.
- (H04): There is no statistically significant role for performance measurement in achieving competitive advantage in the Yemeni telecommunications sector.
- (H05): There is no statistically significant role for risk management in achieving competitive advantage in the Yemeni telecommunications sector.

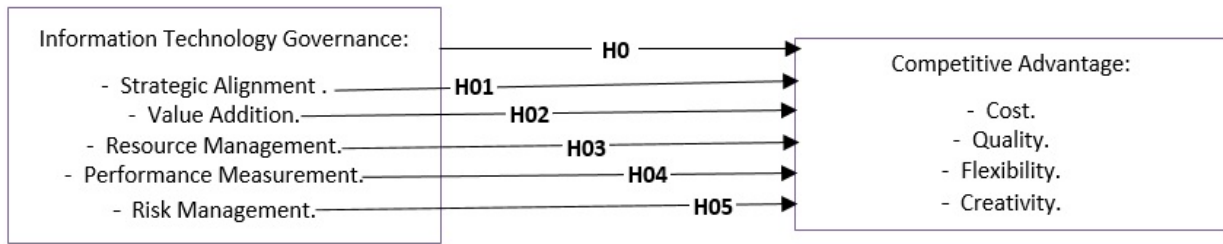


Figure 1 Conceptual model.

2. Materials and Methods

The study adopted a quantitative approach using analytical and descriptive methodologies. This approach is frequently used in social and human studies, enabling the attainment of the study's objectives while effectively describing the context and uncovering the characteristics and nature of the relationships between the study variables.

The total population of the study was 806 participants, and all participants were in leadership positions within six Yemeni telecommunications organizations. The leadership positions included executive and deputy executive directors, general and deputy general directors, department and deputy department directors, and section heads from the six Yemeni telecommunications companies, namely, Public Telecommunications Corporation, Yemen Mobile Company, TeleYemen Company, United Yemeni Omani Telecommunications Company (YOU), Sabafone Company and Y Company, as shown in Table 1:

Table 1 Number of leadership positions across various Yemeni Telecommunications organizations.

No.	Organization	Executive and Deputy Executive Directors	General and Deputy General Director	Department and Deputy Department Directors	Section Heads	Total
1	Public Telecommunications Corporation	5	15	71	165	256
2	Yemen Mobile Company	4	-	15	62	81
3	TeleYemen Company	1	4	17	45	67
4	United Yemeni Omani Telecommunications Company (YOU)	1	9	84	123	217
5	Sabafone Company	1	5	59	97	162
6	Y Company	1	-	7	15	23
Total		13	33	253	507	806

Source: Prepared by the researchers based on the organizations' HR Database.

Given that the study population is heterogeneous, the sample was selected via stratified random sampling to ensure an accurate representation of the population across various administrative, functional, and specialized levels within the Yemeni telecommunications sector. On the basis of the sampling model developed by Krejcie and Morgan, the sample size was 271 individuals, which constituted 33.6% of the total study population. This sample size is deemed sufficient for testing the proposed model.

Each organization within the Yemeni telecommunications sector was assigned the same sampling proportion of 33.6%, as illustrated in Table 2:

Table 2 Distribution of the study sample across Yemeni Telecommunications Organizations.

No.	Organization	Study Population	Relative Sample Size	Sample Size Percentage
1	Public Telecommunications Corporation	256	85	31.4%
2	Yemen Mobile Company	81	28	10.3%
3	TeleYemen Company	67	24	8.9%
4	United Yemeni Omani Telecommunications Company (YOU)	217	71	26.2%
5	Sabafone Company	162	54	19.9%
6	Y Company	23	9	3.3%
Total		806	271	100%

Source: Prepared by the researchers based on the sampling model of Krejcie and Morgan.



For data collection, the researchers utilized a questionnaire as the primary data collection tool for this study, as it is the most commonly employed method. This was supplemented by observations and personal interviews in cases that required additional data collection. The study tool encompassed two main sections:

- The first section contained the demographic characteristics of the study sample, which included six questions: gender, age, academic rank, job position, work experience, and the organization in which they work.
- The second section focused on the study variables and consisted of 45 items divided into two parts, as follows:
 - Part 1: 25 items divided into five dimensions of the IT governance variable. These items were developed with the help of the following studies: AL-Kurabi's study (2020); Hunaiber's study (2022); and Al-Samman & Al-Jabouri's study (2016).
 - Part 2: 20 items distributed across four dimensions of the competitive advantage variable. These items were developed with the help of the following studies: AL-Azab's study (2022); AL-Makhadhi's study (2022); and AL-Hajji's study (2022).

The degree of possible responses to the statements was measured on a seven-point scale according to the seven-point Likert scale, in the distribution of the weights of the sample individuals' answers, which is distributed from the highest weight given to it (7) points, which is represented in the answer field (strongly agree) to the lowest weight, which was given a score of 1 and represented in the answer field (strongly disagree), with five weights in between. The purpose of this was to allow the sample individuals to choose the most accurate answer according to their assessment.

Additionally, the validity and reliability of the tool were assessed before it was administered.

The sources of data necessary for the preparation and implementation of the study are categorized into two main types:

- Primary Sources: These comprise the questionnaire used as a tool for collecting field data pertinent to the study variables.
- Secondary Sources: Key secondary sources include books, academic theses, journals, and literature relevant to the study topic.

3. Results and Discussion

3.1. Validity test for the study tool

To ensure the accuracy of the collected data, validity and reliability tests were conducted for the study tool (the questionnaire) to verify its suitability as follows:

3.1.1. Information technology governance

Pearson correlation coefficients were calculated for each dimension of the ITG and the overall score of the variable, as shown in Table 3:

Table 3 Correlation coefficients among dimensions and their relationships with the ITG overall score.

Dimensions	Strategic Alignment of IT	Value Addition	Resource Management	Performance Measurement	Risk Management
Strategic Alignment of IT	1				
Value Addition	.645**	1			
Resource Management	.566**	.559**	1		
Performance Measurement	.384**	.453**	.474**	1	
Risk Management	.478**	.404**	.582**	.549**	1
Correlation with the Dimension	.747**	.751**	.742**	.723**	.745**

Note: ** Statistically significant at level (0.01).

The results presented in Table 3 reveal correlations among all the dimensions and with the overall score of the independent variable. The correlation coefficients ranged between 0.384 and 0.645, and the correlations with the overall score ranged between 0.723 and 0.751. These correlation coefficients are statistically significant at the 0.01 level, demonstrating strong internal consistency among the dimensions of the independent variable "ITG". These findings support the questionnaire's construct validity and internal consistency, confirming its reliability as a measurement tool.

3.1.2. Competitive advantages

The Pearson correlation coefficients were calculated for each dimension and the overall score of the variable, as shown in Table 4:



Table 4 Correlation coefficients among the dimensions and their correlation with the overall score for competitive advantage.

Dimensions	Cost	Quality	Flexibility	Innovation
Cost	1			
Quality	.794**	1		
Flexibility	.777**	.846**	1	
Innovation	.718**	.775**	.801**	1
Correlation with the Dimension	.849**	.851**	.877**	.845**

Note: ** Statistically significant at level (0.01).

The results presented in Table 4 reveal correlations among all the dimensions and with the overall score of the dependent variable. The correlation coefficients range from 0.718--0.846, and the correlations with the overall score range from 0.845--0.877. All correlation coefficients are statistically significant at the 0.01 level, indicating strong internal consistency within the dependent variable (competitive advantage). These findings support the questionnaire's construct validity and internal consistency, demonstrating its reliability as a measurement tool.

3.1.3. Reliability test of the study tool

Cronbach's alpha test was conducted to assess the reliability and validity of the questionnaire items. This test measures the degree to which responses to different items correlate, with higher values indicating greater reliability. An alpha coefficient of 0.65 was set as the minimum acceptable threshold, with values closer to 1 indicating stronger interitem consistency and, therefore, greater reliability.

To confirm the questionnaire's reliability after application, SPSS statistical software was used to determine the reliability coefficient (Cronbach's alpha). The results are displayed in Table 5:

Table 5 Reliability coefficient (Cronbach's alpha) of the study tool.

Variables	Dimensions	Cronbach's Alpha	Self-Validity
Independent variable: ITG	Strategic Alignment of IT	0.869	0.932
	Value Addition	0.873	0.934
	Resource Management	0.779	0.882
	Performance Measurement	0.899	0.948
	Risk Management	0.869	0.932
Overall distribution of the independent variable		0.792	0.890
Dependent variable: Competitive Advantage	Cost	0.847	0.920
	Quality	0.836	0.914
	Flexibility	0.924	0.961
	Innovation	0.898	0.948
Overall distribution of the dependent variable		0.872	0.934

The results presented in Table 5 demonstrate that the reliability coefficients for the study variables are very high. The reliability coefficient for the first variable is 0.792, with a self-validity of 0.890. The second variable has a reliability coefficient of 0.872 and a self-validity of 0.934. These findings indicate that the questionnaire possesses very high reliability, suggesting that the responses from the sample are homogeneous. Consequently, the results can be generalized to the study population to a significant extent. Thus, the study tool is deemed finalized.

3.2. Answers to the study questions

1. Question 1: What level of competitive advantage is achieved in the Yemeni telecommunications sector?

To evaluate the achievement of competitive advantage across its dimensions (cost, quality, flexibility, innovation) in the Yemeni telecommunications sector, means, standard deviations, and relative weights were computed for each item. The results are detailed in Table 6.

The results presented in Table 6 indicate that the level of competitive advantage achieved within the Yemeni telecommunications sector is relatively high, with an overall mean score of 5.12, a standard deviation of 0.88, and a percentage of 73.14%. The means for the various dimensions range from a minimum of 4.73 to a maximum of 5.34, with corresponding percentages varying from 67.57% to 76.29%. This range reflects an achievement level categorized from "fairly high" to "high" across all dimensions.



Table 6 Means and standard deviations for competitive advantages in the Yemeni telecommunications sector.

Rank	No.	Dimension	Mean	Standard Deviation	Relative Weight	Level of Implementation
3	1	Cost	5.17	0.99	73.86%	Fairly High
1	2	Quality	5.34	0.92	76.29%	High
2	3	Flexibility	5.23	1.00	74.71%	Fairly High
4	4	Innovation	4.73	1.23	67.57%	Fairly High
		Overall Mean	5.12	0.88	73.14%	Fairly High

The ranking for achieving competitive advantage in the Yemeni telecommunications sector is as follows:

1. Quality: Ranked first, with a mean of 5.34% and a percentage of 76.29%.
2. Flexibility: Ranked second, with a mean of 5.23% and a percentage of 74.71%.
3. Cost: Ranked third, with a mean of 5.17% and a percentage of 73.86%.
4. Innovation: Ranked fourth, with a mean of 4.73% and a percentage of 67.57%.

Overall, the findings indicate that the Yemeni telecommunications sector presents a fairly high level of competitive advantage.

Competitive advantage constitutes a pivotal element in effective organizational leadership, serving as a fundamental strength that underpins the sustained development and stability of organizational endeavors (Dahy, 2020).

The study revealed that the competitive advantage in the Yemeni telecommunications sector was fairly high, as evidenced by a mean score of 5.12 (scale unspecified), a standard deviation of 0.88, and a positive response rate of 73.14%. In the current intensely competitive global landscape, contemporary organizations are driven to establish a distinctive competitive edge over their industry counterparts. This is typically accomplished through the provision of enhanced customer value and a commitment to excellence, facilitated by the efficacious deployment of organizational resources and capabilities that amplify overall competitiveness (Fayyad, 2021). This fairly high competitive advantage in the telecommunications sector aligns with the findings of AL-Hajji (2022) within a sample of Yemeni banks. Similarly, AL-Makhadhi (2022) identified a high level of competitive advantage in Yemeni pharmaceutical companies, and AL-Azab (2022) reported comparable results among a sample of Yemeni private universities.

To review studies that addressed competitive advantage in the Yemeni telecommunications sector, Masoud's study (2022) indicated that Yemeni telecommunications companies achieved a fairly high level of competitive advantage, and AL-Awadhi's study (2022) also found that the level of competitive advantage achieved was fairly high in Yemeni mobile telecommunications companies. In addition, Abdo's study (2021) also showed that the level of competitive advantage achieved was fairly in the Public Telecommunications Corporation (one of the organizations in the Yemeni telecommunications sector), and AL-Haimi's study (2019) showed that the level of competitive advantage was achieved to a fairly high degree in Yemen Mobile (one of the organizations in the Yemeni telecommunications sector).

Together, these findings point to the increasing openness of the Yemeni market in different sectors, thereby stimulating the expansion of organizations vying for greater market share. This increase in competition ultimately benefits the community through the enhancement of service and product quality at low prices.

The Yemeni telecommunications sector recognizes the importance of having a competitive advantage that allows it to gain market share, thereby ensuring its survival and development.

However, this concern is not sufficient, as the cost of the services provided is considered high in relation to the purchasing power of the community. This may be attributed to the high cost of telecommunications services purchased by the Yemeni telecommunications organizations, such as the leasing of various transmission capacities and other services, which negatively affects on the cost of the services provided (AL-Awadhi, 2022).

There are also some problems with the quality of the services provided, such as occasional interruptions for various reasons and for varying periods of time. Among these reasons are the difficulty of importing the equipment and supplies needed to modernize and upgrade operating stations due to the difficult conditions the country is experiencing, as well as the inability to provide the necessary specialized training to employees abroad. Furthermore, the diversity and change in customer preferences pose a challenge to Yemeni telecommunications organizations (Abdo, 2021).

In the future, the survival of organizations in the long term will be inextricably linked to their capacity to formulate new paradigms of competitive advantage, as maintaining a competitive advantage shifts from a desirable condition to an utter imperative for organizational survival and expansion (Sharab et al., 2011).

2. Question 2: What is the level of implementation of information technology governance in the Yemeni telecommunications sector?

To assess the level of ITG implementation across its dimensions (strategic alignment of IT, value addition, resource management, performance measurement, and risk management) in the Yemeni telecommunications sector, the means, standard deviations, and relative weights for each item were calculated. The results are summarized in Table 7:

Table 7 Means and standard deviations for ITG implementation in the Yemeni telecommunications sector.

Rank	No.	Dimension	Mean	Standard Deviation	Relative Weight	Level of Implementation
1	1	Strategic Alignment of IT	5.78	0.80	82.57%	High
3	2	Value Addition	5.51	0.90	78.71%	High
2	3	Resource Management	5.62	0.72	80.29%	High
5	4	Performance Measurement	5.14	0.88	73.43%	Fairly High
4	5	Risk Management	5.27	0.91	75.29%	Fairly High
Overall Mean			5.46	0.62	78.00%	High

The results presented in Table 7 indicate that the overall level of ITG implementation within the Yemeni telecommunications sector is high, with an overall mean score of 5.46, a standard deviation of 0.62, and a corresponding percentage of 78.00%. The means for the various dimensions range from a minimum of 5.14 to a maximum of 5.78, with percentages varying from 73.43% to 82.57%. This range reflects a level categorized from "somewhat high" to "high" across all dimensions.

The ranking of the dimensions of ITG implementation in the Yemeni telecommunications sector is as follows:

1. Strategic Alignment of IT: Ranked first with a mean of 5.78, a standard deviation of 0.80, and a percentage of 82.57%.
2. Resource Management: Ranked second, with a mean of 5.62% and a percentage of 80.29%.
3. Value Addition: Ranked third with a mean of 5.51 and a percentage of 78.71%.
4. Risk Management: Ranked fourth, with a mean of 5.27% and a percentage of 75.29%.
5. Performance Measurement: Ranked fifth with a mean of 5.14 and a percentage of 73.43%.

Overall, these findings highlight the robust implementation of ITG across key dimensions in the Yemeni telecommunications sector.

ITG is conceptualized as the structural framework through which executive leadership interacts with IT management to ensure strategic alignment, effective deployment, and efficient utilization of IT investments in support of organizational objectives (Fletcher, 2006).

The findings of this study reveal a high degree of ITG implementation in the Yemeni telecommunications sector, as evidenced by a mean score of 5.46 (scale unspecified), a standard deviation of 0.62, and a positive response rate of 78.00%. This observation corroborates the results reported by Asma (2018), who also reported a high level of ITG implementation in the National Organization for Marketing and Distribution of Petroleum Products (NAFTAL) in Algeria.

However, the high level of ITG implementation identified in the Yemeni telecommunications sector contrasts with the medium levels reported by Hunaiber (2022) and AL-Kurabi (2020) in their respective studies focusing specifically on the Public Telecommunications Corporation, a constituent entity within the Yemeni telecommunications landscape. This divergence in findings suggests a potential limitation in direct comparability, arising from the present study's encompassing scope of the entire sector, as opposed to the more granular focus of the aforementioned research on a specific organizational unit.

The study's findings indicate a significant role played by senior management in the instantiation of ITG principles and the oversight of strategic IT-related decision-making. This involvement, which may be less pronounced within the Public Telecommunications Corporation, as suggested by prior research, is posited as crucial for the attainment of organizational objectives and the enhancement of service value.

Furthermore, senior management assumes responsibility for the effective stewardship of IT resources, the mitigation of risks associated with IT implementation, and the evaluation of overall IT performance (Hunaiber, 2022).

The Yemeni telecommunications organizations should recognize the importance of implementing IT governance and its significant role in obtaining the best performance from IT, which in turn will contribute to achieving the organization's objectives. It is not enough for an organization to possess information technology; there must also be a way to organize, monitor, and direct the use of information technology that provides real strategic value to the organization, ensures that the alignment between the objectives of information technology and the organization is on the right track, and at the same time ensures that its performance is in line with the stated objectives of the organization.

IT governance is essential to any organization as it ensures that IT strategy and objectives are fully aligned with the overall strategy and objectives of the organization. The main role of IT governance is to generate business value from IT investment, which will result in improved operating efficiency, improved data quality, and increased transparency of technology decision-making. IT governance also enables effective management of cybersecurity and regulatory compliance risk, which protects against loss of the organization's assets (Weill & Ross, 2004).

3.3. Study's hypothesis testing

The central hypothesis is that there is no statistically significant role for ITG, encompassing its dimensions (strategic alignment of IT, value addition, resource management, performance measurement, and risk management), in achieving competitive advantage in the Yemeni telecommunications sector.

To evaluate the role of ITG across its dimensions in achieving competitive advantage, a multiple regression analysis was conducted. The results of this analysis are presented in Table 8:

Table 8 Results of multiple linear regression analysis showing the impact of ITG dimensions on achieving competitive advantage.

Summary of the Models			ANOVA		Regression Coefficients and T Test			
Dependent Variable	Independent Variable	Correlation R	Correlation R ²	F Value	Significance Level	β	T Value	Significance Level
Competitive Advantage	Strategic Alignment of IT	0.683	0.467	46.459	0.000	.068	1.065	.288
	Value Addition					.211	3.689	.000
	Resource Management					.123	1.768	.078
	Performance Measurement					.220	4.038	.000
	Risk Management					.302	5.564	.000

The results presented in Table 8 indicate a positive role of the combined dimensions of the independent variable (ITG) in the dependent variable (achieving competitive advantage), as evidenced by a correlation coefficient of 0.683, which signifies a strong positive correlation.

The significance of this role is reinforced by the F value of 46.459, accompanied by a significance level of 0.000. This result demonstrates that the independent variables (dimensions of ITG) are effective in explaining the dependent variable (competitive advantage). Additionally, the R² value of 0.467 indicates that the dimensions of ITG collectively account for 46.7% of the variance in achieving competitive advantage, highlighting the importance of ITG as a contributing factor for competitive advantage in the Yemeni telecommunications sector.

Furthermore, the results suggest that the dimensions of value addition, performance measurement, and risk management play statistically significant roles in achieving competitive advantage. Conversely, the dimensions of strategic alignment of IT and resource management do not exhibit a significant effect when analysed together with the other dimensions.

Table 9 below presents the results of simple linear regression analysis regarding the role of ITG in achieving competitive advantage:

Table 9 Results of simple linear regression analysis for the role of the ITG in achieving competitive advantage.

Dependent Variable: Achieving Competitive Advantage							
Independent Variable: ITG	Summary of the Models		ANOVA		Regression Coefficients and T Test		
	Correlation R	Correlation R ²	F Value	Significance Level	β	T Value	Significance Level
	0.671	0.450	219.976	0.000	0.950	14.832	0.000

From the analysis presented in Table 9, the calculated F value is 219.976, and the T value is 14.832, both of which are statistically significant at the 0.000 level. This strongly confirms the significance of the role of the variable (ITG) on the dependent variable (achieving competitive advantage).

The R² value of 0.450 indicates that 45.0% of the variance in achieving competitive advantage is attributed primarily to the independent variable, ITG. This suggests that while ITG plays a substantial role, 55.0% of the remaining variance is influenced by other variables not included in the model.

Additionally, the predictive regression coefficient (β) of 0.950 indicates that controlling for all other variables, a 100% improvement in the application of ITG would lead to a 95.0% improvement in achieving competitive advantage. Furthermore, the correlation coefficient between ITG and attaining a competitive advantage is R = 0.671, which suggests a strong positive effect of the independent variable on the dependent variable.

In light of these findings, the central hypothesis of the study is rejected, leading to the acceptance of the alternative hypothesis, which states that “there is a statistically significant role of ITG in achieving competitive advantage in the Yemeni telecommunications sector.”

To test the validity of each subhypothesis, simple regression analysis was used, and the results are shown in Table 10.

- Strategic Alignment of IT: According to the results presented in Table 10, the calculated F value is 62.083, and the computed T value is 7.879, both of which are statistically significant at 0.000. This strongly confirms the significance of the variable (strategic alignment of IT) on the dependent variable (achieving competitive advantage). The coefficient of determination (R²) is 0.188, indicating that 18.8% of the variance in attaining competitive advantage can be attributed to the independent variable of strategic alignment of IT. This suggests that while strategic alignment of IT plays a role in achieving



competitive advantage, a significant portion (87.2%) of the remaining variance is explained by other variables not included in the model. The predictive beta coefficient (β) of 0.476 implies that, controlling for any other variables not studied, a 100% improvement in the application of strategic alignment of IT would lead to a 47.6% improvement in achieving competitive advantage. Additionally, the correlation coefficient between strategic alignment of IT and attaining competitive advantage is $R = 0.433$, indicating a moderate positive correlation between the two variables. On the basis of these findings, the first subhypothesis is rejected, leading to the acceptance of the alternative hypothesis, which states that "there is a statistically significant role of strategic alignment of IT in achieving competitive advantage in the Yemeni telecommunications sector."

Table 10 Results of simple linear regression for the role of each dimension of the ITG in achieving competitive advantage.

Independent Variable: ITG	Dependent Variable: Achieving Competitive Advantage						
	Summary of the Models		ANOVA		Regression Coefficients and T Test		
	R	R ²	F Value	Significance Level	β	T Value	Significance Level
Strategic Alignment of IT	0.433	0.188	62.083	0.000	0.476	7.879	0.000
Value Addition	0.488	0.238	84.039	0.000	0.482	9.167	0.000
Resource Management	0.469	0.220	46.995	0.000	0.578	8.717	0.000
Performance Measurement	0.518	0.268	98.572	0.000	0.521	9.928	0.000
Risk Management	0.565	0.320	126.375	0.000	0.548	11.242	0.000

- Value Addition: According to the analysis presented in Table 10, the calculated F value is 84.039, and the computed T value is 9.167, both of which are statistically significant at 0.000. This strongly confirms the significance of the role of the variable (the application of IT in value addition) on the dependent variable (achieving competitive advantage). The coefficient of determination (R^2) is 0.238, indicating that 23.8% of the variance in attaining competitive advantage can be attributed to the independent variable related to the application of IT in value addition. This suggests that value addition is a significant factor in achieving competitive advantage, although a notable portion (76.2%) of the variance is influenced by other variables not included in the model. The predictive beta coefficient (β) of 0.482 implies that, controlling for any other variables not studied, a 100% improvement in the application of IT in value addition would lead to a 48.2% improvement in achieving competitive advantage. Additionally, the correlation coefficient between the application of IT in value addition and attaining competitive advantage is $R = 0.488$, indicating a moderate positive correlation between these two variables. On the basis of these findings, the second subhypothesis is rejected, leading to the acceptance of the alternative hypothesis, which states that "there is a statistically significant role of value addition in achieving competitive advantage in the Yemeni telecommunications sector."

- Resource Management: According to the results in Table 10, the calculated F value is 46.995, and the computed T value is 8.717, both of which are statistically significant at 0.000. This strongly confirms the significance of the role of the variable (the application of IT in resource management) on the dependent variable (achieving competitive advantage). The coefficient of determination (R^2) is 0.220, indicating that 22.0% of the variance in attaining competitive advantage can be attributed to the independent variable related to the implementation of IT in resource management. This suggests that while resource management positively influences competitive advantage, a substantial portion (78.0%) of the variance is accounted for by other variables not included in the model. The predictive beta coefficient (β) of 0.578 implies that, controlling for any other variables not studied, a 100% improvement in the application of IT in resource management would lead to a 57.8% improvement in achieving competitive advantage. Additionally, the correlation coefficient between the application of IT in resource management and attaining competitive advantage is $R = 0.469$, indicating a moderate positive correlation between these two variables. On the basis of these findings, the third subhypothesis is rejected, leading to the acceptance of the alternative hypothesis, which states that "there is a statistically significant role of resource management in achieving competitive advantage in the Yemeni telecommunications sector."

- Performance Measurement: According to the analysis presented in Table 10, the calculated F value is 98.572, and the computed T value is 9.928, both of which are statistically significant at 0.000. This confirms the significance of the role of the variable (the application of IT in performance measurement) on the dependent variable (achieving competitive advantage). The coefficient of determination (R^2) is 0.268, indicating that 26.8% of the variance in attaining competitive advantage can be attributed to the independent variable related to the application of IT in performance measurement. This suggests that performance measurement is a significant contributor to competitive advantage; however, a substantial proportion (73.2%) of the variance is influenced by other variables not included in the model. The predictive beta coefficient (β) of 0.521 implies that, controlling for any other variables not studied, a 100% improvement in the application of IT in performance measurement would lead to a 52.1% improvement in achieving competitive advantage. Additionally, the correlation coefficient between the application of IT in performance measurement and attaining competitive advantage is $R = 0.518$, indicating a moderate positive correlation between these two variables. On the basis of these findings, the fourth subhypothesis is rejected, leading to the acceptance of the alternative hypothesis, which states that "there is a statistically significant role of performance measurement in achieving competitive advantage in the Yemeni telecommunications sector."

- Risk Management: According to the results presented in Table 10, the calculated F value is 126.375, and the computed T value is 11.242, both of which are statistically significant at 0.000. This strongly confirms the significance of the role of the variable (the application of IT in risk management) on the dependent variable (achieving competitive advantage). The coefficient of determination (R^2) is 0.320, indicating that 32.0% of the variance in attaining competitive advantage can be attributed to the independent variable related to the application of IT in risk management. This shows that risk management is a significant factor in achieving competitive advantage. In contrast, a notable portion (68.0%) of the remaining variance is influenced by other factors not included in the model. The predictive beta coefficient (β) of 0.548 implies that, controlling for any other variables not studied, a 100% improvement in the application of IT in risk management would lead to a 54.8% improvement in achieving competitive advantage. Additionally, the correlation coefficient between the application of IT in risk management and gaining competitive advantage is $R = 0.565$, indicating a moderate positive correlation between these two variables. On the basis of these findings, the fifth subhypothesis is rejected, leading to the acceptance of the alternative hypothesis, which states that "there is a statistically significant role of risk management in achieving competitive advantage in the Yemeni telecommunications sector."

The study results indicate a positive role of ITG in achieving competitive advantage within the Yemeni telecommunications sector. The analysis yielded a calculated F value of 219.976 and a T value of 14.832, both of which are statistically significant at a level of 0.000, confirming the importance of ITG in achieving competitive advantage. The coefficient of determination (R^2) is 0.450, indicating that 45.0% of the variance in attaining competitive advantage can be attributed to ITG. In contrast, the remaining 55.0% is influenced by other factors not included in the model. The predictive regression coefficient (β) of 0.950 suggests that, controlling for any other variables not studied, a 100% improvement in ITG application would lead to a 95.0% improvement in competitive advantage, indicating a highly significant impact. Additionally, the correlation coefficient of 0.671 reflects a strong positive correlation between ITG and competitive advantage.

The results of this study align with the findings of Saeidi et al. (2019), who explored the impact of enterprise risk management (a dimension of ITG) in achieving competitive advantage by modifying the role of IT in Iranian financial institutions, revealing a positive relationship between the two. Similarly, Borja et al. (2018) confirmed that ITG significantly influences product and process innovation, a key aspect of competitive advantage, among local associations in Bogotá, Colombia. Asma (2018) also reported a positive role of ITG in enhancing competitiveness within NAFTAL, a petroleum services organization in Algeria. Additionally, the study by Al-Samman & Al-Jabouri (2016) highlighted a significant correlation and impact between ITG and service quality, another dimension of competitive advantage. Furthermore, Chapman (2016) emphasized a high correlation between ITG and achieving competitive advantage.

The observed positive contribution of information technology governance (ITG) to Yemeni telecom organizations indicates the realization of its strengths and a pushy pursuit to implement its essential concepts to attain optimal working effectiveness and overall strategic performance. Given that such firms increasingly adopt firm ITG policies, the opportunity to create long-term competitive advantage increases considerably. This study has continued to highlight the central role that the ITG is expected to play in driving performance improvement, which ultimately enables the attainment of a competitive edge.

By establishing transparent and open governance arrangements and norms, organizations are better positioned to utilize their IT investments, appropriately address potential risks strategically, and exhibit flexibility in responding to continuously evolving market demands. These skills are critical to maintaining a competitive position in an ever-changing and highly competitive industry environment (Asma, 2018).

The Yemeni telecommunications organizations are not only aware of the benefits of IT governance, but are also effectively applying its principles to enhance their operational efficiency and strategic outcomes. As they continue to adopt these practices, the likelihood of achieving further competitive advantages increases significantly. Furthermore, previous literature has consistently emphasized the importance of IT governance in improving and developing performance to achieve competitive advantage.

By establishing clear frameworks and practices, organizations can better manage their IT investments, mitigate risks, and respond quickly to market demands, which is essential for maintaining a competitive advantage in a rapidly evolving industry (Hunaiber, 2022).

IT governance is not a support function, but an organization-wide strategic driver and facilitator of long-term sustainable competitive advantage. IT governance through structures, processes, and mechanisms, including the COBIT framework, encourages alignment of IT investments and objectives and strategic business objectives. IT governance thus turns technological assets into a competitive asset that is difficult to replicate by improving the overall performance of the organization, reducing technology-related risk, and improving strategic decision-making (Weill & Ross, 2004).

4. Final Considerations

The findings of this study convincingly establish an active attempt in the Yemeni telecommunication sector to implement information technology governance (ITG). This is a clear indication of an evident appreciation for the crucial role played by

effective governance mechanisms in the strategic management of IT resources and their alignment with overall organizational objectives, ultimately leading to overall performance.

Furthermore, the existing scholarly literature underscores ITG's instrumental function in delivering performance improvement, which is fundamental to the realization of competitive excellence. The application of well-defined frameworks and operation protocols allows companies to optimize their IT spending and best counterpose impending dangers. It showcases greater agility in responding to shifting market demands, all of which are paramount in sustaining competitive excellence in a continually evolving industry.

The identification by this current research of a significant level of ITG adoption by the telecommunication sector of Yemen also suggests that organizations are not only aware of its benefits but are also presently working proactively and effectively to embrace its premises to increase operational efficiency as well as strategic outcomes. As these organizations continue to instill and cultivate additional such governance practices, the potential for realizing more and sustained competitive advantage is significantly increased.

The value of this study is that it is relevant to the times and, by its relative abundance within the general body of academic work, highly contributes to new ideas and fills the Yemeni academic body with a subject that, until now, has been given minimal academic attention within the local business community. Additionally, the study contains potential for theoretical and knowledge extension upon previous work, a position from which future research may benefit as a valuable point of reference. The resulting conclusions and recommendations have real-world implications for senior management in the Yemeni telecom sector, helping identify ITG's worth in building organizational capacity and potential, ultimately enabling the attainment of a sustainable competitive advantage.

Overall, the role of ITG in attaining a sustainable competitive advantage in the Yemeni telecom sector is unequivocally better. Notably, ITG strategies must be aligned with business objectives to ensure that investments in IT effectively contribute to organizational goals. The local regulatory environment that has been put in place has a significant influence on ITG practices, with the presence of unique challenges as well as possible opportunities for telecommunications players in Yemen. Successful ITG builds an innovation and agility culture, enabling companies to respond quickly to new technologies and shifting customer requirements. Additionally, intelligent deployment of resources made possible by a solid ITG generates actual cost reductions and enhanced operating efficiency, yet another factor for increased competitive positioning. The governance framework has a significant role in risk anticipation by enabling the identification and mitigation of risks to the organization's assets and reputation. Engaging diverse stakeholders in the governance process enhances decision-making quality and fosters a culture of accountability and transparency. Future research must investigate the disruptive impact of emerging technologies, such as artificial intelligence and fifth-generation (5G) networks, on ITG practices in the telecom sector. Additionally, integrating rich case descriptions of successful ITG deployments within the region can be beneficial as best practices for other firms to adopt. Finally, it is crucial to consider that effective ITG is not only a matter of technical necessity but also a matter of strategic necessity that can significantly contribute to a competitive edge in the rapidly evolving and dynamic Yemen telecommunications environment.

5. Declarations

5.1. Ethical considerations

The authors declare that all factors related to protecting participants were carefully considered, ensuring that all information collected during the study was treated with the utmost confidentiality.

5.2. Use of artificial intelligence (AI)

The authors declare that no generative artificial intelligence (AI) tools were used in the preparation, analysis, or writing of this manuscript.

5.3. Conflict of interest

The authors declare that they have no conflicts of interest.

5.4. Funding

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