Overview of Corruption Research in Construction

Introduction

The construction industry plays a vital role in shaping the world. However, this positive social image has been increasingly diminished by corruption issues (Transparency International2008). Corruption can ruin multiple levels of the industry and lead to low performance, including quality defects and increased costs of construction projects (Charles2009). This misconduct can also affect the development of the global construction market (Goldie-Scot 2008). In extreme cases, corruption results negative social effects with serious consequences. Uneke (2010) and Tabish and Jha (2011) stated that corruption violates the rule of law and public trust in government. Corruption has stirred growing concerns not only from developed countries such as the US (Sohail and Cavill 2008; Crist 2009), United Kingdom (Chartered Institute of Building Survey 2006), and Australia (Hartley 2009) but also from developing countries such as India (Tabish and Jha 2012) and Nigeria (Alutu and Udhawuve 2009). However, studies rarely provide a complete view of corruption in construction. Therefore, a systematic review of papers in first-tier peer-reviewed journals in Construction Engineering and Management (CEM) is deemed appropriate to understand key issues in corruption in construction. Specific questions to be addressed in this paper include the following:

1. What is the coverage of corruption-related studies published in first-tier CEM journals in the period from 1990 to 2012?
2. What are the future directions for research on corruption in construction?

Corruption in Construction

Corruption is recognized as one of the major obstacles to economic and social development (World Bank 1997). In the construction industry, corruption may occur in any phase of a project, namely, project initiation, planning and design, bidding and construction, as well as operation and maintenance (Tabish and Jha 2011a). The construction sector is often deemed one of the most corrupt industries worldwide because of much information asymmetry between the client and other participants (Charles 2009). Sohail and Cavill (2008) reported that the annual estimated loss from corruption in the global construction market reaches about US $ 340 billion, which accounts for 1% of the global construction market value (about US $ 3.2 trillion). This figure suggests that considerable enterprise profit is wasted because of corrupt practices in construction.

Sohail and Cavill (2008) revealed that corruption usually occurs for or a number or a combination of the following reasons: (a) substantial flow of public money, (b) competitive nature of the tendering process, (c) lack of transparency in the selection criteria for tenders, (d) political interference in cost decisions, (e) complexity of institutional roles and functions, and (f) asymmetric information between practitioners. Tabish and Jha (2011a) emphasized that lack of standardized execution of construction projects is also a major reason for corrupt practices in the industry. In addition, this form of misconduct is secretly accomplished and very difficult to detect because of lack of access to the relevant documents or stakeholders in the project (Tabish and Jha 2011a).

Corruption also impedes the adoption of corresponding prevention measures in advance. However, considerable effort from industrial associations, non-governmental organizations (NGOs), and international organizations have provided guidelines on preventing corrupt conduct and practice. The American Society of Civil Engineers (ASCE) promoted a “zero tolerance” policy to cultivate an anti-corruption culture in the construction industry (Crist 2009). In collaboration with the Global Infrastructure Anti-Corruption Centre (GIACC), Transparency International (TI) developed an integrated anti-corruption system, the Project Anti-Corruption System (PACS). The PACS employs a group of anti-corruption measures such as the appointment of an independent assessor, commitment of all participants, disclosure of project information, and use of anti-corruption agreements (Transparency International 2013). The World Economic Forum established a global Partnering Against Corruption Initiative to provide a platform that helps companies prevent corrupt practices (World Economic Forum 2013). Despite considerable attempts to prevent corruption in the construction industry, the practice continues to be a common global phenomenon, especially in developing countries (Goldie-Scot2008).

Research Methodology

To identify major research outputs published in first-tier CEM journals, the methodology adopted by Ke et al. (2009) and Hong et al. (2012) was replicated in this study. The research design included two steps, as follows:

In Step 1, a list of first-tier peer-reviewed CEM journals was formulated as the source for identifying relevant papers according to the CEM journal ranking list by

67 Chau (1997). Selected journals included the top six journals in the ranking list of
68 Chau: *Construction Management and Economics (CME), Journal of Construction*
69 *Engineering and Management (JCEM), Engineering, Construction and Architectural*
70 *Management (ECAM), Journal of Management in Engineering (JME), Proceedings of*
71 *the Institution of Civil Engineers: Civil Engineering (PICE-CE),* and *International*
72 *Journal of Project Management (IJPM).* A full search of relevant papers in each of the
73 six journals was conducted using databases with a full collection of reports from 1990
74 to 2012. The common keyword "corruption" was used in the Title/Abstract/Keyword
75 field of search engines of databases such as ASCE Library, Taylor & Francis Online,
76 SciVerse ScienceDirect, Emerald, and the ICE Virtual Library. The search results by
77 relevance were as follows: CME (68), JCEM (67), ECAM (10), JME (27), PICE-CE
78 (17), and IJPM (38). These identified papers were reviewed to examine their
79 relevance to the topic. The results were refined, obtaining the following results: CME
80 (11), JCEM (5), ECAM (2), JME (3), PICE-CE (2), and IJPM (2).

81 In Step 2, a separate research was also conducted to identify more papers on
82 corruption in construction by using Web of Science (WoS), Compendex and
83 Engineering Index Backfile (CEIB) on Engineering Village, and the ASCE Library.
84 These three databases are regarded as major citation sources of high-quality papers in
85 construction engineering. WoS is the leading peer-reviewed literature web source
86 worldwide, covering more than 10,000 journals (Lippi et al. 2012). CEIB provides
87 bibliographic citations and abstracts of over 5,000 engineering journals and
88 conferences in all fields of engineering (Xue et al. 2010). The ASCE Library is

regarded as the largest publisher in the world, providing information on civil engineering (Fitzgerald 2005). Common keywords, including "corruption" and "construction" were used in the Subject/Title/Abstract field of search engines in the three databases. The initial search result was as follows: WoS (95), CEIB (282), and ASCE Library (52). After excluding papers unrelated to the corruption topic and those already identified in Step 1, the results of relevant papers cited in these three databases were refined: WoS (18), CEIB (3), and ASCE Library (10).

Finally, 56 papers were identified and validated as papers relevant to corruption in construction. Information on the 56 papers and their sources are listed in the Appendix. All searches were conducted in September 2012.

Current Research Interests

Based on a review of the 56 relevant papers, three research areas were identified as categories previous research on corruption in construction: forms of corruption in construction, impact of corruption in construction, and anti-corruption mechanisms and measures.

Identification of Forms of Corruption in Construction

Twelve forms of corruption in construction were identified from these 56 papers (Table 1).

(Please insert Table 1 here.)

Bribery is the most common and serious form of corruption in the construction industry, particularly in developing countries (Barco 1994). Bribery is regarded as a major corrupt practice, given that corruption refers to "*offering, giving, receiving or*

soliciting of anything of value to influence the action of an official in the procurement or selection process or in contract execution"(Shakantu 2006). With reference to an empirical survey in South Africa, Bowen et al. (2007a and 2007b) disclosed detailed information on how bribery is committed, revealing that it comes in the form of *gifts, payments, overseas and holiday trips, special favors/privileges,* and *affirmative appointments.*

Fraud is also a common form of corrupt practice in construction. This practice mainly comes in the form of *deceit, misinformation, invoiced and paid for materials those were never received, spurious request for a time extension, deliberate intention to mislead and withhold information, alteration of documents,* and *theft of materials* (Vee and Skitmore 2003; Heuvel2005; Shakantu2006; Bowen et al. 2007a; Bowen et al. 2007b; Sohail and Cavill2008; Jong et al. 2009; Tabish and Jha 2011a; Bowen et al. 2012). In two questionnaire surveys conducted in Australia and South Africa (Vee and Skitmore 2003; Bowen et al. 2007a; Bowen et al. 2007b), *deceit* and *misinformation* ranked first and second, respectively, as the most fraudulent conduct. As a major area in corruption research in construction, fraud has aroused significant research concern in previous studies (Table 1).

Collusion is a form of corruption in which a secret agreement is reached between two or more parties for a fraudulent or deceitful purpose. Collusion may benefit the involved parties but sacrifice the normal benefits of the project or the public (Bowen et al. 2007b). Most collusive practices are committed during project biddings and thus decrease the number of bidders and bid variance (Zarkada-Fraser and Skitmore 2000).

Previous collusion practices mainly involve two key participants in the projects, such as *"contractor and consultant, contractor and cost consultant, contractor and architect, client and consultant, and architect and suppliers"* (Bowen et al. 2007a; Bowen et al. 2007b; Heuvel 2005). Zarkada-Fraser (2000) emphasized that collusion seriously corrodes the foundation of the competitive nature of the construction industry.

Bid rigging is another major form of corruption that occurs mainly between a tenderee and a tender. In some cases, a tenderee intentionally specifies a very short time limit for preparing the bidding document to control the number of potential tenders. Thus, only a small number of tenders who have been informed earlier about the forthcoming bid can promptly submit the bidding documents. Some tenderees can also demand for unequal qualification requests to limit the number of tenders and help their favored tenders (Jong et al. 2009). Bowen et al. (2007a, 2007b) revealed common forms of bid rigging, including *cover pricing, bid cutting, hidden fees and commissions,* and *compensat*ing *for tendering costs through unsuccessful bidders.*

Embezzlement is a crime in which a person fraudulently misappropriates or misapplies what is legally entrusted to that person for his or her own intent (Green 1993). In the construction industry, a typical example of embezzlement is the misappropriation of project fund (Tow and Loosemore 2009; Ling and Hoang 2010). Embezzlement can seriously damage the cost management of construction projects (Sohail and Cavill 2008). For example, the payment for a contractor may be defaulted by the client's embezzlement of the project funds, thereby delaying payment and

project delivery or even resulting in project failure.

Kickback refers to illegal economic incentives that a person uses to seek a favorable decision from a person in power (Jong et al. 2009). For instance, a client staff may help a favored tender win a contract to obtain an economic reward from the tender. A recent questionnaire survey in Nigeria disclosed that the contractor winning the contract usually provides a price quotation that includes a kickback in the bidding (Alutu 2007). Kickbacks occur not only between contractors and owners. This form of bribery also occurs between architects and suppliers or between consultants and suppliers/ consultants, especially when the person in power can help suppliers win the contract by specifying the requirements of certain materials or construction techniques (Bowen et al. 2012).

Conflict of interest refers to a situation in which a professional in a position of trust, such as a site supervisor, an auditor, or a cost consultant cannot fulfill his or her duty impartially because of ambivalent professional or personal interests (Bowen et al. 2007a, 2007 b). Despite the lack of proof of improper activity, a conflict of interest can create an appearance of impropriety and thus undermine confidence in the professional to act properly in his or her position, which may negatively affect the public (Bowen et al. 2007a, 2007 b).

Dishonesty and unfair conduct occur mostly in bidding, bureaucratic or government policy making, negotiations on consultancy fees and project costs, as well as contract negotiation and signing (Vee and Skitmore 2003). Bowen et al. (2007a, 2007 b) summarized the common complaints on dishonesty and unfairness from different key

participants in construction projects, as follows: "*Architects believe that contractors are not always honest in abiding by contractual specifications, and that they commonly use cheaper, inferior alternatives. Contractors believe that the tender adjudication process is unfair, and that professionals act with bias when pressured by clients. Quantity surveyors believe that contractors repeatedly over-claim and that clients pressurize consultants to make savings on projects or cut their fees*."

Extortion refers to corrupt conduct motivated by the desire for gain, usually in the form of forced extraction of bribes and asking for favors from vulnerable parties (Sohail and Cavill 2006). Extortion can occur as a requirement (a) from client staff to contractors or material suppliers, (b) from a major contractor to his subcontractor, (c) from a potential subcontractor to a material/equipment supplier, and (d) from regulatory/permitting agencies to clients, contractors, or material/equipment suppliers. Extortion can result in the misuse of project funds and provide some individuals an illegal income (Jong et al. 2009). Extortion can also diminish project quality and reliability. Thus facility managers and users can suffer from extortion.

Negligence refers to corrupt conduct characterized by failure to exercise the degree of care that an ordinarily prudent and careful professional would exercise under similar circumstances (Richard 1972). Negligence is also a common form of corruption in construction. Specific forms of negligence include inadequate quality specifications, poor workmanship, insufficient safety specifications, low-quality materials, poor process supervision, and lack of project management and skills (Vee and Skitmore 2003). According to Bowen et al. (2007a, 2007 b), over 90% of

199 architects and cost consultants have committed negligence. Similarly, over 70% of
200 contractors and consultants have observed professional negligence in construction.

201 Front companies refer to corporate entities that are established by client staff to
202 obtain illegal income from corrupt conduct (Jong et al. 2009). These companies are
203 usually unknown to the public; however, their controllers usually hold senior positions
204 in the government and may have influence on awarding public projects. The
205 controllers may receive a very large share of bonuses from these companies, and this
206 form mostly occurs in public projects (Jong et al. 2009).

207 Nepotism refers to corrupt conduct by which a client staff may favor participants
208 who have a closer relationship with him or her in terms of race, origins, and private
209 relationships, among others (Kadembo 2008). Nepotism, also referred to as the "good
210 old boys' network," (Singh and Shoura 1999) can have multiple negative effects on
211 the success of construction projects, such as a decrease in construction productivity,
212 deficiency in managerial ability, and lack of contribution to project success (Kale and
213 Arditi1998).

214 ***Impact of Corruption in Construction***

215 Based on 56 identified papers, previous studies on the impact of corruption on the
216 construction industry focused on three areas: corruption risks in construction projects,
217 expansion strategies of global companies in the international construction market, as
218 well as social and economic effects.

219 Corruption is an extremely significant risk in managing construction projects,
220 particularly in managing project costs in developing countries, which usually lack

221 transparent and effective legislative and administrative system (Ofori 1999). Wang et
222 al. (1999 and 2000) indicated that corruption is one major risk in managing
223 build-operate-transfer (BOT) projects, adding that the major forms of corruption in
224 BOT projects in China is the expenditure of corrupt officials. Similarly, public-private
225 partnership projects of China also face a high risk in preventing corruption, which
226 affects project success (Xu et al. 2010; Chan et al. 2011; Ke et al. 2011). Ling and
227 Hoang (2010) obtained similar findings in Vietnam. Meduri and Annamalai (2011)
228 added that corruption can lead to an increase in the cost of construction projects and a
229 waste of public funds in India because of extra bribe payments.

230 Corruption largely affects the expansion strategies of global companies in the
231 international construction market (Ling and Hoang 2010). Barco (1994) viewed
232 bribery as a common strategy taken by global companies to gain competitive
233 advantage in foreign trade in the construction market. According to Tang et al. (2012),
234 corruption combined with political and physical factors is critical for a company to
235 enter successfully the international market. Despite large construction demand and
236 enormous latent benefits in some developing countries, the level of corruption in a
237 country may be one main consideration of global companies, particularly those based
238 in developed countries, in deciding whether to enter a new construction market
239 (Crosthwaite 1998). Therefore, corruption can obstruct global construction companies
240 from entering new construction markets.

241 Finally, corruption can affect the social and economic development of human
242 societies worldwide. Empirical studies have revealed that corruption causes economic

problems and worsen economic crises in some European and Asian countries. Jimenez (2009) noted that corruption contributed to the speculative bubble in Spain. Romero et al. (2012) identified specific forms of corruption in town planning and urban expansion in Spain, such as blurring land lines between the public and private sectors, illegal use of insider information, and lack of transparency. Green (2005) emphasized that widespread corrupt practices in Turkish construction industry can worsen the catastrophe because these practices lead to a lack of adequate quality inspection and assurance. Badun (2011) affirmed that the low quality of infrastructure in Croatia is due to common corrupt practices in the construction industry. Corruption also hinders the development of society and economy in developing countries. For instance, most global contractors abandoned water and irrigation projects in Nigeria (Sonuga et al. 2002) and road projects in Afghanistan (Unruh and Shalaby 2012) because of serious corruption in these two countries.

Anti-corruption Mechanism and Measures

Anti-corruption strategy is another research area on corruption in construction. Previous studies mainly involve four strategies: transparency mechanism, ethical code, project governance, and audit and information technology.

Transparency mechanism is an effective strategy for preventing corrupt conduct in construction projects. Sohail and Cavill (2008) observed that transparency mechanisms can provide the public with access to information on construction projects so that project processes can be monitored by stakeholders, and decision makers can be held accountable for their decisions. Kenny (2012) indicated that

regular exposure of contract and implementation details is a common form of transparency mechanism. Goldie-Scot (2008) noted that some developing countries such as Tanzania, Zambia, the Philippines, and Vietnam have exerted considerable effort in introducing transparency initiatives to prevent corruption in construction projects.

Ethical codes represent another important strategy to prevent corrupt practices by improving ethics and self-discipline in professionals. For instance, Australia developed a National Code of Practice for the Construction Industry to discipline all industry professionals and prevent corrupt transactions in construction projects (Hartley 2009). Goldie-Scot (2008) added that ethical behavior should be rewarded for constructing a positive industry atmosphere. Sohail and Cavill (2008) noted that ethical training may improve the implementation of a national ethical code and that developing an ethical code for a particular organization may be more useful because the industry ethical code cannot include exhaustive guidelines for all situations that different practitioners face in their work.

Several measures for improving project governance can also prevent corrupt activities in construction projects. Kenny (2009) argued that separation of the ownership and regulatory functions of government in construction projects can effectively mitigate corruption because it can restore the competitive nature of the construction sector. Tabish and Jha (2012) proposed that the selection of qualified leaders can facilitate cleaning up of corruption, thereby contributing to project success. Harsh punishment should also be considered in the design of corruption prevention to

provoke real fear in practitioners (Tabish and Jha 2012).

Audit and information technology also play an increasingly important role in corruption prevention in the construction industry worldwide. Sichombo et al. (2009) indicated that technical auditing in the pre-contract state of a construction project can minimize or prevent unethical practices in construction projects. Sohail and Cavill (2008) suggested that the Integrity Pact and information technologies widely applied worldwide can also positively affect corruption prevention. A debarment, which records companies and individuals found guilty of corruption, has been implemented by European Union (EU) member countries to prevent the corrupt companies and individuals from participating in EU projects (Jong et al. 2009).

Some international and industry associations have exerted substantial efforts in promoting a combination of anti-corruption mechanism and measures to prevent corrupt conduct in the construction industry. For instance, TI attempted to address corruption across the construction industry by producing a set of tools and reports in 2005 and subsequently developed PACS in 2007 to assist project participants (Krishnan 2009). The International Federation of Consulting Engineers proposed a comprehensive Business Integrity Management System and a parallel Government Procurement Integrity Management System for consulting firms (Boyd and Padilla 2009). The Global Infrastructure Anti-corruption Center (GIACC) established the GIACC Resource Centre to provide free access to information, advice, and tools designed to help stakeholders understand, prevent, and identify corruption. The ASCE has adopted a series of corruption prevention measures such as organizing a

309 Committee of Global Principles for Professional Conduct and an Engineer's Charter,
310 including anti-corruption topics in annual meeting programs and making a policy
311 statement 510 entitled "Combating Corruption" (Crist 2009). In the UK, an
312 Anti-Corruption Forum that comprises nearly all key local industry associations such
313 as the Institution of Civil Engineers, Chartered Institute of Building, Royal Institution
314 of Chartered Surveyors, and Association of Consulting Engineers has been held
315 annually since 2003 and provided various publications on practical measures for
316 combating corruption in construction (Goldie-Scot 2008).

317 ## Future Research Directions

318 Based on the review of 56 papers, three areas are identified to provide main directions
319 with a rich domain for future research: corruption in developing countries, corruption
320 risk identification, and evaluation of the effectiveness of anti-corruption strategies.

321 ### *Corruption in developing countries*

322 The construction industry in developing countries faces a greater challenge in
323 corruption prevention because of its lack of mature legislative and administrative
324 system. Goldie-Scot (2008) evaluated the impact of corruption on developing
325 countries as more devastating than that on developed countries. Thus, this topic has
326 aroused increasing research concern worldwide. For instance, identification of forms
327 of corruption in construction has been investigated with growing frequency in South
328 Africa, Nigeria, and India (Alutu2007; Bowen et al. 2007a and b; Alutu and
329 Udhawuve 2009; Ameh and Odusamj 2010; Tabish and Jha 2011a; Bowen et al. 2012).
330 This area is predicted to be a significant research opportunity.

Identification of Corruption Risk

Corruption risk identification is another emerging research area on corruption in construction. According to Zou (2006) and Sichombo et al. (2009), auditing techniques can detect corrupt practices in construction projects. However, these techniques cannot predict corruption risks, thereby preventing the adoption of proper measures against these risks. A systematic technique should be developed to identify corruption risks in managing construction projects. This area deserves futher research.

Evaluation of the effectiveness of anti-corruption strategies

Corruption prevention is a complex issue. Thus, no one-fits-all strategy can address all forms of corrupt conduct in construction projects. Wang et al. (2000) evaluated the effectiveness of some anti-corruption strategies such as maintaining a close relationship with government agencies, establishing joint ventures with local partners, and writing anti-corruption requirements into contracts by an empirical survey. None of these strategies received high evaluation from industrial practitioners. Therefore, the effectiveness of strategies proposed by governments, NGOs, and industry associations should be evaluated, and the fit between the specific forms of corruption and their solution strategies should be examined further.

Conclusions

This paper represents a critical review of 56 papers on corruption in construction within the 1990 to 2012 period. These papers were selected from six top construction journals (CME, JCEM, ECAM, JME, PICE-CE, and IJPM) and three influential and reliable academic search engines (WoS, CEIB, and ASCE Library)., Three categories

were identified to summarize current research interests in corruption research in the construction industry: identification of forms of corruption, impact of corruption on construction, and anti-corruption mechanisms and measures. These papers fully reflect the development and different perspectives of this filed, thereby establishing a platform for future research by providing a general view of corruption research in construction in the past two decades.

Three areas for future research on corruption in construction were identified and proposed for future inquiry and development: corruption in developing countries, corruption risk identification, and evaluation of the effectiveness of anti-corruption strategies. Corruption in construction is an emerging field with global concerns. Thus, more advanced and significant endeavors should be focused on this area for advanced knowledge and informed practice in the future.

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References

ASCE. (2013). “Journals.” *ASCE*, <http://www.asce.org/Books-and-Journals/Journals/Journals/>

(January 15, 2013)

Assibey-Mensah, G.O. (2008). “Ghana’s construction industry and global competition: A research note.”*J. Blac Stud.*, 39(6), 974-989.

Chau, K.W. (1997). “The rankings of construction journals.” *Constr. Manage. Econ.*, 15(4), 387-398.

The Chartered Institute of Building Survey.(2006). *Corruption in the UK construction industry*, Berkshire, U.K.

Fitzgerald, M. (2005).“ASCE Workshop Brings Together Participants in Iraq Rebuilding Efforts.”*ASCE News*, 30(1). <http://www.mfitzgeraldspage.com/uploads/iraqirebuildingefforts-SF.pdf> (January 15, 2013)

Green, G.S. (1993). “White-collar crime and the study of embezzlement.”*Annals of the American Academy of Political and Social Science*, 525, 95-106.

Hong, Y., Chan, D.W.M., Chan, A.P.C., and Yeung, J.F.Y. (2012). “Critical analysis of partnering research trend in construction journals.” *J. Manage. Eng.*, 28(2), 82-95.

Kadembo, E. (2008). “Corruption and the distortion of technology transfer and marketing process: An insight into Africa’s economic malaise and the decadence of its social fabric.”*J. Sustain. Dev.*, 1(1), 58-68.

Kale, S., and Arditi, D. (1998). “Business failures: Liabilities of newness, adolescence, and smallness.” *J. Constr. Eng. Manage.*, 124(6), 458-464.Ke,Y., Wang, S.Q., Chan, A.P.C., and Cheung, E. (2011).“Understanding the risks in China's PPP projects: Ranking of their probability and consequence.”*Eng. Constr. Archit. Manage.*, 18(5), 481-496.

Ke, Y., Wang, S.Q., Chan, A.P.C., and Cheung, E. (2009). “Research trend of Public-Private

397 Partnership in construction journals." *J.Constr.Eng. Manage.*, 135(10), 1076-1086.
398 Lippi, G., Favaloro, E.J., and Simundic, A.M. (2012). "Biomedical research platforms and their
399 influence on article submissions and journal rankings: An update."*Bioch. Med.*, 22(1), 7-14.
400 Ofori, G. (1999). "Challenges of construction industries in developing countries: Lessons from
401 various countries."*Proc., 2nd Int. Conf. on Construction Industry Development: Construction*
402 *Industry Development in the New Millennium*, Dept. of Building, National Univ. of Singapore.
403 Richard, A.P. (1972). "A theory of negligence." *J. Legal Stud.*, 1(1), 29-96.
404 Singh, A., and Shoura, M. (1999). "Improvement of Management Parameters in Public
405 Construction Agency." *J. Manage. Eng.*, 15(3), 52-59.
406 Snaith, M.S., and Khan, M.U. (2008). "Deleterious effects of corruption in the roads sector." *P.*
407 *Inst. Civil EngineerTransport*, 161(4), 231-235.
408 Sohail, M., and Cavill, S. (2006). "Corruption in construction projects."*Proc. of CIB W.*, Santiago,
409 Chile.
410 Tow, D., and Loosemore, M. (2009). "Corporate ethics and in the construction and engineering
411 industry." *J. Legal Aff. Dispute Resolut Eng. Constr.*, 1(3), 122-129.
412 Transparency International. (2008). *Transparency International Bribe Payers' Index, 2008*,
413 <http://www.transparency.org/policy_research/surveys_indices/bpi/bpi_2008> (October 1,
414 2012)
415 Transparency International. (2013). *Preventing Corruption on Construction Projects*,
416 <http://archive.transparency.org/tools/contracting/construction_projects> (January 16, 2013)
417 World Bank. (1997). *Helping Countries Combat Corruption: The Role of the World Bank,*World
418 Bank, Washtingtong

419 DC.<http://www.worldbank.org/publicsector/anti-corrupt/corruption/coridx.htm> (October 1,
420 2012)
421 World Economic Forum. (2013). *Partnering Against Corruption Initiative*,
422 <http://www.weforum.org/issues/partnering-against-corruption-initiative> (January 16, 2013)
423 Xue, X., Shen, Q., and Ren, Z. (2010). "Critical review of collaborative working in construction
424 projects: Business environment and human behaviors." *J. Manage. Eng.*, 26(4), 196-208.

425 # A list of Tables

426 **Table1.** Corruption forms summarized from collected articles

No.	Categories	References	Frequency in papers
1	Bribery	Barco1994; Vee and Skitmore 2003;Shakantu 2006;Alutu2007;Bowen et al. 2007a; Bowen et al. 2007b;Goldie-Scot 2008;Sohail and Cavill 2008; Sichombo et al. 2009; Krishnan 2009; Stansbury 2009; Hartley 2009; Jong et al. 2009; Ameh and Odusami 2010;Ke et al. 2011; Bowen et al. 2012; Meduri and Annamalai 2012;Tabish and Jha 2012	18
2	Fraud	Vee and Skitmore 2003;Heuvel 2005;Shakantu 2006; Bowen et al. 2007a; Bowen et al. 2007b; Goldie-Scot 2008;Sohail and Cavill 2008;Sichomboet al. 2009; Stansbury 2009; Jong et al. 2009; Tabish and Jha 2011a; Bowen et al. 2012	12
3	Collusion	Heuvel 2005; Shakantu 2006;Bowen et al. 2007a; Bowen et al. 2007b; Sichombo et al. 2009; Jong et al. 2009; Tabish and Jha 2011a; Chotibhongs and Arditi 2012a; Chotibhongs and Arditi 2012b	9
4	Bid Rigging	Vee and Skitmore2003;Bowen et al. 2007a; Bowen et al. 2007b; Sichombo et al. 2009; Krishnan 2009;Hartley	8

No.	Categories	References	Frequency in papers
		2009;Jonget al. 2009; Bowen et al. 2012	
5	Embezzlement	Sohail and Cavill 2008;Hartley 2009;Jong et al. 2009; Stansbury 2009; Ling and Hoang 2010	5
6	Kickbacks	Barco1994; Alutu 2007; Sohail and Cavill 2008; Jong et al. 2009; Bowen et al. 2012	5
7	Conflict of Interest	Bowen et al. 2007a; Bowen et al. 2007b; Hartley2009;Jong et al. 2009	4
8	Dishonesty and Unfair Conduct	Vee and Skitmore2003; Bowen et al. 2007a; Bowen et al. 2007b; Alutu 2007	4
9	Extortion	Sichombo et al. 2009; Stansbury 2009;Bowen et al. 2012; Tabish and Jha 2011a	4
10	Negligence	Vee and Skitmore 2003;Shakantu 2006; Bowen et al. 2007a; Bowen et al. 2007b	4
11	Front Companies	Hartley 2009; Jong et al. 2009	2
12	Nepotism	Hartley 2009; Bowen et al. 2012	2

427 Appendix Table Corruption papers identified from selected journals between 1990 and 2012

No.	Journal	Database	Year	Volume (Issue)	Authors	Topic
1.	Constr. Manage. Econ.	*TFO	2012	30(10)	Bowen,P.A., Edwards, P. J., and Cattell, K.	[c]Ant
2.	Constr. Manage. Econ.	*TFO	2012	30(1)	Tabish, S.Z.S., and Jha, K. N.	[a]Ide
3.	Constr. Manage. Econ.	*TFO	2011a	29(3)	Tabish, S.Z.S., and Jha, K. N.	[a]Ide
4.	Constr. Manage. Econ.	*TFO	2007b	25(6)	Bowen,P.A., Akintoye, A., Pearl,R., and Edwards, P. J.	[b]Imp
5.	Constr. Manage. Econ.	*TFO	2011b	29(8)	Tabish, S.Z.S., and Jha, K. N.	[b]Imp
6.	Constr. Manage. Econ.	*TFO	1998	16(4)	Crosthwaite, D.	[b]Imp
7.	Constr. Manage. Econ.	*TFO	2012	30(10)	Tang, L.C.M., Atkinson, B., and Zou, R.R.	[a]Ide
8.	Constr. Manage. Econ.	*TFO	2000	18(1)	Zarkada-Fraser,A., and Skitmore M.	[a]Ide
9.	Constr. Manage. Econ.	*TFO	2001	19(1)	Fan,L., Ho, C., and Ng, V.	[c]Ant

No.	Journal	Database	Year	Volume (Issue)	Authors	Topic
10.	Constr. Manage. Econ.	*TFO	2012a	30(3)	Chotibhongs, R.,and Arditi, D.	[a]Ide
11.	Constr. Manage. Econ.	*TFO	2008	26(6)	Moodley,K., Smith, N., and Preece, C.N.	[c]Ant
12.	J. Constr. Eng. Manage.	ASCE Library	2008	134(9)	Sohail, M., and Cavill, S.	[b]Imp
13.	J. Constr. Eng. Manage.	ASCE Library	2013	139(1)	Meduri, S.S., and Annamalai, T.R.	[b]Imp
14.	J. Constr. Eng. Manage.	ASCE Library	2000	126(3)	Wang, S.Q., Tiong, R.L.K., Ting,S.K., and Ashley, D.	[b]Imp
15.	J. Constr. Eng. Manage.	ASCE Library	1999	125(3)	Wang, S.Q., Tiong, R.L.K., Ting,S.K., and Ashley, D.	[c]Ant
16.	J. Constr. Eng. Manage.	ASCE Library	2012b	138(11)	Chotibhongs, R.,and Arditi, D.	[a]Ide
17.	Eng. Constr. Archit. Manage.	Emerald	2011	18(5)	Ke, Y., Wang, S.Q., Chan, A.P.C., and Cheung, E.	[a]Ide
18.	Eng. Constr. Archit. Manage.	Emerald	2003	10(2)	Vee, C., and Skitmore, M.	[b]Imp
19.	J. Manage. Eng.	ASCE Library	2009	25(1)	Alutu, O.E., andUdhawuve, M. L.	[b]Imp
20.	J. Manage. Eng.	ASCE Library	2011	27(3)	Chan, A.P. C., Yeung, J.F. Y., Yu, C.C. P., Wang, S.Q., and	[b]Imp

No.	Journal	Database	Year	Volume (Issue)	Authors	Topic
					Ke, Y.	
21.	J. Manage. Eng.	ASCE Library	1994	10(5)	Barco, A. L.	[b]Imp
22.	Proc. Inst. Civil Engineer-Civil Eng.	ICE Virtual Library	2012	29(1)	Kenny, C.	[b]Imp
23.	Proc. Inst. Civil Engineer-Civil Eng.	ICE Virtual Library	2011	164(1)	Amaee, R.	[a]Ide
24.	Int. J. Proj. Manage.	SciVerseScienceDirect	2002	20(8)	Sonuga, F., Aliboh, O., and Oloke, D.	[c]Ant
25.	Int. J. Proj. Manage.	SciVerseScienceDirect	2009	27(8)	Sichombo, B., Muya, M., Shakantu, W., and Kaliba, C.	[a]Ide
26.	Proc. Inst. Civil Engineer-Municipal Engineer	Web of Science	2008	161(4)	Goldie-Scot, H.	[b]Imp
27.	Proc. Inst. Civil Engineer-Transport	Web of Science	2008	161(4)	Snaith, M.S., and Khan, M.U.	[a]Ide
28.	Build. Res. Inf.	Web of Science	2004	32(2)	Dorée, A.G.	[a]Ide
29.	Build. Res. Inf.	Web of Science	2007a	35(2)	Bowen,P.A., Pearl,R., and Akintoye, A.	[b]Imp

No.	Journal	Database	Year	Volume (Issue)	Authors	Topic
30.	Automat. Constr.	Web of Science	2010	19(7)	Xu,Y., Yeung, J.F.Y., Chan, A.P.C., Chan, D.W.M., Wang, S.Q., and Ke, Y.	[a]Ide
31.	Bus. Ethics Eur. Rev.	Web of Science	2004	13(2-3)	Graafland, J.J.	[b]Imp
32.	British J. Crim.	Web of Science	2005	45(4)	Green, P.	[a]Ide
33.	Crime Law Social Ch.	Web of Science	2005	44(2)	Heuvel, G.V.D.	[b]Imp
34.	DrustvenaIstrazivanja	Web of Science	2011	20(2)	Badun, M.	[b]Imp
35.	Environ. Plan. C Gov. Policy	Web of Science	2012	30(3)	Romero, J., Jimenez, F., and Villoria, M.	[a]Ide
36.	Int. Econ. Rev.	Web of Science	2004	45(4)	Besfamille, M.	[a]Ide
37.	J. Bus. Ethics	Web of Science	2000	23(3)	Zarkada-Fraser, A.	[b]Imp
38.	Prog. Dev. Stud.	Web of Science	2012	12(1)	Unruh, J., and Shalaby, M.	[b]Imp
39.	Public Money Manage.	Web of Science	2003	23(3)	Deng, X., Tian, Q., Ding, S., and Boase, B.	[a]Ide

No.	Journal	Database	Year	Volume (Issue)	Authors	Topic
40.	Rev. Econ. Stat.	Web of Science	2003	85(4)	Bajari, P., and Ye, L.	[a]Ide
41.	Rev. Ind. Organ.	Web of Science	2005	26(2)	Porter, R.H.	[b]Imp
42.	S. Eur. Soc. Polit.	Web of Science	2009	14(3)	Jimenez, F.	[b]Imp
43.	Transport Rev.	Web of Science	2009	29(1)	Kenny, C.	[a]Ide
44.	Organ. Technol. Manage. Constr. Int. J.	*CEIB	2009	1(2)	Brockmann, C.	[a]Ide
45.	J. Pan. Afr. Stud.	*CEIB	2010	3(6)	Uneke, O.	[a]Ide
46.	Civil Eng.	*CEIB	2006	14(7)	Shakantu, W.	[a]Ide
47.	J. Prof. Issues Eng. Educ. Pract.	ASCE Library	2007	133(2)	Teo, E. A. L., and Aibinu, A. A.	[c]Ant
48.	J. Prof. Issues Eng. Educ. Pract.	ASCE Library	2007	133(2)	Alutu, O.E.	[b]Imp
49.	J. Prof. Issues Eng. Educ. Pract.	ASCE Library	2010	136(1)	Ameh, O.J., and Odusami, K.T.	[b]Imp
50.	J. Prof. Issues Eng. Educ. Pract.	ASCE Library	2010	136(3)	Ling, F.Y.Y., and Hoang, V.T.P.	[c]Ant

No.	Journal	Database	Year	Volume (Issue)	Authors	Topic
51.	Leadership Manage. Eng.	ASCE Library	2009	9(3)	Boyd, J.M., and Padilla, J. D.	[a]Ide
52.	Leadership Manage. Eng.	ASCE Library	2009	9(3)	Jong, M.D., Henry, W.P., and Stansbury, N.	[c]Ant
53.	Leadership Manage. Eng.	ASCE Library	2009	9(3)	Krishnan, C.	[c]Ant
54.	Leadership Manage. Eng.	ASCE Library	2009	9(3)	Stansbury, C.	[c]Ant
55.	Leadership Manage. Eng.	ASCE Library	2009	9(3)	Hartley, R.	[c]Ant
56.	Leadership Manage. Eng.	ASCE Library	2009	9(3)	Crist, R.A.	[a]Ide

Notes: [a]Ide represents Identification of forms of corruption in construction

[b]Imp represents Impacts of corruption in construction

[c]Ant represents Anti-corruption mechanism and measures

*TFO represents Taylor & Francis Online

*CEIB represents Compendex and Engineering Index Backfile