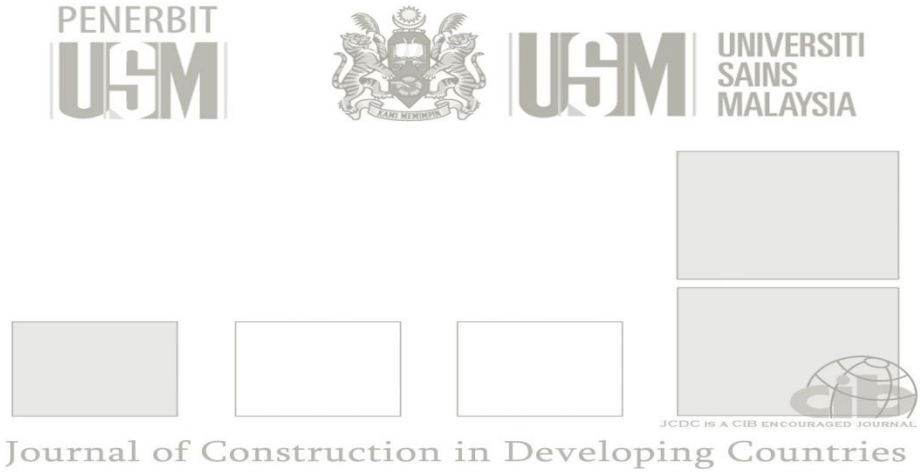

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Identifying and Assessing the Root Causes, Impacts, and Countermeasures of Corruption in Warzones countries: A case of Yemen's Public Construction Projects

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ABSTRACT

The issue of corruption in the construction industry in Yemen receives less attention from researchers and reporters. This is due to its sensitivity and complexity, despite the widespread of the issue across the industry. This article aims to uncover and assess the causes and effects of corruption in the Yemeni construction industry and propose preventive measures. A general explorative literature study was carried out to explore and identify the causes, effects, and countermeasures contributing to and resulting from the spread of corruption in the construction industry. Based on that, a questionnaire survey was developed and then distributed to Yemeni construction practitioners. Participants were able to rank each factor using a 5-point Likert scale. The finding showed that the most dominant causes of corruption are political instability, economic instability, a lack of law enforcement, lobbying, and a lack of transparency. The major effects of corruption are halting foreign investment, project failure, interrupting social and economic development, construction of defective and dangerous infrastructure, and offering tenders to unqualified contractors. The study proposed some preventive measures, and the ones with the highest priority, according to the results, are support of public disclosure, third-party evaluation of contractors, motivating honesty and high integrity, transparent employee recruitment, and supporting freedom of the press. The outcome best serves the Ministry of Works and other legislative state departments in addressing their anti-corruption agendas and bringing forward the attention of public awareness.

Keywords: Corruption, Civil War, Prevention, Causes, Effects, Public Construction Projects, Yemen

INTRODUCTION

One of the biggest obstacles to the growth of nations and the continued improvement of the standard of living in industrialized nations is corruption, which is a major concern for public strategy (Chan & Owusu, 2017). Studies have shown that the increased rate of corruption has a detrimental effect on the progress of society, the economy, and the environment (Zou, 2006). The agreement among academics and experts is that corruption can be eliminated via improved education and cultural shifts (Chan & Owusu, 2017; De Jong, Henry, & Stansbury, 2009; Monteiro, Masiero, & Souza, 2020). The realized effect can be observed when the high levels of poverty among construction workers are dominant, contractors are getting richer, and bribery is normalized (Oni et al., 2022). The built environment professionals, civil servants, politicians, and many other interested stakeholders play a major role in combating corruption (Chiocha, 2009).

According to the intensive report by Thabit (2019), corruption is a common problem in Yemen and has been exacerbated by the ongoing conflict and political instability in the country. The Transparency International Corruption Perceptions Index ranked Yemen as one of the most corrupt countries in the world in 2020, with a score of 14 out of 100 (with 0 being highly corrupt and 100 being very clean) while in 2021 it goes to 16 out of 100 and ranked 174 (Tranparency.org, 2021). In this aspect, there have been numerous reports of corruption at all levels of government in Yemen, addressing embezzlement of public funds, nepotism, and bribery. The lack of transparency and accountability in the country's political and economic systems has contributed to the widespread corruption (Gamil et al., 2017). The ongoing conflict in Yemen has also made the country more vulnerable to corruption, as it has disrupted the economy and led to a breakdown in the rule of law. Humanitarian organizations have reported that aid intended for civilians has been diverted or misused by corrupt officials and armed groups, leading to further suffering for the people of Yemen (Gamil & Rahman, 2020). Efforts to combat corruption in Yemen have been limited, due in part to the ongoing conflict and the lack of a functioning government (Al-Awlaqi et al., 2018). However, international organizations and civil society groups have worked to raise awareness about corruption and promote transparency and good governance in the country (Sultan, 2005).

In the construction industry, it is difficult to achieve a corruption-free sector due to its fragmented and complexity in nature (Gamil & Abd Rahman, 2022; Yap, Lee, Rose, & Skitmore, 2022), the industry involves many parties in a complicated contractual framework, and has many different factors that influence the ethics and morale of individuals that are susceptible to corruption (Thabit, 2019). Every stage of a construction project can include corrupt practices, which have disastrous effects on the built environment's quality, the timeline for completing the project, and the industry's ability to be a corruption-free sector (Chan & Owusu, 2017; Monteiro et al., 2020). According to the report released by PwC's global economic crime and fraud survey, about 49% of economic crimes including bribery and corruption happened in the construction industry as the highest compared to other industries (PWC, 2014).

The definition of corruption remains the same in different sectors, in the construction sector, it can mean the deviation from normal duties or practices and

violating official ethics of public services due to individual influences (Chan & Owusu, 2017). It is a complex set of personal processes involving many types of crime that implies some form of illicit human behavior which are difficult to recognize or measure (Chan & Owusu, 2017; Hartley, 2009; Shakantu, 2006).

Corruption is caused by different factors which are related to governmental and unimplemented legislative enforcement, then comes to the project stakeholders and then to the individual ethics and morale matters (Ayodele, Ogunbode, Ariyo, & Alabi, 2011; Cavill, 2006; Ebekozien, 2020; Owusu, Chan, & Shan, 2019; Van Klinken & Aspinall, 2010). The weak counter-corruption institutions have been the dominating reason for corruption in different countries (Ayodele et al., 2011; Bowen, Edwards, & Cattell, 2012a; Nordin, Takim, & Nawawi, 2011; Thabit, 2019; Yap et al., 2022). Corruption should be treated as a technical matter of insufficient legislation and punishment, and behavioral issues of individuals in the institutions should not be left behind (Nordin, Takim, & Nawawi, 2013).

The effect of corruption can be disastrous and difficult to resolve because it is associated with money for rehabilitation and casualties if unsafe work is constructed (Chih, Demir, Hu, Liu, & Shen, 2022; Thabit, 2019; Urazaliev, 2022). Studies on corruption in economics, social science, and law demonstrate that they may affect a variety of activities including economic collapse, and the spread of crimes (Monteiro et al., 2020). There are several instances in the literature, press, and legal cases that demonstrate how corrupt practices are especially common in huge infrastructure projects (Bowen, Edwards, & Cattell, 2012b; Cavill, 2006; Shakantu, 2006; Yap et al., 2022). The study of corruption, however, has not received enough attention from academics due to the nature of the issue and its complexity (Thabit, 2019).

The source of corruption in the construction industry can vary across the stages of the project and most of the corruption starts in the stage of procurement (Thabit, 2019). An intensive study on the issues of preventing corruption in procurement in Uzbekistan (Urazaliev, 2022), highlights that crimes involving corruption in the construction business are typically connected to land allocation, holding bids, registering urban planning papers and permits, and procedures for connecting to engineering and communication networks.

Yemen still faces many challenges such as political instability, war, lack of modern technologies, and poverty (Gamil & Abdul Rahman, 2020; Gamil, Rahman, Nagapan, & Alemad, 2017; Gamil, Rahman, Nagapan, & Nasaruddin, 2020; Gamil & Rahman, 2019; Thabit, 2019). The construction industry was subsequently affected negatively (Sultan, 2005). Many projects have been suspended or even failed to achieve the stipulated plans (Gamil & Abdul Rahman, 2020; Gamil et al., 2017). There are many reports addressing the issues of the Yemeni construction industry in terms of technologically decelerated application of the legislation and less awareness of the governmental role. The issue of corruption in its many forms has not yet been thoroughly discovered especially in government and aid-funded projects. This study aims to answer the following questions:

- What are the factors contributing to the widespread corruption in Yemen's construction industry?

- What are the effects of corruption on project performance and project completion?
- What possible strategies/ preventive measures should be proposed for minimizing corruption in the Yemen construction industry?

Implications of the research

The implications of research on corruption in the construction industry are wide-ranging and significant. This research helps to identify the causes, and effects besides developing effective strategies for preventing and combating corruption. The theoretical implication of this research lies in the study of corruption as a complex phenomenon in Yemen with different causes, and effects while the impact can be realized on economy, stability, and equality. The practical implications include proposing effective strategies for preventing corruption. These strategies are useful for the government, and relevant agencies. The methodological implications in this topic concern the challenges to measure and quantify corruption but more flexible methods such as questionnaires and opinion sharing would glimpse into the issue indirectly, hence more research is needed particularly in underdeveloped countries such as Yemen.

A review of corruption causes, effects, and preventive measures

The motives for corruption differ from one industry to another due to the societal and cultural background and the extent of law enforcement (Castro et al., 2020). One of the main causes is that the nature of the construction industry and its projects are fragmented and many involved stakeholders and players which may cause corruption (Yap et al., 2022; Yap, Lee, & Skitmore, 2020). The method of payment in some countries deals with cash where the flow of cash can be a major reason for corruption and seepage of money due to the difficulty of control (Owusu et al., 2019). Another reason that leads to corruption is due to the low salary schemes the industry offers especially to the workforce (Yap et al., 2020). According to an investigation by (Nordin et al., 2011), a negative workplace can also lead to corruption in a way that makes project players irritable and defensive and that also can lead to poor productivity and lack of motivation. In countries where civil war exists, political instability creates a vacuum for low breakers and that leads to a lack of law enforcement which leads to the spread of corruption (Bowen et al., 2012b; Thabit, 2019). Corruption in the construction project can be in different forms, this has been addressed by Chan & Owusu (2017), one of the forms is intimidation and threats which have been discussed before as the abuse of power against any individual or firm. Influence peddling is also a form of corruption which is the practice of using or influencing the government to obtain projects in return for unlawful payment (Chan & Owusu, 2017). Another form of corruption is the kickbacks which is a payment made to someone to facilitate transactions or any service particularly illicitly (Hope, 2020). One other form is embezzlement which is the theft of money in one's trust and baselessly and unlawfully (Balleisen, 2023). Some other forms include blackmail, coercion, clientelism, and dishonesty (Thabit, 2019). It is also related to some of the forms of corruption due to lack of technology because technology promotes transparency in the way a project is handled (Owusu et al., 2019).

Several studies have been conducted in different countries on the topic of corruption in the construction industry. Such as, (Yap et al., 2022; Yap et al., 2020) conducted studies in the Malaysian construction industry related to corruption causes, effects, and preventive measures. According to the research, corruption behavior is more likely to occur when there is no enforcement, followed by the nature of the construction sector and weak regulatory frameworks. The best preventive measures include high integrity and honest construction cultures, effective reporting channels, and enforcement of laws, and fines. The audit system and code of conduct are the most important cause-driven preventative measures, according to a correlational study. Two recent studies by (Yap et al., 2022; and Yap et al., 2020) investigated corruption in the Malaysian construction industry and found the most common reasons for corruption occurrence are the relations between the stakeholders in the project, lack of transparency, defective legal system, inadequate sanctions, personal greed, low morale, people perception toward the faulty party, less attention from people and negative leader role.

A comprehensive working paper on anti-corruption in Yemen by Thabit (2019) highlighted some common causes of corruption which include a lack of law enforcement that motivates project stakeholders to break the law despite the terms being harsh against corruption. Another reason addressed is money laundering since money is dealt with mostly in physical cash which leads to concealing the source. The study also stressed the bureaucratic traditions that hinder the lack of law enforcement and lead to a lack of monitoring of the project activities and quality of the work. Moreover, the study also addressed the issue of collusion and bid rigging which is a fraudulent scheme in the procurement process of selecting non-competitive contractors to gain the project tender. Another common problem addressed by the study is the concentration of power which is very widespread across many governmental institutions in Yemen and gives the right to the ministers and executives to decide on baseless grounds because none can question their decisions due to their ultimate power and that leads to the abuse of power which also leads to lobbying to try and sway top management on getting the projects. This also leads to nepotism, patronage, and favoritism by offering the projects to those who are close relative to the decision-makers or even to the unqualified contractor who seems to have a common interest with the decision-makers and that is supported by the findings from (Ebekozien, 2020). The findings also considered economic instability as one of the leading motives for corruption.

In South Africa, Amoah & Steyn (2022) investigated the barriers to unethical and corrupt practices and the results show that contractors face a variety of unethical problems while performing their duties, including inflated tender prices, overpricing of rates, kickbacks based on tenders, bribes for projects, unethical project execution techniques, and use of low-quality materials. Some other causes of corruption include problems like avarice, accepting corruption as a standard practice, ignorance of the code of conduct, and peer pressure make it difficult for construction professionals to adhere to the code of conduct and prevent corruption practices.

Corruption can have many negative impacts on the public sector and the nation's development at large (Khan & Krishnan, 2019). In the construction industry, it can lead to many effects which presumably damage the trust between project stakeholders and the people (Wells, 2015). A comprehensive study (Yap et al., 2022) found the effects of corruption can emerge from the inception of the project to the end, which include compromising quality, safety, project delay, defective work, lack of productivity, and deterioration of the construction sector. These tangible effects may even lead to the failure of the entire project or at minimum to the sustainability of the project.

Another effect would be the demotivation of foreign investment which is hugely affected by widespread corruption (Ashyrov & Masso, 2020). A study by Chih et al. (2022) on Chinese construction found that high corruption leads to more local investment than international. In the Thai construction sector, Opoku et al.(2022) found that the negative effects accumulate in the middle-income people causing more suffering and poverty. In Zambia, Kabwe (2022) found that corruption is an influencing factor in the performance of the organization, especially among local contractors. Above all corruption can lead to the failure of construction projects (Gamil et al., 2017), or leads to disastrous infrastructure that can collapse at any time (Chiocha, 2009). Corruption can also result in increased costs of operation due to excessive maintenance due to faulty construction or low-quality materials (Yap et al., 2022).

Although a corruption-free sector is unachievable, many preventative measures can reduce the problem or perhaps stop it in its tracks. According to Sohail & Cavill (2008), accountability is a key element in reducing corruption while Gunduz & Önder (2013) reported that a clear workflow and job description are required to reduce the risk of fraud, and internal control is also proposed in compliance with the regulation, in terms of hiring, a pre-employment background check is essential to be considered for the job. Additional measures suggested by Gunduz & Önder (2013) include on training employees about their rights, and ethics and proposing an anonymous reporting system to report any fraud or misuse of power.

A comprehensive study on corruption and its effects in Malawi by Chiocha (2009) recommended that more directive actions are required from the authorities to combat corruption giving more attention to law enforcement and motivating transparency. While in Thailand Opoku et al. (2022) suggested some of the tactics that could be utilized to combat corruption in the Thai construction sector include organizational system improvement, decentralization, ethical training, and encouraging ethical culture. In addition to that, working on ethical and spiritual considerations, especially in more conservative societies would minimize corruption (Zulkifle & Sabli, 2022). In terms of strategies, Tabish & Jha (2012) investigated the effect of anti-corruption strategies in public projects and found that most of the effective ways to combat corruption are the focus on management leadership while promoting quality and transparency to prosper the economy. Despite many studies focused on corruption issues in different regions of the world. In Yemen, few were reported due to the sensitivity of the topic. Hence, this study aims to further identify and assess these

causes, effects, and countermeasures of corruption focusing on the Yemeni construction industry.

METHODOLOGY

The methodology used in this research consists of two parts, the first part is conducting a literature review to identify the causes, effects, and preventive measures of corruption in different construction industries and then finalizing these factors to avoid any repetition or similarity. The second part consists of a quantitative study by developing a questionnaire survey based on the literature and then distributing the survey to practitioners in different provinces in Yemen. The data is analyzed using SPSS to determine the relative importance of each factor. The methodology is demonstrated in Figure 1.

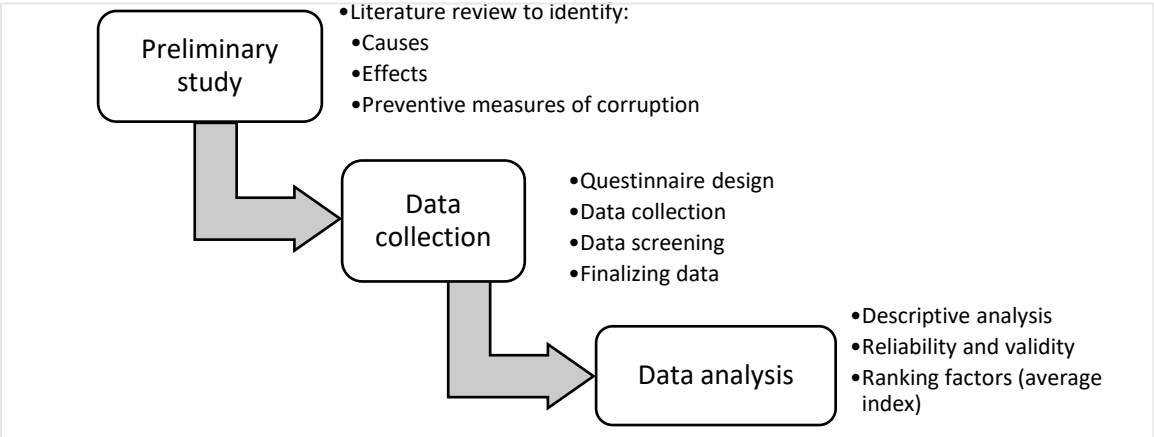

Figure 1. Research Methodology

Figure 1 demonstrates the process and methods employed to carry out this research, from the initial study to the final stage of thesis writing. It comprises the following three key phases: the first is the introduction to the study focuses on identifying the research problem, studying the literature to understand the issue, and identifying any gaps or opportunities for more research. The causes, effects, and preventive measures of corruption included in the survey have been identified from the literature. To translate this extensive review into a manageable data collection tool, these factors were framed into questionnaire surveys. the questionnaire survey gives respondents selected answers among a set of possible ones.

The second phase involves conducting a quantitative study by applying these factors to the construction industry with the use of a questionnaire survey. A total of 327 responses were received and verified to analyze the factors. The response rate was 65% which is acceptable. The data collected for this study targets engineers, architects, project managers, and government representatives in public project company owners and directors. The questionnaire was prepared and sent to them via an online questionnaire survey, and follow-up on their answers was also set frequently. Their contact details were obtained from the Ministry of Public Works and the Board of Engineers.

The questionnaire consists of two main parts: the first part is about the demography of participants, and the second part addresses the assessment of the causes, effects, and measures. Respondents were given a scale from 1 to 5 according to the importance level, where 1 denotes not important and 5 is extremely important.

Third Phase: In this phase, the collected data are checked and analyzed using univariate analysis, employing statistical tools like SPSS. The mean and standard deviation (SD) were used to rank the importance of causes, the severity of effects, and the priorities of preventive measures. The ranking was based on the highest mean in descending order; if they happen to have the same mean value, then standard deviation is used, where the lower SD ranks higher for the same mean.

RESULTS AND ANALYSIS

Demographic Profile of Respondents

To get insights from different construction industry players, the demographics of the targeted participants are varied, including both public and private sectors. The first part of the questionnaire includes all the necessary information about the respondents, which includes the type of company, the qualifications, the years of experience, and the role in the company. Table 1 demonstrates the demography of respondents. The selection process of the respondents to this survey is based on the databases of the Ministry of Works and Board of Engineers Yemen which makes them suitable to participate in public construction projects.

Table 1. Distribution of respondent's profile

Category	Sub-category	Frequency	Percentage (%)
Type of company	Private	189	57.80
	Public (state-owned)	138	42.20
Company projects	Residential buildings	124	37.92
	Commercial buildings	97	29.66
	Infrastructure projects	56	17.13
	Industrial facility	42	12.84
	Maintenance	8	2.45
Role of respondent	Company director	17	5.20
	Company Owner	27	8.26
	Government representative	83	25.38
	Project manager	48	14.68
	architecture	33	10.09
	Civil engineer	119	36.39
Years of experience	0-10	195	59.63
	11-20	79	24.16
	More than 20	53	16.21
Qualification	Below bachelor degree	102	31
	Bachelor degree	183	56
	Master	39	12
	PhD	3	1

The findings of the demographic analysis for the study's participants are shown in Table 1. The questions primarily target industry professionals in construction from different agencies, as well as their qualifications, activities, and years of experience. It is shown that most participants work in the private sector; their most common projects are residential building projects; they mostly play the role of civil engineers; most of them have a bachelor's degree; and most of them have about 0–10 years of experience. These diversified characteristics demonstrate that the participants are from different types of projects, and their opinions would significantly serve to understand the issue of corruption in Yemen's construction sector.

Data Reliability

Before proceeding to the data analysis, it is a prerequisite to check the data and questionnaire reliability and that is achieved through checking Cronbach's alpha. Cronbach's alpha helps to test the reliability and validity of scores which is the Likert scale used to rank the factors (Ghazali, 2016). The analysis showed that Cronbach's is more than 0.87 hence it is more than 0.7 which shows good internal consistency of the scales and data and the data are reliable for further analysis.

Assessing causes of corruption in the Yemeni construction industry

The second part of the questions was on the assessment of the importance of the causes where respondents were given to rank the importance from 1 to 5 i.e., 1 denotes not important and 5 extremely important. Then the mean and SD were calculated using SPSS. Table 2 shows the ranking.

Table 2. Ranking of significant causes of corruption

Categories	Causes	Mean	SD	Category rank	Overall rank
Nature of the industry	Political instability	4.98	1.013	1	**1**
	Economic instability	4.95	1.042	2	**3**
	Lack of transparency	4.93	1.088	3	**5**
	Concentration of power	4.88	1.098	4	7
	Bureaucratic tradition	4.84	1.101	5	11
	Lack of technology	4.82	1.156	6	14
	Lower salary schemes	4.81	1.123	7	16
	Relationship between parties	4.71	0.987	8	21
	Poor working conditions	3.86	1.281	9	34
	Salary paid by cash	3.57	1.233	10	40

	Complexity of projects	3.51	0.891	11	42
	Competitions on bidding	3.51	0.983	12	43
Legislative and flawed monitoring system	Lack of law enforcement	4.96	0.897	1	**2**
	Abuse of power	4.86	0.923	2	10
	Defective legal system	4.83	1.022	3	13
	Lack of punishment	4.81	1.102	4	15
	Lack of monitoring	4.79	1.181	5	19
	Money laundering	4.78	1.001	6	20
	Intimidations and threats	4.62	1.212	7	23
	Collusion and bid rigging	4.56	1.10	8	24
	Inadequate sanctions	4.21	1.061	9	30
	The double standard in law practices	3.77	0.966	10	37
	Bid rigging	3.73	0.997	11	38
	Lack of policing mechanisms	3.59	1.051	12	39
	Conflicts of laws	3.54	0.942	13	41
Cultural. Personal. and ethical	Lobbying	4.93	1.072	1	**4**
	Nepotism and favoritism	4.92	1.177	2	6
	Bribery	4.88	1.138	3	8
	Clientelism	4.87	1.025	4	9
	Personal greed	4.84	1.291	5	12
	Accepting as a standard practice	4.8	1.32	6	17
	Negative leader role	4.79	1.091	7	18
	Blackmail	4.71	1.23	8	22
	Coercion	4.54	1.09	9	26
	Collusion	4.54	0.983	10	25
	Conflict of interest	4.31	1.281	11	27
	Low morale	4.23	1.232	12	28
	Influence Peddling	4.23	0.971	13	29

Kickbacks	4.02	0.991	14	31
Dishonesty	4.01	1.021	15	32
People perception	3.86	1.051	16	33
Embezzlement	3.82	1.231	17	35
Different culture	3.81	1.028	18	36
Lack of ethics	3.21	1.172	19	44
Personal behavior	2.89	1.452	20	45

The finding showed that the most dominant causative factors of corruption in the Yemeni construction industry are political instability as the first, which is due to the civil war facing the country since the Arabic Spring in 2011, while the second is economic instability, which is a result of political instability; the third is a lack of law enforcement, which is common in Yemen because the integrity of law enforcement agencies has deteriorated; the fourth in the rank is lobbying, which happens in most of the project tenders and doesn't go through rigorous evaluation, which leads to the fifth reason, which is lack of transparency. These imperatives need attention from the government and social interventions to combat corruption or at least prevent crime at its root.

To evaluate these results with other construction sectors, the following are the top three reasons for corruption, according to a study in Malaysian: personal financial avarice, connections between the parties, a lack of moral principles, fierce competition, and a significant sum of money (Yap et al., 2022). In South Africa, the ranking of causes seems to be different, according to (Bowen et al., 2012a, 2012b) lack of expertise and inefficient procedures, public figures serving as role models, a lack of deterrents and consequences, and neglected ethical standards are the main causes of corruption. However, the leading causes in China include companies who lack Business to Government (B2G) relationships being at a competitive disadvantage, the tendering procedure having a significant amount of off-site activities, government officials' power being too centralized, and investment funds being sufficient and easily obtainable for public investment projects. Unsuccessful judicial administration (Zhang, Le, Xia, & Skitmore, 2017). According to Ameyaw et al. (2017), the operating environment of construction projects, the private opening of tenders, excessive and careless sourcing for public procurement contracts, the lack of commitment by construction firms to combating corruption, and high political connections are the main causes of corruption crime in Ghana.

Assessing the Effects of corruptions on the Yemen construction industry

The third part of the survey allowed participants to rank the severity of the corruption effects, which is demonstrated in Table 3.

Table 3. Effects of corruption in the Yemen construction sector

Effects	Mean	SD	Overall rank
Halting foreign investment	4.97	1.01	1
Project failure	4.94	0.95	2
Interrupt social and economic development	4.94	1.21	3
Defective or dangerous infrastructure	4.92	1.13	4
Offering tenders to unqualified contractors	4.91	1.04	5
Damaging morale	4.90	0.89	6
Raises the operating cost	4.88	0.95	7
Deterioration of the construction sector	4.86	0.92	8
Demotivate workers	4.85	1.24	9
Uncompleted projects	4.84	0.98	10
Cost overrun	4.81	0.92	11
Poor provision of services	4.81	1.06	12
Reduced credibility	4.80	1.18	13
Upsurge in poverty among construction workers	4.79	1.01	14
Lack of productivity	4.77	1.21	15
Compromised quality	4.76	1.02	16
Financial loss	4.72	1.1	17
Labor exploitation	4.72	0.91	18
Defective work	4.69	1.03	19
Mismanagement of project	4.67	0.87	20
Tarnishing the company´s reputation	4.62	0.99	21
Boost nepotism	4.62	1.08	22
Project delay	4.61	0.96	23
Poor growth and development	4.59	1.21	24
Growing mistrust	4.59	1.23	25
Shorten the lifespan of the constructed facility	4.51	1.06	26

The finding demonstrated the most severe effect of corruption is halting foreign investment, which is happening due to demotivating investors leading to the fear of corruption. The second effect is project failure. which was demonstrated in a study by (Gamil et al.. 2017) that showed mega projects in Yemen failed due to corruption. The third-ranked effect is interrupted social and economic development, which is caused by the misuse of public funds in failed projects. The cost of corruption is very high. and in general. the entire economy is significantly harmed by corruption. The infrastructure and service delivery that are needed for development are not up to par. Additionally. there is unmistakable evidence of mistrust, inequality, labor exploitation, and a lack of opportunities.

Preventive measures of corruption in the Yemen construction industry

The third part of the survey is on the preventive measures that are suggested in different industries and applied to the Yemeni construction sector. Table 4 presents the measures and their rankings based on their importance.

Table 4: Ranking of prioritized preventive measures against corruption in Yemen.

Measures	Mean	SD	Rank
Support public disclosure	4.99	0.922	1
Third-party evaluation of contractors	4.98	1.023	2
Motivating honesty and high integrity	4.92	0.872	3
Transparent recruitment process	4.88	0.982	4
Supporting freedom of the press	4.83	0.792	5
No leniency or exceptions in law enforcement	4.81	0.814	6
Negotiating adequate salaries	4.78	1.032	7
Improved accountability	4.73	0.832	8
Attention to ethics	4.69	0.794	9
A pre-employment background	4.69	0.958	10
Independent internal and external audit	4.63	1.102	11
Anonymous reporting systems	4.61	0.985	12
Training employees in rights and obligations	4.6	1.213	13
Focus on leadership	4.36	1.141	14
Private sector anti-corruption initiatives	4.25	1.125	15
Adequate site supervision	4.02	1.172	16
Procurement process reforms	4.02	0.991	17
Strengthen citizen demand for anti-corruption	4.02	1.031	18
Reform the public admin and finance management	3.95	1.028	19
Third-party monitoring	3.92	0.897	20
Raising awareness	3.81	0.986	21
Code of conduct	3.75	0.987	22
Campaigns in media. newspaper. and social events	3.56	0.912	23
Audit practices	3.52	1.093	24

The result in Table 4 demonstrated the most important countermeasures needed by the government which were ranked primarily as: support for public disclosure, third-party evaluation of contractors, motivating honesty and high integrity, transparent recruitment process, and supporting freedom of the press. These precautionary actions would help to minimize the corruption crime occurrence in the industry and would lead to a more prosperous and fair distribution of wealth among the citizens.

It is important to emphasize. from the open-ended question is that the emergence of advanced technologies, for example, building information modeling (BIM) into the construction industry not only streamlines the construction process but also helps to produce a proactive collaborative environment that is associated with higher transparency which tentatively minimizes or even exposes the sources of corruption as a major threat crime in the Yemeni construction industry. This research area has been discussed previously in (Gamil & Rahman. 2019). The proposed future studies are going to link the causes with the effects while mediating with the mitigation measures to provide a relationship model that can be used to develop a combating framework for the stakeholders involved in the construction industry.

CONCLUSIONS

Corruption is a serious issue in the construction industry. and it is likely to get worse in Yemen in the current situation where instability is at its climax. More work and initiatives need to be introduced by the government, contractors, built environment specialists, civil employees, legislators, consultants, property owners, developers, public works authorities, and many other interested stakeholders in the construction business to fight corruption in the industry. This study has identified and assessed the causes, effects, and preventive measures to combat or minimize corruption. The results showed that all the factors carry more significance in the Yemeni construction industry. The study covered a wide range of demographic profiles of construction practitioners and players.

The findings implied that political instability, economic instability, a lack of law enforcement, lobbying, and a lack of openness were the main factors of corruption. When it comes to consequences, the most adverse repercussions of corruption are the suspension of foreign investment, failure of projects, the interruption of social and economic development, faulty or unsafe infrastructure, and the awarding of contracts to subpar firms. The study suggested various preventive measures and the most important ones based on the findings, include support for public disclosure, independent contractor review, encouraging sincerity and high integrity, transparent employee recruitment, and promoting press freedom. The Ministry of Works and other legislative state ministries should act on the findings in their agendas for fighting corruption. Effective and coordinated anti-corruption strategies that focus on both the supply and demand sides of corruption are needed to halt fraud and prevent corruption. Accountability, transparency, and stricter rules against bribery and corruption all contribute to less corruption. However, those with integrity are less likely to engage in corrupt practices, instilling integrity, and ethical values among the stakeholders through ethics education and training programs is a continual commitment toward corruption-free construction.

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Ethical Approval

The research is study exempted from requiring ethics approval because there are no animals involved while collecting the data of this research.

Informed consent

Consent was deemed not necessary. because the response was voluntary and no personal demography was asked for.

Author's contribution

Y.G. has developed the idea. conducted the literature review. developed the questions. analyzed the results and wrote the manuscript. While I. L. helped with the supervision and revision of the manuscript. M.A contributed to improving the results and discussion.

Conflict of interest

No financial or non-financial interests that are directly or indirectly related to the work submitted for publication.

Data availability statement

Data are available upon request

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REFERENCES

Al-Awlaqi, W., al-Madhaji, M., & Biswell, A. (2018). Local Governance in Yemen Amid Conflict and Instability. Rethinking Yemen's Economy, July.

Ameyaw. E. E.. Pärn. E.. Chan. A. P.. Owusu-Manu. D.-G.. Edwards. D. J.. & Darko. A. (2017). Corrupt practices in the construction industry: Survey of Ghanaian experience. Journal of Management in Engineering. 33(6). 05017006. doi:10.1061/(ASCE)ME.1943-5479.0000555

Amoah. C.. & Steyn. D. (2022). Barriers to unethical and corrupt practices avoidance in the construction industry. International Journal of Building Pathology and Adaptation(ahead-of-print). doi:10.1108/IJBPA-01-2022-0021

Ashyrov, G., & Masso, J. (2020). Does corruption affect local and foreign-owned companies differently? Evidence from the BEEPS survey. Post-Communist Economies, 32(3), 306-329.

Ayodele. E. O.. Ogunbode. A. B.. Ariyo. I. E.. & Alabi. O. M. (2011). Corruption in the construction industry of Nigeria: Causes and solutions. Journal of Emerging Trends in Economics and Management Sciences. 2(3). 156-159.

Balleisen, E. J. (2023). America's Anti-Fraud Ecosystem and the Problem of Social Trust: Perspectives from Legal Practitioners. Nw. UL Rev., 118, 51.

Bowen. Edwards. & Cattell. (2012a). Corruption in the South African construction industry: A mixed methods study. Paper presented at the Proc. of 28th Annual ARCOM Conference (ed. Smith. SD).

Bowen. Edwards. & Cattell. (2012b). Corruption in the South African construction industry: A thematic analysis of verbatim comments from survey participants.

Construction Management and Economics. 30(10). 885-901. doi:10.1080/01446193.2012.711909
Castro, A., Phillips, N., & Ansari, S. (2020). Corporate corruption: A review and an agenda for future research. Academy of Management Annals, 14(2), 935-968.
Cavill. S. (2006). Corruption in construction projects. Paper presented at the Proceedings of the CIB W107 Construction in Developing Countries Symposium "Construction in Developing Economies: New Issues and Challenges".
Chan. A. P.. & Owusu. E. K. (2017). Corruption forms in the construction industry: A literature review. Journal of Construction Engineering and Management. 143(8). 04017057. doi:10.1061/(ASCE)CO.1943-7862.0001353
Chih. Y.-Y.. Demir. F.. Hu. C.. Liu. J.. & Shen. H. (2022). Residential Housing Investment and Local Corruption: Evidence from the Chinese Housing Market. Available at SSRN 4255915. doi:10.2139/ssrn.4255915
Chiocha. C. I. M. (2009). Corruption and its effects on the development of the construction industry in Malawi.
De Jong. M.. Henry. W. P.. & Stansbury. N. (2009). Eliminating corruption in our engineering/construction industry. Leadership and Management in Engineering. 9(3). 105-111. doi:10.1061/(ASCE)1532-6748(2009)9:3(105)
Ebekozien. A. (2020). Corrupt acts in the Nigerian construction industry: is the ruling party fighting corruption? Journal of Contemporary African Studies. 38(3). 348-365. doi:10.1080/02589001.2020.1758304

Gamil. Y. & Abd Rahman. I. (2022). Impact of poor communication on dispute occurrence in the construction industry: a preliminary exploratory study of Yemen construction industry. International Journal of Construction Management. 1-7. doi:10.1080/15623599.2022.2092388
Gamil. Y. & Abdul Rahman. I. (2020). Assessment of critical factors contributing to construction failure in Yemen. International Journal of Construction Management. 20(5). 429-436. doi:10.1080/15623599.2018.1484866
Gamil. Y. Rahman. I. A.. Nagapan. S.. & Alemad. N. (2017). Qualitative approach on investigating failure factors of Yemeni mega construction projects. Paper presented at the MATEC web of conferences. doi:10.1051/matecconf/201710303002
Gamil. Y. Rahman. I. A.. Nagapan. S.. & Nasaruddin. N. A. N. (2020). Exploring the failure factors of Yemen construction industry using the PLS-SEM approach. Asian Journal of Civil Engineering. 21(6). 967-975.doi:10.1007/s42107-020-00253-z
Gamil. Y.. & Rahman. I. A. R. (2019). Awareness and challenges of building information modelling (BIM) implementation in the Yemen construction industry. Journal of Engineering. Design and Technology. doi:10.1108/JEDT-03-2019-0063
Ghazali, N. H. M. (2016). A Reliability and Validity of an Instrument to Evaluate the School-Based Assessment System: A Pilot Study. International journal of evaluation and research in education, 5(2), 148-157.
Gunduz. M.. & Önder. O. (2013). Corruption and internal fraud in the Turkish construction industry. Science and engineering ethics. 19(2). 505-528. doi:10.1007/s11948-012-9356-9
Hartley. R. (2009). Fighting corruption in the Australian construction industry: The national code of practice. Leadership and Management in Engineering. 9(3). 131-135. doi:10.1061/(ASCE)1532-6748(2009)9:3(131)

Hope, Sr, K. R. (2020). Channels of corruption in Africa: analytical review of trends in financial crimes. Journal of Financial Crime, 27(1), 294-306.
KABWE. J. (2022). The Influence of Organisational Culture on Local Contractor Project Performance Factors in Zambia.
Khan, A., & Krishnan, S. (2019). Conceptualizing the impact of corruption in national institutions and national stakeholder service systems on e-government maturity. International Journal of Information Management, 46, 23-36.
Monteiro. B.. Masiero. G.. & Souza. F. d. (2020). Corruption in the construction industry: a review of recent literature. International Journal of Construction Management. 1-9.
Nordin. R. M.. Takim. R.. & Nawawi. A. H. (2011). Critical factors contributing to corruption in construction industry. Paper presented at the 2011 IEEE Symposium on Business. Engineering and Industrial Applications (ISBEIA). doi:10.1109/ISBEIA.2011.6088831
Nordin. R. M.. Takim. R.. & Nawawi. A. H. (2013). Behavioural factors of corruption in the construction industry. Procedia-Social and Behavioral Sciences. 105. 64-74. doi:10.1016/j.sbspro.2013.11.008
Oni, O. Z., Olanrewaju, A., Khor, S. C., & Akinbile, B. F. (2022). A comparative analysis of construction workers' mental health before and during COVID-19 pandemic in Nigeria. Frontiers in engineering and built environment, 3(1), 63-75.
Opoku. A.. Poshyanand. M.. Elmualim. A.. Kavishe. N.. Mushtaha. E. S. N.. & Abdalla. S. B. (2022) corruption in the construction industry: an insight from the Thai construction sector.
Owusu. E. K.. Chan. A. P.. & Shan. M. (2019). Causal factors of corruption in construction project management: An overview. Science and engineering ethics. 25(1). 1-31. doi:10.1007/s11948-017-0002-4
PWC. (2014). Fighting corruption and bribery in the construction industry. Retreived from: https://www.pwc.com/gx/en/economic-crime-survey/assets/economic-crime-survey-2014-construction.pdf
Shakantu. W. (2006). Corruption in the construction industry: forms. susceptibility and possible solutions issues. Civil Engineering= Siviele Ingenieurswese. 2006(7). 43-47.
Sohail. M.. & Cavill. S. (2008). Accountability to prevent corruption in construction projects. Journal of Construction Engineering and management. 134(9). 729-738. doi:10.1061/(ASCE)0733-9364(2008)134:9(729)
Sultan. B. M. (2005). The construction industry in Yemen: Towards economic sustainability. Queensland University of Technology.
Tabish. S.. & Jha. K. N. (2012). The impact of anti-corruption strategies on corruption free performance in public construction projects. Construction Management and Economics. 30(1). 21-35.doi:10.1080/01446193.2011.654128
Thabit. M. A. A. (2019). A Working Paper on Procurement Anti-corruption in Yemen. Arabian journal of managemen..264-251 .(4)39 doi:10.21608/aja.2019.66952
Transparency international, accessed from https://www.transparency.org/en/cpi/2021/index/yem
Urazaliev. M. (2022). ISSUES OF PREVENTION OF CORRUPTION CRIMES IN THE FIELD OF PUBLIC PROCUREMENT. European International Journal of Multidisciplinary Research and Management Studies. 2(08). 1-6. doi:10.55640/eijmrms-02-08-01
Van Klinken. G.. & Aspinall. E. (2010). Building relations: Corruption. competition and cooperation in the construction industry. In The state and illegality in Indonesia (pp. 139-151): Brill. doi:10.1163/9789004253681_009

Wells. J. (2015). Corruption in the construction of public infrastructure: Critical issues in project preparation. U4 Issue. Chr. Michelsen Institute.
Yap. J. B. H.. Lee. K. Y.. Rose. T.. & Skitmore. M. (2022). Corruption in the Malaysian construction industry: investigating effects. causes. and preventive measures. International Journal of Construction Management. 22(8). 1525-1536. doi:10.1080/15623599.2020.1728609
Yap. J. B. H.. Lee. K. Y.. & Skitmore. M. (2020). Analysing the causes of corruption in the Malaysian construction industry. Journal of Engineering. Design and Technology. 18(6). 1823-1847.doi:10.1108/JEDT-02-2020-0037
Zhang. B.. Le. Y.. Xia. B.. & Skitmore. M. (2017). Causes of business-to-government corruption in the tendering process in China. Journal of Management in Engineering-ASCE. 33(2). Article number: 05016022 doi:10.1061/(ASCE)ME.1943-5479.0000479
Zou. P. X. (2006). Strategies for minimizing corruption in the construction industry in China. Journal of construction in Developing Countries. 11(2). 15-29.
Zulkifle. M. A. H.. & Sabli. N. A. M. (2022). The Perception and Awareness among Construction Players Towards The Practice of Shariah Compliance. Jurnal Pengajian Islam. 70-82.