

# **Dynamic Assessment of Corruption Forms in An Infrastructure Procurement Process: An International Expert Survey.**

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## **Abstract**

Following the protracted supposition regarding the proliferation of corrupt practices within the specific stages of the procurement process, this study intends to examine the dynamic criticality of corruption forms throughout the procurement process of infrastructure projects. The study also examines the vulnerability patterns of the key parties to the noted corruption forms. After establishing the measurement items from a structured literature review, an expert survey was conducted with sixty-five international professionals involved in infrastructure procurement process using a purposive sampling approach. Descriptive statistics such as the criticality index and the Mann-Whitney U Test Statistics analysis were employed to evaluate the dynamic criticality of the various corruption forms throughout the process as well as the contributions by the project parties. With bribery and collusive acts dominating the process, the results revealed that project parties in the developing world contribute more to the incidence of corruption as compared to those from the developed context. Moreover, the results revealed that public-participants (including government representatives) contribute immensely to the forms not only in comparison with the public parties from the developed sector but also the other project parties from the developing world. In the case of the developed context, contractors and sub-contractors are revealed to be the key parties to question followed by suppliers even though their respective criticality indexes are relatively lower. Theoretically, this study contributes to an extended understanding of the dynamism of corrupt practices and the parties behind the acts. Moreover, it contributes to the body of knowledge on corruption-related studies in the context of project procurement and management. Practically, this study is intended to inform project parties responsible for drafting contractual stipulations for a project, policymakers and anti-corruption institutions about the dynamics of corruption within the procurement process and how to develop strategic and holistic anti-corruption measures focused on extirpating specific forms at specific stages of the procurement process.

**Keywords:** Corruption, Infrastructure procurement, project management, international survey, project parties.

## 1. Introduction

Corruption concerns in the infrastructure procurement process have stimulated the development of several indicators by institutions such as the Global Competitiveness Index (GCI) on Government Integrity by World Economic Forum, Corruption Perception Index (CPI) by Transparency International (TI), Worldwide Governance Indicators, (WGI) on Corruption Control by the World Bank and other ratings used by other institutions. These indicators are often used to examine the criticalities of corruption on a more generic scale. However, despite these indicators, that often reports the general view or perception of corruption within the broader context such as at the country-level, hardly are there periodic reports or studies that highlight the key institutions, sectors or processes within the public and private sectors that contribute to the widespread of corruption. The determination of the causative factors at these sub-unit levels are noted to be vital areas of concern as the prevalence of corrupt activities at these levels amalgamate to highlight the general condition of how corrupt or clean a country is. Thus, there have been efforts by different researchers such as Le et al. (2014), Shan et al (2017), Bowen et al. (2012) to conduct empirical studies at some of the vital areas of concern noted to contribute to corruption such as the procurement sector, public construction sectors among others.

Given that the procurement process is noted to be one of the most vulnerable processes in the world presently, there is the need to examine not only the criticalities of the forms prevalent within the process and their causal factors but also the risk indicators that renders the process to corruption and the key parties that contribute to this menace. Moreover, given the lack of empirical studies that focus only on the project parties' contributions to the prevalence of corruption in the procurement process, this study intends to examine: i) the prevalence of the various forms of corruption throughout the activities within the procurement process and ii) the key project parties that contribute to the prevalence. Theoretically, this study is intended to add to the body of knowledge on corruption-related studies by empirically examining how critical the key forms of corruption and the key project parties contribute to the prevalence of corruption throughout the procurement process which is in turn expected to practically facilitate the development of more focused and stringent anti-corruption measures. Thus, contributing to the holistic assessment of corrupt practices and the respective measures needed to extirpate their influence and prevalence in both the developed and the developing countries.

## 2. Literature Review

While corruption is defined in this context as the misappropriation of a project's resources for private use, the actual definition of corruption varies across different norms and cultures (Jain 2001). As a result, corruption is viewed as a context-specific phenomenon. For instance, in the context of public policy literature, corruption can be defined as the abuse of public office for personal or selfish illegitimate gain. Moreover, the topic of corruption covers a wide range of topical concerns. They include research into the different forms of corrupt practices identified during the procurement process such as kickbacks, ghosting, patronage, and bribery collusion (Brown and Loosemore 2015; Ling and Tran 2012; Chan and Owusu 2017); research into the causative instigators that propel these various forms of corruption to occur (Zhang 2016; Owusu et al. 2017; Locatelli et al. 2017), risk indicators of corrupt practices based on contextual evidences (Ameyaw et al. 2017; Le et al. 2014b; Bowen et al. 2012), the anti-corruption measures (ACM), developed over time to thwart and expunge the corrupt practices (OECD 2016; de Yong et al. 2009; World Bank 2008), and lastly research into the deterring factors that hinder the effective application of the developed ACM otherwise termed as barriers ACM applications (Bowen et al. 2012; Le et al. 2014a). However, despite the extant studies conducted on the topics mentioned, there is yet to be conducted, an empirical study that focuses on the key project parties' influences on the criticalities of the various forms of corruption within the procurement process as well as the estimated magnitudes of corrupt practices within the individual stages of the procurement process. The parties involved in corruption may vary given the context in which corruption occurs. However, even though the parties involved may vary from context-to-context, Boyd and

Padilla (2009) indicated that generically, the parties involved in any form of corruption, at any given time and in any given context could be classified into three main categories. They are; i) the demand side, ii) the supply side and iii) the condoning side. However, the most vulnerable parties are reported to be the demand side and the supply sides. While any of these two parties may initiate the corruption process, the distinctions between the parties are discussed in the following paragraph. The demand side, as the name implies is the party who calls for the reward and is mostly the initiator or the corrupt process. The supply side, on the other hand, is the party who responds to the requirements from the demand side. While the supply side may not always be willing to engage in a corrupt act or practice, the tendency for this party to engage in a corrupt practice becomes high when he/she is willing to receive a favour in return (Owusu et al. 2017; Boyd and Padilla 2009). Taking construction procurement process as the exemplary process in this study, the key project parties involved in this process include the client or financier, contractors or contracting team, sub-contractors, suppliers, design team, consultants, legal advisors, public officials among others (Zou 2006; Sohail and Cavill 2008; Bowen et al. 2012). As a result of the contractual and the social relations between or among any of the mentioned parties, the tendency to obstruct (corrupt) any of the stages of the process becomes possible by the concurrence of any two or more of the mentioned parties.

Thus, as highlighted in the study of Owusu et al. (2017), corruption does not happen in a vacuum. It takes at least any two of the mentioned parties to distort the process. While any of the key parties is identified to be either susceptible to corruption or contribute to corruption, the actual empirical estimations justifying how each party contributes to corruption is lacking. This formed one out of the two of the objectives of the study. Moreover, following the comprehensive review conducted by Chan and Owusu (2017) on the forms of corruptions, the authors recommended a further empirical study to be conducted regarding the identified corruption forms within their respective constructs. Chan and Owusu (2017) reviewed 39 selected publications on the various forms of corruption identified in construction processes and the industry. Twenty-eight forms were identified and were captured under six categorical constructs namely bribery acts, extortionary acts, discriminatory acts fraudulent acts, collusive acts and the last set of variables labelled as unclassified acts. According to Chan and Owusu (2017) *Bribery refers* to a corrupt act that may involve giving, promising, soliciting, accepting, or offering a benefit to lure or entice someone to act in an unethical or illegal manner. Discriminatory acts refer to the actions of showing more concern or favours that are ethically and professionally wrong. They include nepotism, favouritism, patronage, and guanxi. Detailed explications of these and the other forms can be found in Chan and Owusu (2017). These are as well made up of their unique individual variables of not less than three in constructs. For instance, the variables captured under extortionary acts were clientelism, intimidations and threats, coercion and blackmail (Sichombo et al. 2009; Smith 2009; Zhang et al. 2016). While this may arguably the first review to be conducted in the context of construction management related studies, the authors recommended that the need for an empirical assessment of the identified forms within the procurement and construction processes of construction projects.

### 3. Methodology

#### 3.1 Questionnaire Design and Survey Participants

The questionnaire represented the primary data instrument used to solicit respondents' personal experiences, and their opinions on the subject matter. This data collection method was adopted because it provides reliable and valid information within a manageable or relatively shorter time frame at a reasonable cost (Ameyaw et al. 2017; Hoxley 2008). The use of questionnaires often ensures respondents' anonymity and data confidentiality, especially on sensitive matters, such as unethical practices in the management of construction and engineering projects and corruption (Chan et al. 2018). The variables encapsulated in the questionnaire were derived from the extensive literature review conducted prior to the survey. The 5-point grading scale system was adopted, and the respondents were asked to grade the criticalities of the impact

from 1 (not critical) to 5 (extremely critical) and were provided additional rows (for optional open-ended responses) to insert any known barriers that were not captured in the literature review. The questionnaire was first pilot-tested with some experts prior to the main survey. Afterwards, the non-probability sampling techniques were adopted to reach the needed respondents for the survey. The non-probability sampling methods (i.e., purposive and snowball sampling techniques) were used since the respondents for the study were limited to experts with deep knowledge and involvement in the processes of the procurement activities and also understands the dynamics of corruption in the process. Over 300 experts involved in infrastructure projects in both the developed and the developing regions were contacted via online platform and some in person. At the end of the survey, a total number of 65 valid responses were regarded suitable for further analysis after checking, cleaning, and making good any discrepancies or irregularities that affected the further processing of the data. Table 1 present the background information of the respondents. The 65 experts came from 19 different countries (9 from developed countries and 10 from the developing countries) (see Owusu et al. 2018). They are classified as experts because of their expertise, which served as the underlying indicator for selecting the respondents. These are experts involved in the day-to-day active participation in matters and activities related to construction management and infrastructure procurement. With over 35% of the respondents having more than 20 years of experience and over 65% with more than 11 years of experience, the responses were esteemed with high relevance because of the experts' backgrounds, and the results are thought to be highly reliable. The Cronbach's alpha in each context (i.e., developed and developing) confirms this proposition of data reliability. Although the respondents were assured of data confidentiality, most were unwilling to participate in the survey due to the sensitive nature of the topic under study and to avert any anticipated reprisal in the future. However, the number of responses gathered was deemed adequate and suitable for further analysis after the necessary pretests.

Table 1: Respondents' Data

Categories	Overall	Developed Region		Developing Region	
	Number of respondents	%	Number of respondents	%	Percentage
<b>Background</b>					
Public Sector	43	66.2	26	76.5	54.8
Private Sector	12	18.5	5	14.7	22.6
Both	10	15.4	3	8.8	22.6
<i>Total</i>	65	100.0	34	100.0	100.0
<b>Professional Affiliation</b>					
Academic	19	29.2	5	14.7	45.2
Contractor	18	27.7	9	26.5	29.0
Engineer	11	16.9	8	23.5	9.7
Procurement Expert	6	9.2	6	17.6	0.0
Quantity Surveyor	6	9.2	4	11.8	6.5
Architect	5	7.7	2	5.9	9.7
<i>Total</i>	65	100.0	34	100.0	100.0
<b>Working Experience</b>					
Over 20 years	22	33.8	16	47.1	19.4
11-20 years	23	35.4	11	32.4	38.7
1-5 years	12	18.5	5	14.7	22.6
6-10 years	8	12.3	2	5.9	19.4
<i>Total</i>	65	100.0	34	100.0	100.0

### 3.2 Data Analysis and Survey Results

The gathered responses were subjected to descriptive analysis to explicate the issue under study. The mentioned tools were adopted based on their ability to realize the objectives of the study. The gathered data were analyzed using the 23rd version of the Statistical Package for the Social Sciences (SPSS). The data were first examined to determine their suitability and reliability for further analysis as that constitutes a

requirement to enhance the justifications for the results (Owusu et al. 2018). The reliability test was therefore conducted in this study using the Cronbach's alpha test tool in SPSS. Because it is extensively used in different studies and especially in construction management-related research (Le et al. 2014; Chan et al. 2018), the Cronbach's alpha tool was used in this study to perform the previously mentioned tasks. Given the two divisions of the total sample (i.e., 33 for developed countries and 32 for developing countries), the test was performed on each group because most of the analysis and discussions were made on comparative bases (i.e., between developed and developing countries). Complying with a scale from 0 to 1 in which 0 represents no reliability and 1 stand for full reliability, the closeness of the alpha value to 1 depicts an increasing level of reliability and vice versa with a given threshold of 0.7 (Chan et al. 2018; Santos 1999).

### 3.3 Forms Criticalities' and Contextual Disparities Test

In accessing the criticality of the corruption forms (CF), the mean score (MS) technique was adopted. The MS was regarded as the primary tool to demonstrate the level of vulnerability for the project parties and the level of criticality for the corruption forms (i.e., how a project party is relatively susceptible to the others and how a CF is more critical than another in each context). The ranking of both constructs (i.e., vulnerability – which indicates how prone the procurement stages are to corruption and criticality – *the magnitude of the forms at the respective stages of the procurement process*) was therefore based on the mean difference. Using the ordinal measurement from 1 to 5 as the lowest to the highest means, respectively, the respective ratings of the respondents were therefore defined from “1=not critical” to “5=very critical,” for the sections of the project parties and “1=not vulnerable” to “5=very vulnerable,” for the CFs. Per the ratings, the variables with relatively higher mean values under each construct (i.e., from 3.5) were considered to be vulnerable and critical respectively. The Mann-Whitney U test is recognized to be one of the most useful and widely adopted nonparametric techniques in assessing the significant difference or assigning a statement of probability to the difference between two samples that are independent of each other (McKnight and Najab 2010; Chan et al. 2018). A number of construction management-related studies have also used this statistical tool to determine significant differences on different topics such as risk assessments of public-private partnership in diverse context ( Osei-Kyei and Chan 2017). Therefore, to determine the significant statistical disparities regarding the criticality of the barriers in the two regions as expressed by the experts, the Mann-Whitney U test was used to execute this task. As a flexible tool, the Mann-Whitney U test requires no prior supposition on the distribution of data. Moreover, the number of respondents of the representative groups can be varied (Darko et al. 2017). By using the Mann-Whitney U test, the null hypothesis states that “there is no difference regarding the levels of criticality of barriers between the two contexts.” The null hypothesis can, therefore, be rejected if the individual significance levels exceed the critical alpha value (0.05). The test was conducted specifically to determine how the vulnerability patterns differ in the contexts of both developed and developing countries.

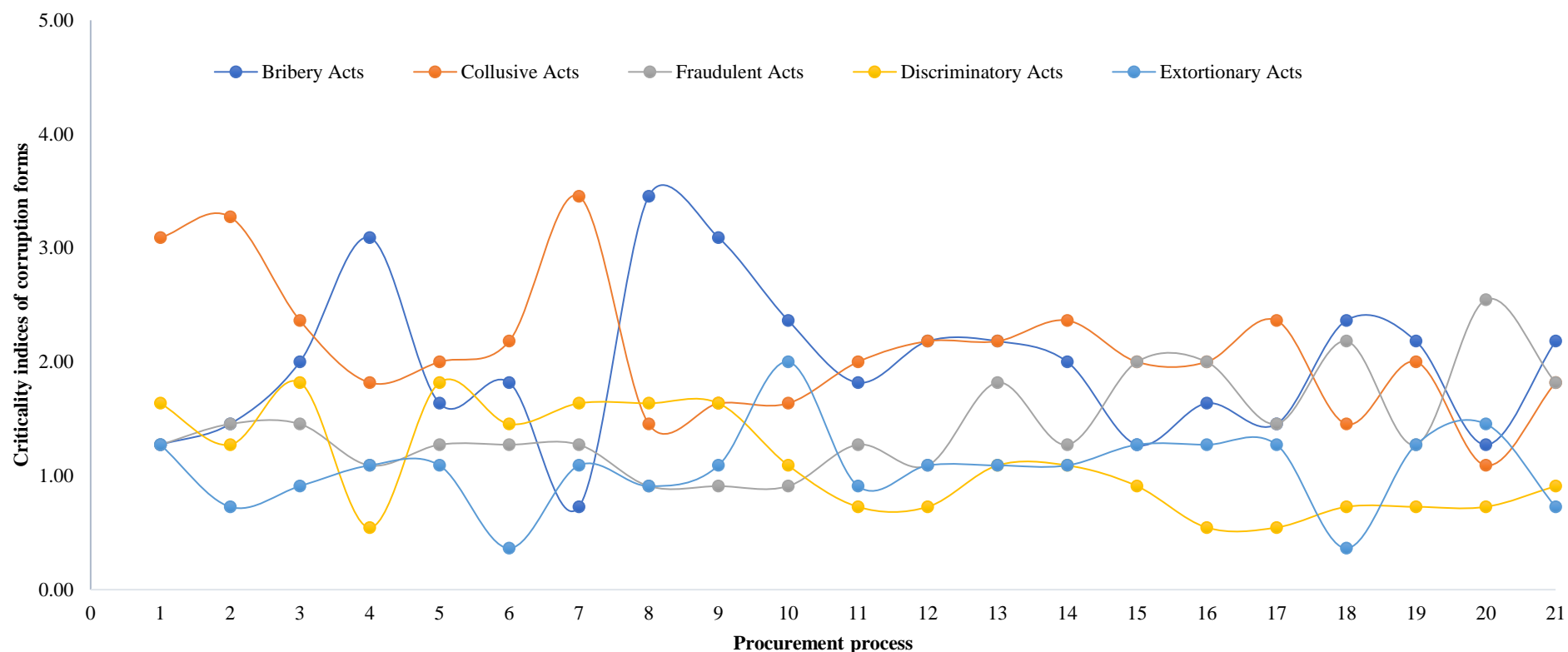
## 4. Data Presentation and discussion

Following the structure of the study's objectives, the discussions are limited the critical CFs at the different stages of the procurement process and the significant disparities regarding the susceptibility of the key parties involved in corruption. However, commencing with the criticalities of the forms of corruption throughout the procurement process, it was necessary to establish the respective stages of the process. As such the procurement process consists of four stages namely: i) pre-contract stage (PCS); ii) contract stage (CTS), iii) contract administration stage (CAS) and iv) post-contract stage (PCP) (Lester 2007; Ruparathna and Hewage 2013). Each stage, which represents a construct is made up of their respective variables which are also called activities. The activities under the pre-contract stage are i) Define requirements (PCS1), ii) procurement process planning and strategy development (PCS2), iii) Pre-tender survey (PCS3), iv) obtaining necessary approvals, (PCS4), v) soliciting tenders (PCS5), vi) receipt of tenders (PCS6). The

contract stage comprises: i) pre-tender meeting for establishing evaluation criteria, evaluation plan, evaluation criteria (CTS1), ii) tender evaluation (review to approve or reject bids) (CTS2), iii) select contractor (CTS3), iv) award contract/purchase order (CTS4), v) preparation and signing of contract (CTS5). The contract administration stage (CAS) which is the third stage of the procurement process consist: i) issuing contract amendments (CAS1), ii) monitor progress (CAS2), iii) follow up delivery (CAS3) and iv) administer progress payments (CAS4). Lastly, the post-contract phase (PCP) is also made up of six activities namely: i) file final action contractor agreement to final claim (PCP1), ii) issue final contract amendment (PCP2), complete of financial audits (PCP3), check for proof of delivery (PCP4), v) return of performance bonds and close-out (PCP5) and vi) ensure completeness and accuracy of file documentation (PCP6). There are twenty-one stages in all (Fig. 1) and the CFs are explored across all the 21 stages. The three key legends in Fig. 1 are i) the constructs of the CFs, ii) the 21 stages/activities involved in the procurement of construction and other infrastructure-related works and iii) the respective mean scores of the form construct at each respective stage. These legends are clearly defined to avoid any form of confusion and that readers may easily interpret how each stage or activity is clogged with the different forms of corrupt acts. Moreover, although each chart contains a great deal of information and requires a comprehensive and detailed analysis at each stage, the authors intend to highlight the most pressing or critical form of corruption construct at each stage since word limitation would not permit thorough exploration in each case.

However, beginning with the criticalities of the CFs at each stage of the process, bribery and collusive tend to be somewhat the prevalent CFs as expressed by the respondents from both the developed and the developing contexts. However, other forms such as discriminatory acts and extortionary practices were revealed to be prevalent in the first half of the stages and last half respectively. Moreover, this study assessed the highly pervasive CFs across the more critical stages indicated by the Wilcoxon's signed rank test result (i.e., the 9 activities in the case of the developing world and 10, in the case of the developed). As pointed earlier, Fig. 1 demonstrated that indeed, none of the activities of the procurement process in both contexts is free from the pervasiveness of CFs. It can be noted in Fig. 1 that while collusive acts construct is revealed by the overall respondents to be the most critical or highly observable acts at the pre-tender meeting stage (CTS1), bribery acts' construct was as well regarded as the most critical at both the tender evaluation and contractor selection stage. In connecting the results to real-life situation, it was identified that price fixing which is a type of collusive act was noted to be one of the common acts among contractors or potential bidders prior to the tender meeting and the receipt of tenders (Shan et al. 2016). Moreover, the top three activities within the stages that recorded the highest peaks as shown in Fig. 1 can be traced at 2, 7, and 8. They are PCS2, CTS1 and CTS2. As mentioned, the predominant peaks are the collusive and bribery acts with collusive acts maintaining a sturdy downward slope from requirement definition to the very last stage. However, even though bribery acts are mostly dominant of PCS4, CTS2 and CTS3, the bribery acts' slope depicts a sturdy upward movement indicating bribery acts become somewhat dominant right from the very first activity to the last. The slope of fraudulent acts CF was also noted as the steepest upward slope throughout the process. However, this construct is noted as not very critical as the range of this construct throughout the process lies between 1 (not critical) to 2 (less critical). Lastly, discriminatory acts identified as the least of criticalities throughout the process coupled with a downward slope. This indicates, that the further we progress along the process, the DA construct slopes downwards. The results realized in this study are intended to inform policymakers or parties responsible for contract documentation involved in project procurement and management to develop or implement a holistic framework aimed at expunging corrupt practices in a more direct and specific approach. Also, the results are intended to trigger more insightful discussions and similar analysis to be carried out in specific contexts to determine the exact situation, and the intensity of corruption form constructs that respective contexts may be opened or exposed to. Simply because the results obtained in this study cannot be defined to represent or be attributed to either the respective countries of the respondents involved or the entire developing and the developed contexts as different countries within these two contexts may share dissimilar views.

### Criticality of CFs throughout the procurement process (Overall)



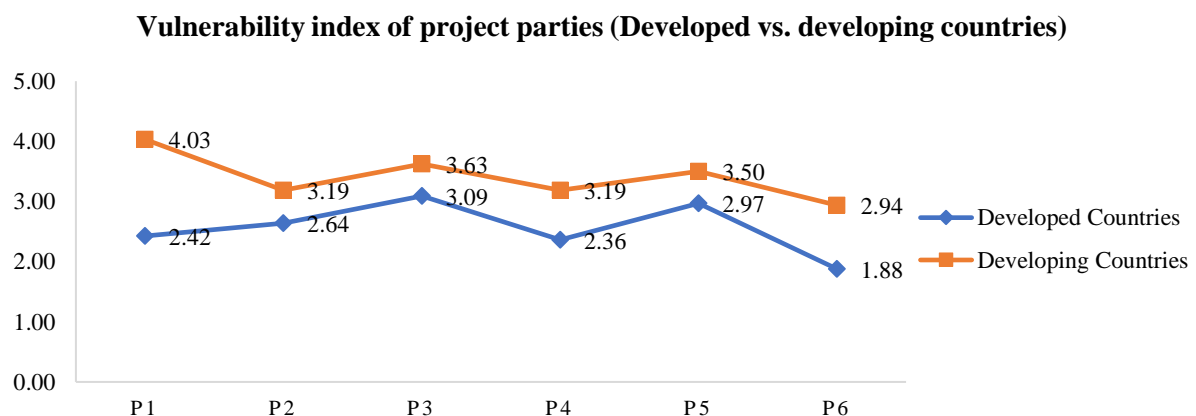
Procurement Stages	Pre-Contract Stage						Contract Stage					Contract Administration Stage				Post-contract Stage					
	PCS1	PCS2	PCS3	PCS4	PCS5	PCS6	CTS1	CTS2	CTS3	CTS4	CTS5	CAS1	CAS2	CAS3	CAS4	PCP1	PCP2	PCP3	PCP4	PCP5	PCP6
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
<b>Bribery Acts</b>	1.27	1.45	2.00	3.09	1.64	1.82	0.73	3.45	3.09	2.36	1.82	2.18	2.18	2.00	1.27	1.64	1.45	2.36	2.18	1.27	2.18
<b>Collusive Acts</b>	3.09	3.27	2.36	1.82	2.00	2.18	3.45	1.45	1.64	1.64	2.00	2.18	2.18	2.36	2.00	2.00	2.36	1.45	2.00	1.09	1.82
<b>Fraudulent Acts</b>	1.27	1.45	1.45	1.09	1.27	1.27	1.27	0.91	0.91	0.91	1.27	1.09	1.82	1.27	2.00	2.00	1.45	2.18	1.27	2.55	1.82
<b>Discriminatory Acts</b>	1.64	1.27	1.82	0.55	1.82	1.45	1.64	1.64	1.64	1.09	0.73	0.73	1.09	1.09	0.91	0.55	0.55	0.73	0.73	0.73	0.91
<b>Extortionary Acts</b>	1.27	0.73	0.91	1.09	1.09	0.36	1.09	0.91	1.09	2.00	0.91	1.09	1.09	1.09	1.27	1.27	1.27	0.36	1.27	1.45	0.73

**Figure 1:** Criticalities of the forms of corruption within the respective stages of the procurement process.



## 4.1 Vulnerability levels of Influencing Parties behind the ACM effectiveness

At this stage, the experts were also asked to rate the vulnerability levels of the project team members or the parties working on a common project. The results are presented in Table 2 and Fig. 2. While the respective vulnerability indexes are captured in Fig. 2, the overall mean means as well as the Mann-Whitney U results showing the significant disparities between the developed and the developing countries are presented in Table 2. Thus, commencing from the results in the context of the developing world, there is a wide global perception on the high level of corruption instigated or perpetuated by contractors and sub-contractors (Ameyaw et al. 2017; Bowen et al. 2012; Tabish and Jha 2011). However, per the views of the experts' involved in this study, contractors and sub-contractors (domestic or nominated) come next to public participants. The public participants may include governments representatives delegated to oversee a governmental projects, directors and management teams of public boards, civil servants, and other public personnel who are directly or indirectly connected to a project (Fig. 2). The studies of (Le et al. 2014; Ameyaw et al. 2017) confirm the vulnerability and the corruption levels of these public participants who often initiate a corrupt process with a contractor. Contractors and sub-contractors are also regarded as vulnerable and corrupt in the developing world, however, not as vulnerable and corrupt as the public participants involved in projects and especially, public infrastructure projects. This is followed by suppliers responsible for supplying parts of the work in progress. Design consultants such as architects, quantity surveyors, engineers, were statistically regarded as neutral with an MS around 3.0 in each case. Even though they are seen to be neutral participants to influence the occurrence of corrupt behaviours they may still fall under the demand, supply or condoning sides of corrupt practices (Boyed and Padilla 2009). Condoners often remain silent in the event of identifying a corrupt act (Chan and Owusu 2017). Legal advisors or practitioners were identified to be the least vulnerable or influenced by corrupt activities. Fig. 2 shows the overall vulnerability levels (indicated by their respective MS) of the projects' participants as well as the variations indicated by the respondents. A more rigorous disparities between the two groups as well as the full meanings of the codes P1 to P6 are presented in Table 2.



**Figure 2:** Graphical presentation of construction process participants vulnerability to corruption.

The main concern from the deductions made is not just to highlight how vulnerable or corrupt these participants are but also how they contribute to the enforcement of the identified ACM. For instance, public participants who charged with duties to oversee the realization of public projects may as well be the same personnel in charge or connected to management teams charged with supervisory duties or formulations of conditions governing a contract. This often leads to the situation where checks and balances are either sidetracked or eliminated from the supervisory demands of a project (Owusu et al. 2018). Thus, creating the room for corrupt practices to flourish. Contexts such as Hong Kong, Singapore among many other regions have established independent bodies for enforcing the demands of developed ACM to deal with these and other causal instigators of corrupt practices. These bodies often have sole

authority to investigate or partially audit project documents or processes with the aim of ensuring transparency and reducing the risks of corruption.

**Table 2:** Descriptive and Mann-Whitney U Test Statistics of Project Parties.

Code	Overall Ranks	Mann-Whitney U Test Statistics <sup>a</sup>						
	Project Parties	Mean	SD	Rank	U Stat*	W*	Z	p-value
P1	Public participants	3.21	1.27	3	150.500	711.500	-5.144	.000*
P2	Private participants	2.91	1.20	4	390.500	951.500	-1.863	.062
P3	Contractors and subcontractors	3.35	1.22	1	408.000	969.000	-1.660	.097
P4	Design consultant (Architects, Quantity Surveyors, Engineers, etc.)	2.77	1.16	5	324.000	885.000	-2.759	.006*
P5	Suppliers	3.23	1.18	2	387.000	948.000	-1.919	.055
P6	Legal advisors	2.40	1.18	6	252.000	813.000	-3.762	.000*

Note: <sup>a</sup> Grouping Variable: Developed and Developing Regions; \* represents C = Codes of individual ACM; U Stat\* = Mann-Whitney U Test Statistics; W\* = Wilcoxon W; Z – Z values; P = Significance level (Asymp. Sig.)

Several reports and scholarly investigations have proven the distinct demarcations in both perceived, proposed and statistical differences regarding corruption cases in developed and developing regions. The previous section on the effectiveness of ACM conducted in both contexts attests to the propounded differences. Per the views of the experts involved in this study, the discussed differences can be said to be the same for the parties involved in the modus operandi of construction activities. In conjunction with the discussions on the vulnerability levels of the involved parties where contractors, subcontractors, and suppliers were identified to be the top three vulnerable participants in the context of the developed world, the MWU text statistics demonstrate explicit statistical differences among the project participants from the two contexts. The same class of participants that is contractors, subcontractors, and suppliers with the addition of private participants were identified to be identical in both contexts showing no statistical difference according to the MUW text statistics. However, it is realized from the results that there is a statistical difference with respect to the general public, consultant teams, and legal advisors. Even though these parties may not be vulnerable nor add to the incidence of corrupt practices, the statistical inference or deduction that can be made from this result concerns the distinct disparities between the public participants in both contexts. That is, per the results, it can be inferred that one of public participants contributes tremendously to the incidence of corrupt practices is the construction project management in developing regions, and therefore primary considerations for parties who are required to enforce ACMs should consider less involvement of public participants. It should be noted that the conclusions made do not eliminate the inclusions of public participants in the modus operandi of construction works, but rather should be regarded primary parties to exclude from enforcing anti-corruption measures in the developing world and contractors in the developed. The distinct disparities demonstrated presented in Fig. 2 and Table 2 depicts the relational influence on the effectiveness of the identified ACMs in both contexts. From the two regions, experts from each context demonstrate how vulnerable project participants are to corruption on any given project. The inferential connotations from the mean statistics also show how each participant is or will be willing to enforce stipulated ACM in an institution or on a firm.

## 5. Conclusion

This study sought to examine the criticality of the various forms of corruption identified within the procurement process of construction works and the parties liable to the incidence of corrupt practices since limited empirical assessment has been conducted in this regards. Thus, creating a gap in literature. However, this gap had to be addressed since it is highly relevant for future endeavours. Moreover, assessed the significant disparities regarding the vulnerabilities of the identical stages between the respondents of the representing contexts. The methodological framework employed involved a pertinent review of related literature as well as a questionnaire survey with international experts involved in the supply chain of the procurement process. First, it was revealed that the critical prevalent CFs that run through all the stages in both economies are collusive, and bribery acts. Moreover, even though the

respondents from both contexts expressed dissimilar views in their respective ratings regarding the vulnerable parties who contribute greatly to corruption within the procurement process as presented in Fig. 2, however, regarding the disparities in their judgements, the respondents concurred to the respective positions that the main lines of differences that place the developed countries on a better pedestal as compared to the developing countries rallies around the fewer vulnerabilities of public participants, design consultants and the legal advisors towards their contribution to corruption. That is, these three categories of parties represent the key areas where the countries within the developed contexts do well than that of the developing countries. This study informs institutional policymakers, anti-corruption bodies, industrial and academic researchers on the critical stages and activities that may need thorough investigations and the development of effective anti-corruption measures to tackle corruption in the supply chain of the procurement process.

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