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Impact of Factors Influencing Organizational Readiness to Adopt the Build-Operate-Transfer Model in Yemen's Infrastructure Projects

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Abstract

The Build-Operate-Transfer (BOT) model presents a viable approach to financing infrastructure projects, especially in contexts with constrained public funding. Despite its potential, the model remains relatively unfamiliar in Yemen, with limited empirical research on its adoption. This study aims to examine how organizational factors, specifically structure and culture, affect an organization's readiness to adopt BOT in the Yemeni infrastructure sector. Drawing on theories of organizational readiness and innovation adoption, this study proposes and empirically tests several hypotheses. Using stratified sampling, a questionnaire survey was distributed to senior managers and executives in both public and private organizations. Data were collected from 269 respondents and analyzed using multiple regression, correlation, and factor analysis to identify the key determinants of BOT readiness. The findings reveal that structural factors, namely formalization and centralization, play a significant role in influencing BOT adoption, whereas organizational culture did not show a statistically significant impact. These findings underscore the dominance of top-down decision-making in Yemeni organizations, thereby diminishing the influence of cultural factors on strategic adoption. The study contributes to the BOT literature by offering empirical evidence from a bureaucratic, hierarchically structured environment. It also extends the theory of organizational readiness to the BOT context.

Keywords: Build-Operation -Transfer (BOT), Organizational structure, Organizational culture, Readiness index, Yemen

1.0 INTRODUCTION

Infrastructure projects are among the most sought-after worldwide, yet their successful implementation requires substantial funding, efficient management, and advanced technology. The build-operate-transfer (BOT) model is a widely used public-private partnership (PPP) approach that many nations have adopted to address shortages in government funding and expertise. However, as recent studies have shown, reducing risks—especially those that impact revenue streams is essential to the success of BOT projects (Attarzadeh, et al., 2017; Henderson & Salado, 2024). These challenges are particularly severe in Yemen, which has long been regarded as the least developed country in the Middle East and North Africa region in terms of infrastructure (World Bank, 2017). Due to decades of underinvestment, over 60% of Yemen's infrastructure is non-functional, necessitating costly temporary repairs. For instance, Yemen pays $1.5 billion annually to private companies for electricity (House of Representatives, 2014). Despite the country's dire financial situation (Al ashwaly, 2018), these imbalances highlight the urgent need for long-term solutions, such as the build-operate-transfer (BOT) system, to leverage private sector resources in bridging Yemen's infrastructure deficit.

Although Build-Operate-Transfer (BOT) adoption has been studied globally, most research has focused on sector-level readiness, overlooking organizational-level factors that shape readiness for BOT adoption (Gamil et al., 2020). For instance, infrastructure projects in Yemen saw a boom in 2011 but soon stalled due to political instability. Nevertheless, active NGOs like the Social Fund for Development persisted, highlighting the importance of flexibility and organizational readiness in overcoming challenges (Gamil et al., 2020). This underscores the need to explore how organizational readiness particularly cultural and structural factors influence BOT adoption. Public-private cooperation is central to discussions on BOT feasibility, as neither sector can independently resolve infrastructure deficiencies (Ong & Lenard, 2003). However, organizational adoption of innovations such as BOT remains complex. Some studies link structure and culture to innovation (Katz & Allen, 1984), identifying them as critical to organizational readiness. Addressing these elements can enhance

performance and competitiveness (Christine, 2011). Yet, other research shows that numerous internal and external factors shape innovation processes (George & Jones, 2003). Hill and Hupe (2002), noted that successful firms assess relevant variables before adopting new strategies. While Katz & Allen (1984) emphasized the impact of structure and culture on innovation, Jantan, Nasurdin, and Fadzil (2003) found no such relationship in Malaysian manufacturing sectors. Similarly, Chong et al., (2009) showed that organizational readiness significantly influences IT and e-commerce adoption decisions. In housing, Yusof & Shafiei (2011) found that readiness had no direct impact on the Build-Then-Sell (BTS) Readiness Index. Likewise, N.A. Yusof & Abidin (2012) reported that cultural dimensions did not significantly affect innovativeness. However, Kamaruddeen et al., (2012) demonstrated that culture significantly enhances innovation capabilities, and structure positively correlates with innovativeness, even though formalization and centralization had no significant effect.

Overall, empirical findings from various studies examining the links between organizational structure, culture, and openness to innovation remain mixed. Although Build-Operate-Transfer (BOT) models are gaining recognition in Yemen, practical experience remains limited concerning how organizational structure and culture influence their adoption. Addressing this gap is essential for developing strategies that align with the strengths and limitations of both public and private sector stakeholders involved in infrastructure development. These challenges are more pronounced in developing countries such as Yemen, where the lack of prior studies on BOT systems underscores the need to understand local conditions and develop context-specific solutions.

This study aims to provide insights into the organizational readiness factors influencing the adoption of Build-Operate-Transfer (BOT) projects in Yemen, drawing on organizational readiness theory as it applies to both the public and private sectors. By identifying these determinants, the study aims to guide policymakers in fostering a collaborative environment for BOT adoption—one that enhances infrastructure service delivery, improves public resource efficiency, and accelerates technological progress. As the first specialized study in this field in Yemen, this research addresses a significant knowledge gap and lays the groundwork for future studies in the country's critical infrastructure sector.

■2.0 LITERATURE REVIEW

2.1 Concept of Build- Operate-Transfer (BOT)

The Build-Operate-Transfer (BOT) model is among the most recognized and extensively studied forms of Public-Private Partnerships (PPPs), serving as a successful mechanism for funding and delivering infrastructure projects. A widely acknowledged feature of this model is that the government grants a concession to the private sector, which finances, builds, and operates the project during the concession period, before returning it to the government or a designated third party (Gbadegesin & Oyewole, 2014; Shi et al., 2024). Despite this consensus, academic interpretations differ in their emphasis on the financial versus contractual aspects of the model. Sharaffudin and Al-Mutairi (2015) highlight its reliance on project financing, a non-recourse or limited-recourse method designed to isolate project risks from sponsors, while other researchers, such as Kumaraswamy & Zhang (2001), focus on the legal structure of the agreement, particularly the concessionaire's obligations and the eventual asset transfer. From another perspective, Yang and Meng (2000), view the BOT model as a project implementation tool that promotes private sector engagement throughout the concession period. This divergence in analytical approaches reflects a broader conceptual divide in BOT literature, with the model viewed either as a financial tool or as an integrated mechanism for project implementation and management. Although there is general agreement on its basic structure, studies vary in their focus on economic, legal, and operational dimensions, highlighting the absence of a comprehensive analytical framework that integrates these aspects. The literature review reveals a clear shortcoming in critically assessing how conceptual variations in the BOT model influence implementation outcomes and whether stakeholder interests, particularly those of the public and private sectors, are equitably balanced. This gap highlights the absence of comparative studies analyzing how contextual variations in the model's application across different political and economic settings affect implementation effectiveness and sustainability. Hence, there is an urgent need for research frameworks that link contextual characteristics to performance outcomes in BOT projects, supporting the development of more adaptive and comprehensive public-private partnership models.

2.2 Build - Operate- and –Transfer (BOT) in Yemen

The conflict in Yemen has led to the deterioration of infrastructure and public services, particularly in the sectors of energy, transport, water, and sanitation (World Bank, 2017). In response to these challenges, the Build-Operate-Transfer (BOT) model has attracted increased attention as a potential strategy for infrastructure development, especially in developing countries with limited resources. This model allows private sector participation in financing, constructing, and operating infrastructure projects under government agreements (Shi et al., 2024). The literature indicates that, although the Build-Operate-Transfer (BOT) model is a viable option, Yemen's unique post-conflict situation presents considerable challenges. In the context of water and sanitation service reform, for example, (Sahooly, 2003), who worked with the International Development Association (IDA), noted institutional interest in the model. However, he also highlighted structural barriers, including low staff engagement, limited technical capacity, and internal opposition from facility managers. This discrepancy underscores a critical issue in the model's implementation: while the BOT system offers financial and operational efficiencies, institutional readiness and stakeholder alignment are essential for its success.

Kleijn (2010) conducted a study in Taiz, Yemen, exploring the potential implementation of the BOT model through a partnership between the Ministry of Water and Environment and Vitens-Evides International (VEI). The study found strong intentions behind the partnership, but also revealed that institutional challenges, such as administrative inertia, lack of accountability, and entrenched bureaucratic resistance, significantly hindered implementation. This case illustrates the difficulties international donor-funded BOT projects may face, particularly in environments lacking robust local governance frameworks. In addition, the Ministry of Water and Environment (2010)

organized a national workshop to evaluate and adapt global BOT experiences to the Yemeni context, assess feasibility, address implementation challenges, and build communication strategies between public and private sector actors. While this signals a policy-level recognition of BOT's potential, the absence of sustained follow-through and practical frameworks remains a persistent gap. Numerous studies have shown that the Build-Operate-Transfer (BOT) model, despite its theoretical potential, faces profound practical limitations in the Yemeni context due to weak governance, fragmented institutional structures, and the structural fragility typical of post-conflict phases. These studies emphasize that the model's success should not be assumed universally applicable; rather, it depends on flexible institutional design, a genuine willingness to implement structural reforms, and the active, strategic involvement of all stakeholders throughout the project lifecycle.

2.3 Readiness to Adopt Build - Operate- and –Transfer (BOT)

The concept of readiness for change is vital in determining the feasibility of BOT adoption. Vakola (2013) summarized the concept of "readiness for change" quite well. It is indeed a multifaceted term that encompasses three concepts. The first concept is individual readiness for change, which involves personal attributes like trust in the change process and belief in one's abilities (self-efficacy) to adapt and thrive in new situations. The second concept is organizational readiness for change, which refers to the collective attitude within an organization, including its efficiency and the shared confidence in the organization's capacity to implement new ideas successfully. The third is actual readiness for change, representing the practical and tangible ability of the organization to execute the change effectively. Holt et al., (2007) note that readiness for change implies not only willingness but also a proactive approach to overcoming resistance within an organization. By fostering a culture of openness, addressing concerns, and actively engaging stakeholders, organizations can enhance readiness and improve the likelihood of successful implementation. Wang et al., (2023) report that readiness, when seen as behavior, emphasizes the active and intentional steps organizations take to prepare for impending changes. This view frames readiness not as a static condition but as an ongoing process that evolves with continuous action and engagement.

Parasuraman (2000) proposes that emotion plays a dominant role in individuals' willingness to adopt new ideas, whether positively or negatively. Through extensive research, he identified four dimensions of a Readiness Index: optimism, innovativeness, discomfort, and insecurity. Optimism refers to a positive attitude toward innovation and belief in its potential to enhance work efficiency and quality of life. Innovativeness is the ability and willingness to experiment with new ideas and influence others. Discomfort indicates a lack of control over innovations and difficulty in adopting them. Insecurity reflects a distrust of innovation and doubts about the organization's ability to implement it successfully. The concept of organizational readiness is pivotal to the adoption of the BOT model. Various researchers have contributed to understanding its dynamics and implications. It is now widely accepted that readiness is not a singular concept but a multidimensional construct involving individual, organizational, and behavioral elements that together shape an organization's ability to adapt and implement change. Vakola (2013) expanded upon earlier models by framing readiness as a tripartite structure, comprising individual, organizational, and actual readiness. These align with Parasuraman's psychological dimensions and Holt et al.'s structural emphasis. Meanwhile, Wang et al. (2023) introduced a new behavioral perspective, defining readiness as a set of intentional and concrete actions that organizations take to prepare for and manage change. This perspective Wang et al. (2023) advanced the discussion by highlighting readiness as a behavioral process, something organizations continually refine through deliberate action. Together, these perspectives mark a progression in the literature: from emotional and psychological models (Parasuraman, 2000), to structural and organizational frameworks (Holt et al., 2007; Vakola, 2013), to dynamic behavioral approaches (Wang et al., 2023). Despite differing emphases, scholars generally agree that readiness is multifaceted and critical to successful change.

This study applies Parasuraman's (2000) Readiness Index to evaluate the readiness of Yemeni organizations to adopt the BOT model. Its four dimensions, optimism, innovativeness, discomfort, and insecurity are particularly relevant in Yemen's context, where institutional instability and limited resources prevail. These psychological and emotional factors significantly influence organizational adoption decisions. In addition to emotional readiness, the study investigates organizational factors such as structure, skilled personnel, and leadership commitment. By combining Parasuraman's psychological model with broader organizational attributes, the study develops a comprehensive diagnostic tool that identifies the key factors affecting Yemen's adoption of the BOT model.

2.4 Factors Affecting Organizational Readiness

Organizational structure is a key factor that influences the effectiveness of organizations in coordinating activities and achieving strategic objectives. Researchers agree that structure determines the distribution of responsibilities, authority, and relationships within an organization, although they may differ in the specific factors they emphasize (Eva et al., 2021). Other studies highlight the dynamic role of structure in promoting innovation and strategic adaptability (Gentile-Lüdecke et al., 2020; Zheng et al., 2010), contrasting with foundational views that define it as a system of stable, formal roles and communication channels (James, 1976; Wagner & Hollenbeck, 2009). Meanwhile, the past studies argue that decentralized structures empower employees and enhance their capacity to innovate (García-Morales et al., 2007; D. M. Russell & Hoag, 2004). However, others caution that dispersed decision-making can lead to coordination challenges, particularly in larger or more hierarchical organizations (Olson et al., 2005; Willem et al., 2007). These contrasting findings suggest that the optimal degree of centralization depends on organizational size, task complexity, and innovation goals. Organizational structure has been defined as a lasting characteristic reflected in the allocation of management roles and the formal relationships among them (James, 1976). Zheng et al. (2010), indicate that it signifies the formation of permanent tasks and responsibilities. Borgatti (2001), notes that structure is the mechanism by which an organization is arranged to achieve predetermined results. Wagner and Hollenbeck (2009), describe it as a stable system connecting individuals and tasks, designed to coordinate activities efficiently. Sehanovic and Zugaj (1997), it quantitatively represents relationships among components at all organizational levels.

Several structural elements influence how organizations adopt new ideas. For example, Russell (1999) states that less formal and more decentralized setups promote independence and innovation. García-Morales et al. (2007) observe that innovation adoption differs between

large and small organizations, with larger ones typically having stronger structures, more investment in R&D, and higher employee quality, factors that influence readiness for change. Organizational structure includes two dimensions: structural dimensions, such as formalization and centralization. Subramanian and Nilakanta (1996) define centralization as the concentration of decision-making authority. Specialization refers to the specific competencies employees possess in relation to their job roles. Structure also shapes approaches to open innovation, where formalization can negatively affect outbound open innovation while positively affecting inbound open innovation (Gentile-Lüdecke et al., 2020). Formalization pertains to the extent to which responsibilities and rights are clearly defined and codified in policies, procedures, and guidelines (Schminke et al., 2000). While it can hinder innovation by imposing rigidity, it can also standardize practices and provide problem-solving frameworks (Auh & Menguc, 2007). Centralization, as described by (Olson et al., 2005), introduces complexity into decision-making processes when power is held by top management rather than distributed among lower levels. Willem et al. (2007) add that centralized decision-making resides with senior leaders. A study by Kamaruddeen et al. (2012) on Malaysian housing developers found that while organizational structure correlates positively with innovativeness, dimensions like formalization and centralization have a limited direct impact.

More importantly, organizational culture was found to have a significant positive effect on innovation. Culture is often seen as emergent and resistant to top-down control, reflecting deeply embedded shared knowledge, whereas structure is more flexible and subject to leadership influence (Kamaruddeen et al., 2012). This suggests that neither structure nor culture alone determines innovative capacity; rather, it is their alignment that fosters or hinders innovation. Wagner and Hollenbeck (2009) define organizational culture as the shared perceptions and values among members, grounded in collective understanding and norms. Organizational characteristics encompass various elements, including culture (Rangarajan et al., 2004). Effective change efforts must consider readiness for change, which involves individuals and teams adapting to new conditions. While leadership can enhance readiness, external factors also play a role (Muir, 1996). Davies et al., (2007), argue that culture is shaped through formal and informal practices and shared behaviors between employees and leaders' Organizational cultures can be classified into market culture and adhocracy. Adhocracy emphasizes external growth and resource acquisition, while market culture prioritizes internal efficiency and compliance with policies (Shih & Huang, 2010; Van Beek & Gerritsen, 2010). Tsalits and Kismono (2019) found a positive relationship between hierarchy and market cultures and change readiness in Indonesian organizations. Byrd and Marshall (1996), identify adhocracy as one of the four key organizational culture types. Adhocracy encourages open systems and flexibility, often being the subject of cross-cultural studies. It represents one end of the spectrum in organizational types and promotes transformation and risk-taking.

The literature consistently highlights the role of a dynamic culture and market orientation in achieving innovation and strategic success Denison and Spreitzer (1991) define adhocracy as a culture that encourages growth, competition, and risk-taking, motivating leaders and employees to innovate. Njagi et al., (2020) support this by showing that a learning culture positively correlates with strategy implementation in Kenyan organizations. The concept of market orientation has evolved to include both cultural and behavioral dimensions. Jaworski and Kohli (1993) and Slater and Narver (1995) emphasize that market orientation goes beyond actions to include shared organizational values. Their earlier work (Kohli & Jaworski, 1990) has had lasting influence and is widely cited, e.g., (González-Benito, 2005). These studies suggest that market orientation, organizational culture, and adhocracy work together to support innovation. Jantan et al. (2003) found that organizational culture positively influences innovativeness among Malaysian firms. The convergence of these findings across various contexts underscores the importance of both internal cultural dynamics and external strategic processes.

Despite these insights, few studies have examined the combined impact of organizational structure and culture on innovation outcomes. Addressing this gap, the current study investigates how these two dimensions influence the adoption of the Build-Operate-Transfer (BOT) model in Yemen. By examining this interaction in a unique and underexplored setting, the study aims to provide a more comprehensive understanding of the organizational factors that drive BOT model adoption.

2.5 Research framework

The selection of organizational factors (variables) examined in this study was informed by previous empirical studies (Laforet, 2008; O'Regan et al., 2006; Pun, 2004). O'Regan et al. (2006) assert that the adoption of new concepts is closely related to an organization's culture and structure. Similarly, Pun (2004), observed that organizations of all sizes, small, medium, and large, operate in increasingly complex, dynamic, and unpredictable global environments. As a result, many organizations have adopted creative approaches to developing new business strategies Moreover a significant body of research suggests a strong link between the implementation of novel ideas and the development of a market-oriented strategy.

For example, several studies (Ibem, 2010; Matear et al., 2002; Maydeu-Olivares & Lado, 2003; Vázquez et al., 2001) have demonstrated a correlation between market orientation and innovation. Maydeu-Olivares and Lado (2003) found that market orientation not only influences innovation performance but also has a broad impact on economic outcomes. Therefore, this study examines the organizational factors that may influence the implementation of the Build-Operate-Transfer (BOT) model, considered a novel policy for infrastructure development in Yemen. Specifically, it focuses on organizational culture (adhocracy culture and market orientation) and organizational structure (formalization and centralization). The theory of readiness for change, which remains dominant in the organizational change literature, is used to support the relationship between the independent and dependent variables. The aim of this study is to identify the organizational factors that contribute to the successful implementation of BOT. A general model has been developed to assess organizational readiness for adopting new concepts. This research framework illustrates the relationships between the independent and dependent variables (Sekaran, 2006), specifically exploring how organizational factors influence readiness to adopt BOT. Although existing literature addresses this topic, it remains inconclusive on how organizational structure and culture affect readiness for BOT adoption, highlighting the need for further investigation. Accordingly, the study poses the following research questions:

RQ1: what is the impact of organizational factors on the BOT readiness index among public and private sector organizations in Yemen?

RQ2: which factors predict readiness to adopt BOT?

Based on the research questions, the following main hypotheses are proposed:

H1: There is a positive and significant relationship between formalization and readiness to adopt BOT.
H2: There is a positive and significant relationship between centralization and readiness to adopt BOT.
H3: There is a positive and significant relationship between adhocracy culture and readiness to adopt BOT.
H4: There is a positive and significant relationship between market orientation and readiness to adopt BOT.

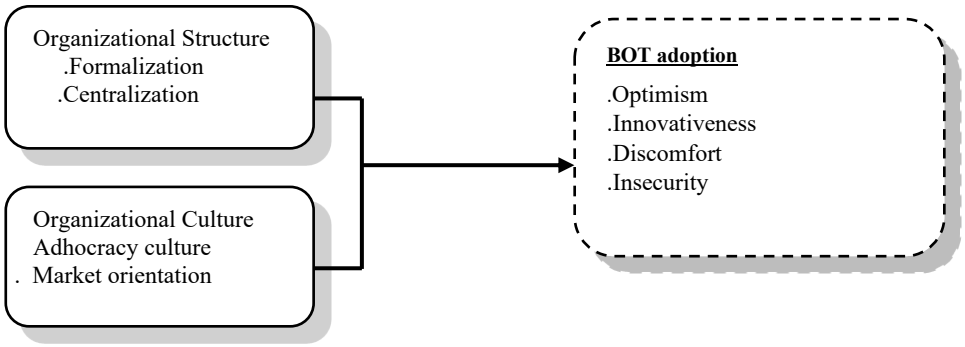

Figure 1 Framework for the influence of organizational readiness factors in adopting BOT

■3.0 METHODOLOGY

3.1 Research Approach

This study aims to identify organizational readiness factors that influence the adoption of the Build-Operate-Transfer (BOT) model in infrastructure projects. Given its exploratory nature and its focus on examining the relationships between organizational factors and BOT adoption readiness, a quantitative research approach was deemed appropriate (Alford & Teater, 2024). This approach enables the systematic measurement of variables, statistical testing of hypotheses, and the potential generalization of findings to a broader organizational context. The selection of a quantitative methodology is justified for several reasons. First, it facilitates the analysis of relationships among multiple variables (such as organizational structure, culture, and BOT adoption readiness) using statistical methods. Second, it allows for the testing of hypotheses derived from the literature. Third, it supports data collection from a large sample of organizations, thereby enhancing the generalizability of the results. Lastly, quantitative methods provide objective, replicable measurements, contributing to the cumulative body of knowledge in this field (Roppelt et al., 2025). This research employs a cross-sectional survey design, which is suitable for collecting data at a single point in time to examine current attitudes, beliefs, and practices related to BOT adoption readiness. This design is efficient in terms of time and resources while still providing comprehensive data for analysis (Babbie, 2013).

3.2 Research design

This study outlines the research process in eight distinct stages. The first stage involves identifying the research topic, defining the problem, and establishing the study's objectives. The second stage includes conducting a comprehensive literature review, focusing on the definition of the Build-Operate-Transfer (BOT) model and the organizational factors that influence readiness for its adoption. In the third stage, the research methodology is developed, emphasizing a quantitative approach and the design of a structured questionnaire as the primary data collection instrument. The fourth stage entails refining the questionnaire through expert reviews and validation to ensure clarity, content validity, and reliability. The fifth stage focuses on administering the finalized questionnaire to the target population. The sixth stage involves data collection and statistical analysis using descriptive statistics, correlation analysis, exploratory factor analysis, and multiple regression techniques. In the seventh stage, the data is processed and analyzed using SPSS software to ensure accuracy and robustness. Finally, the eighth stage presents the findings, conclusions, and recommendations. Figure 3.1 provides a visual summary of the entire research process.

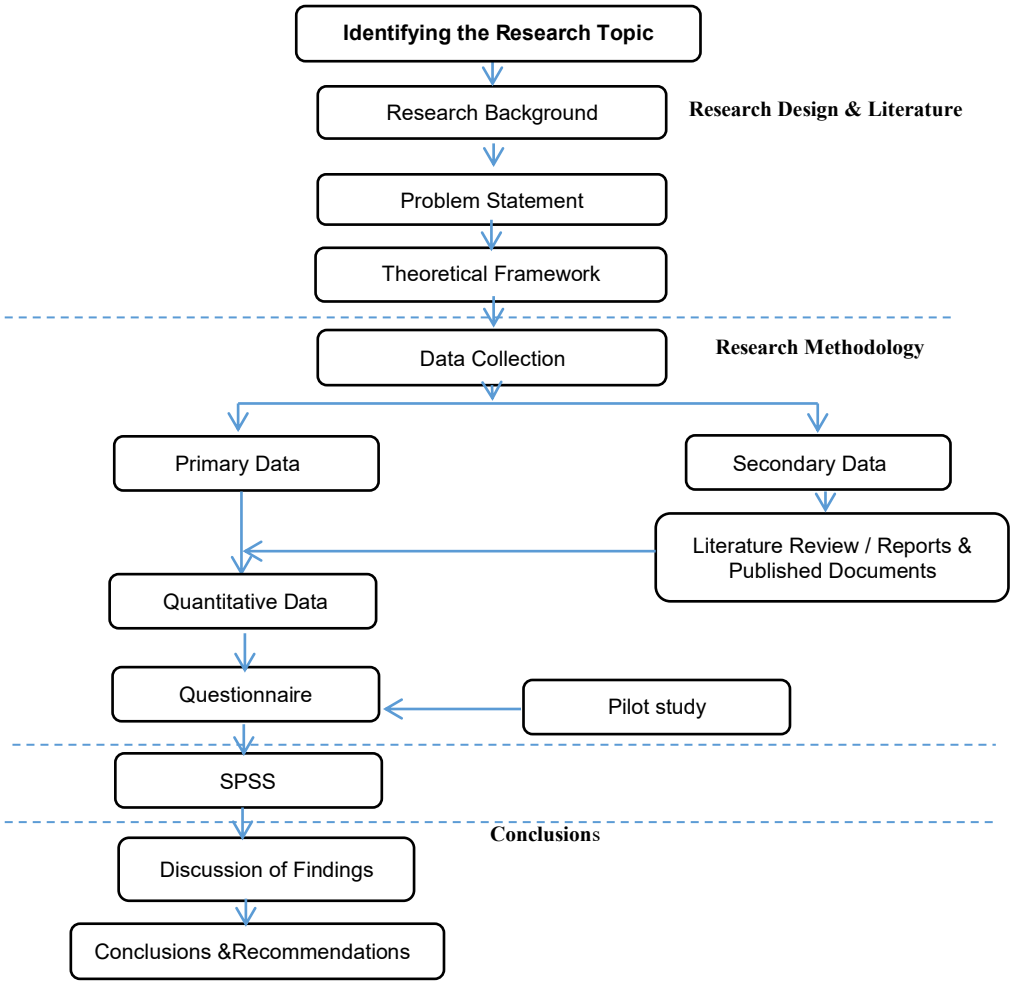

Figure 3.1 Flowchart of Research Methodology

3.3 Population and sampling

The study targets managers of public and private entities with experience in implementing and financing infrastructure projects in Yemen between 2007 and 2024. To ensure a statistically representative sample of the population, the formula presented in Equation (1) was used (Alaghbari et al., 2019; Mukhopadhyay, 2020) :

$$n = \frac{\mathbf{m}}{\mathbf{1}+\left(\frac{\mathbf{m}-\mathbf{1}}{\mathbf{N}}\right)} \qquad (1)$$

Where n, m, and N = the sample size of the limited, unlimited, and available population, respectively. The value of m is estimated using the following formula (2):

$$m = \frac{\boldsymbol{z}^{\mathbf{2}}\times\boldsymbol{\rho}\times(\mathbf{1}-\boldsymbol{p})}{\boldsymbol{\varepsilon}^{\mathbf{2}}} \qquad (2)$$

Where z is the statistic value for the confidence level used (i.e. 2.575, 1.96, and 1.645) for 99%, 95%, and 90% confidence levels respectively, p is the value of the population proportion that is being estimated, and ε is the sampling error of the point estimate.

Since the actual value of p is unknown, previous studies (Alaghbari et al., 2019; Mohammad Al-Naghi et al., 2024), recommend using a conservative estimate of p = 0.50, which provides the maximum required sample size. Using a 90% confidence level (z = 1.64) and a 5% margin of error (ε = 0.05), the unlimited sample size m can be calculated as follows (Shafer & Zhang, 2012):

$$m = \frac{(1.64)^2 \times 0.50 \times (1-0.50)}{(0.50)^2} \approx 269$$

Stratified sampling was employed to ensure representativeness of the sample. Based on the finite population size and the sample size formula, the adjusted sample size n was calculated to be approximately 269 (Alaghbari et al., 2019; Levy & Lemeshow, 2013; Mohammad Al-Naghi et al., 2024).

3.4 Data Collection

The researcher encountered significant challenges in reaching the target respondents during the questionnaire distribution phase. These difficulties stemmed mainly from the study's broad scope, covering various governorates in Yemen and targeting both public and private infrastructure organizations. The questionnaire targeted managers with decision-making authority and sufficient knowledge of their organization's readiness to adopt the BOT concept. To address the challenges arising from the conflict in Yemen, various communication channels were used to reach the target respondents. The questionnaire was created using Google Forms and distributed via email and social media platforms. This approach yielded a high response rate, with 248 out of 269 questionnaires returned. Of these, 198 (approximately 72%) were valid for analysis, while 50 were excluded.

3.5 Research instrument

The questionnaire is a structured tool designed to measure respondents' levels of agreement with statements reflecting their views. It was developed based on insights from the literature review and refined through expert consultations. Factors influencing organizational readiness for BOT adoption in the infrastructure sector were identified and grouped into distinct thematic categories. A five-point Likert scale was employed, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), to ensure consistency and enhance reliability. The questionnaire items were adapted from validated instruments in previous studies and modified to suit the local context.

To ensure validity and reliability, the instrument underwent several evaluation stages, including expert review, linguistic refinement, and feedback from professionals in the infrastructure field. A pilot study was conducted to assess clarity, resolve ambiguities, and evaluate the effectiveness of the measurement items. The pilot study also contributed to enhancing content validity and improving the overall questionnaire structure. Reliability testing using Cronbach's Alpha demonstrated high internal consistency, with values ranging from 0.832 to 0.895, indicating strong reliability across the different categories (see Table 1). These results confirm the robustness of the scales used to measure organizational readiness for BOT implementation.

Table 1 Cronbach's Alpha Values for the Study Variables

Variables	Number of items	Cronbach's alpha
Organizational structure	5	0.895
Organizational culture	4	0.832
BOT Readiness index	5	0.892

■4.0 RESULTS AND DISCUSSIONS

4.1 Organizational Profile

Table 2 offers a comprehensive overview of the demographic characteristics of the organizations that participated in this study. The sample included chief executive officers and senior managers from various Yemeni organizations involved in infrastructure projects. A total of 269 questionnaires were distributed through an online survey platform, from which 248 valid responses were returned, resulting in a response rate of approximately 92.2%. The results indicate that the majority of respondents (61.6%) were from the private sector, while 36.7% represented the public sector, and 2.0% were from partnership organizations. Regarding the year of establishment, 40 % of the organizations were founded between 1999 and 2010, indicating a relatively mature institutional base. In terms of organizational size, 20.7 % of the firms had 90–100 employees, followed by 11.6% with 11–20 employees and 10.6% with 31–40 employees.

Table 2 demographic characteristics of the organizations

Parameter	**Frequency**	**%**
Organizational ownership type		
Private sector	124	61.7
Public sector	72	35.8
Partnership	5	2.5
Establish of organizational		
1980 - 1985	26	12.9
1986 - 1990	10	5
1991 - 1995	24	11.9
1996 - 2000	35	17.4

2001 - 2005	71	35.3
2006 - 2010	35	17.4
Number of employers		
1-10	10	5
11-20	23	11.4
21-30	18	9
31-40	21	10.4
41-50	16	8
51-60	16	8
61-70	11	5.5
71-80	15	7.5
81-90	11	5.5
91-100	41	20.4
Above100	19	9.5

4.2 Factor Analysis for Organizational Structure

According to Gentile-Ludecke (2020), Cronbach's alpha was used to assess the reliability of the questionnaire. The reliability coefficients (alpha) for the organizational structure constructs, formalization and centralization, were both above 0.70, indicating acceptable internal consistency. Factor analysis was conducted to evaluate construct validity. The measures of sampling adequacy (MSA) for each item in Table 3 were above 0.5, suggesting sufficient shared variance among the items .According to Field (2009), the Kaiser-Meyer-Olkin (KMO) test confirmed sampling adequacy for the analysis with a value of 0.854, which Field (2009) describes as "great." Bartlett's test of sphericity yielded $\chi^2 = 1779$, $p < 0.001$, indicating that the correlations between items were statistically significant and suitable for factor analysis. To explore the relationships among the 11 items and their underlying constructs, principal component analysis with Varimax rotation was conducted. The rotated component matrix showed that two items had low factor loadings and high cross-loadings; therefore, they were removed due to weak associations with the core factors. The final factor analysis extracted two components, formalization (4 items) and centralization (5 items), each with eigenvalues exceeding Kaiser's criterion of 1.0. Together, these two components explained 81.61% of the total variance.

Table 3 Factor Analysis Results for organizational structure

Factors		Factor	Commonality	Eigenvalue	Variance	Mean
Formalization				5.091	46.19	3.60
Liberty of staff		0.922	0.894			
Employee make rules		0.896	0.836			
Employees' freehand		0.827	0.690			
Employees' decision		0.837	0.739	2.25	35.42	3.48
Centralization						
Employees feel control		0.924	0.890			
Supervisor consent		0.873	0.789			
Permission final		0.908	0.870			
Management ratification		0.923	0.882			
Permission from leader		0.862	0.756			
Total Variance explained	81.61					
Total Scale Reliability	0.901					
KMO	0.854					
Bartlett's Test of sphericity	0.000					

4.3 Factor Analysis for Organizational Culture

The organizational constructs of market orientation and adhocracy culture demonstrated acceptable reliability, with Cronbach's alpha coefficients exceeding 0.70. Construct validity was evaluated through factor analysis. As shown in Table 4, the Measure of Sampling Adequacy (MSA) for each item exceeded the threshold of 0.5, indicating sufficient shared variance for analysis. The Kaiser-Meyer-Olkin (KMO) measure confirmed sample adequacy with a value of 0.898, which Field (2009) describes as "great." Bartlett's test of sphericity yielded a statistically significant result ($\chi^2 = 1893$, $p < 0.001$), indicating that the correlation matrix was suitable for factor extraction. Principal component analysis (PCA) with Varimax rotation was conducted to explore how the 21 items related to their underlying factors. The rotated component matrix identified seven items with low factor loadings and high cross-loadings. These items were excluded from the analysis due to their weak association with the intended constructs. The final factor structure revealed two components, adhocracy culture (7 items) and market orientation (7 items), with eigenvalues greater than 1.0, in accordance with Kaiser's criterion. Together, these components explained 68.24% of the total variance.

Table 4 Factor Analysis results for organizational culture

Factors		Factor	Commonality	Eigenvalue	Variance	Mean
Adhocracy Culture				5.189	35.97	3.60
Vibrant place Entrepreneurial place		0.823	0.680			
Exemplifies innovativeness		0.733	0.602			
Style of management		0.777	0.605			
Adopting a new idea		0.787	0.633	4.365	32.26	3.48
Commitment to development		0.796	0.638			
Emphasizes creating challenges		0.866	0.754			
Market Orientation		0.790	0.623			
Success on basis unique						
Discusses competitors		0.844	0.716			
Competitive advantage		0.829	0.688			
After-sales service		0.887	0.789			
Customer satisfaction		0.877	0.769			
Understanding the customer		0.780	0.609			
Needs competitors 'weaknesses		0.876	0.768			
		0.824	.0682			
Total Variance explained	68.24					
Total Scale Reliability	0.865					
KMO	0.898					
Bartlett's Test of sphericity	0.000					

4.4 Build, Operate, and Transfer (BOT) Readiness index

Optimism, innovativeness, discomfort, and insecurity demonstrated reliability coefficients (alpha) greater than 0.70. Factor analysis was used to assess construct validity. Table 5 shows that every item had a Measure of Sampling Adequacy (MSA) above 0.5. The Kaiser-Meyer-Olkin (KMO) measure confirmed sample adequacy with a value of 0.843, which is considered "great" according to Field (2009) Bartlett's test of sphericity yielded $\chi^2 = 3331$, $p < 0.001$, indicating sufficient correlations among the items. A principal component analysis was conducted using Varimax rotation to determine the relationship between the 24 items and their underlying factors. In the rotated component matrix, no items were dropped due to the absence of cross loading. The final factor analysis revealed that optimism (6 items), innovativeness (7 items), discomfort (6 items), and insecurity (5 items) each had eigenvalues greater than Kaiser's criterion of 1.0, explaining 67.84% of the total variance.

Table 5 Factor Analysis results for BOTs readiness index

Factors	Factor	Commonality	Eigenvalue	Variance	Mean
Optimism			6.39	21.21	3.1
Approved an adoption BOT	0.792	0.655			
Encourage in BOT housing	0.829	0.718			
BOT better than current method	0.866	0.765			
BOT generate more profits	0.814	0.685			
Readiness to adopt the BOT	0.836	0.756			
BOT stimulated in productivity	0 .757	0.591			
Innovativeness			3.77	17.68	3.72
Feels confident BOT	0.750	0.625			
Operators technological developments	0.738	0.630			
BOT large, medium firms	0.881	0.809			
Competitors know about BOT	0.824	0.689			
Challenge BOT adoption	0.828	0.717			
Products without helping others	0.922	0.871			
New technology to adopt BOT	0.886	0.798			
			3.26	14.67	2.41
Discomfort					
BOT involve higher risk BOT	0.750	0.573			
Not solve the deficit, infrastructure	0.757	0.595			
Not ready to adopt the BOT	0.734	0.567			
BOT may seem to fail	0.780	0.630			
Feels overwhelmed in BOT	0.651	0.436			
Not confident an adopt BOT	0.811	0 .667			

Insecurity			2. 89	14.26	2.82
Worries about BOT project	0.817	0.677			
The worries cash flows	0.879	0.787			
Not ready to adopt BOT	0.764	0.604			
forced BOT not encouraged housing BOT	0.884	0.799			
Not safe to implement	0.788	0.625			
	67.84				
Total Variance Explained	0.852				
Total Scale Reliability	0. 843				
KMO	0.000				
Bartlett's Test of Sphericity					

4.5 Correlation Analysis

Table 6 presents a strong positive correlation between organizational structure and the BOT readiness index, with a Pearson correlation coefficient of r = 0.598, statistically significant at $p < 0.01$. A similarly significant positive correlation was observed between the BOT readiness index and formalization ($r = 0.587$, $p < 0.01$). Furthermore, the data reveal a significant positive relationship between organizational culture and the BOT readiness index ($r = 0.529$, $p < 0.01$). In contrast, the correlation between the BOT readiness index and market orientation was weak and not statistically significant ($r = 0.082$, $p > 0.01$). However, the BOT readiness index was strongly and positively correlated with adhocracy culture ($r = 0.702$, $p < 0.01$). Additionally, the analysis reveals a strong correlation between organizational structure and BOT adoption ($r = 0.589$, $p < 0.05$), and between organizational culture and BOT adoption ($r = 0.529$, $p < 0.05$). The statistical significance of these associations underscores the interrelated nature of these variables and highlights the critical role of organizational readiness in facilitating the adoption of the BOT model. These findings are further supported by the systematic literature review conducted by Njagi et al. (2020) which emphasizes the significant influence of organizational factors on the adoption of innovative practices.

Table 6 Correlation Analysis

	BOT Readiness	Organizational Structure	Formalization	Centralization	Culture	Adhocracy	Market orientation
BoT readiness Index	1.000	0.598**	.587**	.467**	.529**	.702**	.082
Structure	589**	1.000	.881**	.880**	.594**	.777**	.102
Formalization	.587**	.881**	1.000	.550**	.549**	.747**	.063
Centralization	.467**	.880**	.550**	1.000	.496**	.621**	.117
Culture	.529**	.594**	.549**	.496**	1.000	.802**	742**
Adhocracy	.702**	.777**	.747**	.621**	.802**	1.000	.194**
Market orientation	.082	.102	.063	.117	.742**	.194**	1.000

**Correlation is significant at the 0.01 level (2-tailed).

4.6 Multiple Regression Analysis

Multiple regression analysis was employed to test the hypotheses and determine the extent to which each independent variable contributes to predicting the BOT readiness index (Pallant, 2020). Table 7 summarizes the results of this analysis. The model demonstrated a good level of explanatory power, with an R^2 of 0.539, indicating that the two independent variables, organizational structure and organizational culture, collectively explain 53.9% of the variance in the BOT readiness index. The F-ratio of 56.920, significant at $p < 0.001$, confirms the overall model's validity and suggests that the predictors, when considered together, significantly contribute to the outcome variable. In terms of individual predictors: Organizational structure had a statistically significant and positive effect on BOT readiness (standardized $\beta = 0.197$, $p < 0.05$), supporting the related hypothesis. Conversely, organizational culture showed a weak and non-significant effect (standardized $\beta = 0.071$, $t = 1.067$, $p > 0.05$), suggesting that it does not meaningfully predict BOT readiness in this context. These findings indicate that, while organizational structure plays a significant role in predicting BOT readiness, organizational culture does not exert a substantial impact. This outcome aligns with the findings of Gentile-Lüdecke et al. (2020), who also highlighted the central importance of structural factors in the adoption of innovative models such as BOT.

Table 7 Multiple Regression Analysis

Independent Variables	B	Std. Error	Standardized Beta	t	Sig.
(Constant)	2.103	0.132		15.952	.000
Organizational structure	0.096	0.035	0.197	2.776	.006
Organizational culture	0.045	0.042	0.071	1.067	.287
R square	0.539				
Adjusted R square	0.529				
F value	56.920				

5.0 CONCLUSION

This study utilized a quantitative approach to examine how the readiness of both public and private organizations in Yemen influences the adoption of the Build-Operate-Transfer (BOT) model in infrastructure projects. Drawing upon readiness theory as the theoretical framework, the study aimed to evaluate the impact of organizational readiness by applying a readiness index to assess the potential for BOT model adoption. The findings reveal that organizational structure has a significant impact on the readiness of the public and private sectors in Yemen to adopt the Build-Operate-Transfer (BOT) model. This finding is consistent with previous research, including Kamaruddeen et al. (2012), which demonstrated that structural characteristics influence innovation readiness among Malaysian housing developers, and Pearson et al., (2004), who found that centralized, autocratic structures in BOT divisions led to increased productivity and infrastructure development in Indonesia's telecommunications sector.

These results underscore the importance of structural clarity in enhancing coordination, decision-making, and operational efficiency, critical elements for BOT success. In developing contexts like Yemen, characterized by political, financial, and legal instability, robust organizational structures are essential for navigating the risks inherent in BOT projects Chong et al. (2009), support this perspective, noting that weak regulatory and institutional frameworks in developing countries often lead to inefficiencies and corruption in BOT implementations, highlighting the need for strong structural foundations. In light of these findings, organizations aiming to implement BOT projects in Yemen should prioritize structural readiness by establishing formalized processes, centralized authority for streamlined decision-making, standardized communication channels, and documented operational procedures. Such structural measures may play a central role in ensuring the stability of BOT project implementation in uncertain environments. On the other hand, the study found that organizational culture did not have a statistically significant impact on BOT readiness. This contrasts with earlier studies, such as those by Alateeg and Alhammadi (2024), Jantan et al. (2003) and Yusof & Abidin (2012), which emphasized the cultural dimension in driving innovation and organizational change.

However, in Yemen's context, the limited influence of culture may be attributed to the weak institutionalization of cultural values or the dominance of structural challenges that overshadow softer organizational traits. Given that BOT projects are contract-intensive and compliance-driven, they may rely more on procedural formalities than on cultural adaptability. Furthermore, the non-significant results may be due to the fact that the study measured general cultural traits such as teamwork and openness, rather than BOT-specific cultural dimensions like risk tolerance and accountability, which are more directly relevant to BOT project environments. Interpreted through Organizational Readiness Theory, the significance of structure relates to both cognitive readiness (shared belief in the organization's capability to implement BOT) and resource readiness (availability of systems, processes, and expertise), while the insignificance of culture suggests limited influence on behavioral readiness (motivation to engage with change). Supporting this interpretation, Weiner (2009) argues that clear structures enhance readiness by aligning beliefs and resources toward collective action, providing further rationale for the observed dominance of structural over cultural factors in the Yemeni context.

5.1 Theoretical Contributions

This study provides important theoretical contributions to understanding the readiness of organizations to adopt the Build-Operate-Transfer (BOT) model, with a focus on infrastructure projects in Yemen. It builds upon existing theories of organizational readiness, such as Weiner (2009) framework, which views readiness as a shared commitment (*cognitive readiness*) and collective capacity (*behavioral readiness*), by integrating structural (formal and centralized) and cultural dimensions as key components of contextual readiness. The study demonstrates that these characteristics influence an organization's preparedness to adopt the BOT model and its capacity to sustain that adoption throughout the implementation process. Our findings are consistent with previous research, including that of Kamaruddin (2011) and Willem et al. (2007), which suggests that formal and centralized structures are associated with greater innovation adoption. However, this study enriches the theoretical debate by demonstrating that the willingness to adopt a BOT model is a dynamic and evolving factor, embedded in both the decision-making and implementation phases. This approach aligns with Davies et al. (2007) argument that readiness should be integrated into innovation processes. It challenges earlier models that regard readiness as a static condition that must be met prior to initiating change. By applying readiness theory to infrastructure development in low-resource, post-conflict settings like Yemen, and the study provides a context-specific extension of the theory, an area largely overlooked in existing research. Unlike previous studies that applied readiness theory to sectors such as e-commerce (Chong et al. (2009) IT adoption, or housing systems (Yusof & Shafiei, 2011), this research develops a tailored framework that addresses the unique challenges of implementing BOT in developing countries, including organizational, cultural, and structural factors.

Although the study found that organizational culture had no significant impact on readiness to adopt the BOT model in the Yemeni context, it contributes to the theoretical understanding by emphasizing that the cultural dimension remains an essential part of organizational readiness frameworks, particularly in promoting cooperation and adaptability. The weak impact of culture may not reflect a lack of theoretical relevance but may instead highlight the specificity of the Yemeni context, where structural and administrative barriers overshadow cultural dynamics. From this perspective, the study adds a critical nuance to change-readiness models by suggesting that cultural factors may be less influential in environments with limited resources or weak institutional structures. Thus, this study offers a realistic and context-sensitive theoretical contribution by integrating structural and cultural dimensions into a comprehensive model that reflects the unique conditions of BOT implementation in developing countries.

5.2 Practical Contributions

Based on the findings, this study outlines several important implications for policymakers in both the government and private sectors who are seeking to adopt the Build-Operate-Transfer (BOT) model in Yemen. First, by understanding and applying readiness assessment strategies and approaches, both public and private sectors, as well as BOT practitioners, can be better supported in successfully implementing BOT in infrastructure projects. Second, the findings provide policymakers, government bodies, and private sector stakeholders with a foundation for developing strategies and mechanisms tailored to the Yemeni context, including the formulation of policy guidelines for effective management of BOT adoption proposals. These strategies can support the adoption of BOT, particularly in infrastructure-related projects, by ensuring that implementation is aligned with organizational readiness levels and local institutional realities. Third, the results of this study highlight the critical role of organizational readiness, specifically, the importance of formalization and centralization, in enhancing the capacity to adopt and manage BOT projects effectively. Fourth, the study emphasizes the need for a unified organizational culture that encourages cross-sector collaboration, shared learning, and continuous professional development by identifying structural and cultural enablers of successful BOT adoption. Fifth, the study urges managers and executives in both public and private sectors to strengthen their organizational structures and cultures to enhance their capacity to successfully implement the BOT model. Finally, the findings inform policymakers and governments in other developing countries that have not yet adopted the BOT model of the importance of assessing organizational readiness before introducing innovations such as BOT. To foster greater willingness to adopt BOT in Yemen, both structural and cultural readiness should be prioritized across sectors.

5.3 Limitations and suggestions for Future Research

While this study provides valuable insights into the organizational factors influencing the adoption of the Build-Operate-Transfer (BOT) model in Yemen, several limitations should be acknowledged. First, the explanatory power of the model accounts for 53.9% of the variance in organizational readiness for BOT adoption. This indicates that other influential factors remain unexplained and warrant further investigation to gain a more comprehensive understanding. Recognizing a study's geographical limitations is critical to evaluating the generalizability of its findings. Due to safety concerns, this study excluded many Yemeni cities and focused only on cities in the northern region. Second, the study did not consider moderating variables, as it was necessary to establish direct correlations first before examining the effects of other factors. Future researchers are therefore encouraged to explore potential moderating variables that may influence BOT adoption. Additionally, the purposive quantitative approach used in this study primarily reflects the views of executive managers in top decision-making positions. This limits the diversity of perspectives within organizations. Future research can address these limitations in the following ways:

1. Incorporate qualitative methods, such as in-depth interviews alongside surveys, to collect richer data and compare results with those of this quantitative study.
2. Include participants from various job levels to broaden insights into organizational readiness for BOT adoption.
3. Conduct in-depth case studies to explore the specific organizational contexts and nuances of BOT adoption. Such studies can help differentiate readiness factors based on the organizational setting and the intended purpose of adopting the BOT model.

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Conflict of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

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