1 **Exploring strategies to reduce moral hazard and adverse selection of**
2 **Ghanaian Public-Private-Partnership (PPP) Construction Projects**

3 **Abstract**

4 **Purpose:** Conditions of inadequate and asymmetric information when an agent is hired by a
5 principal have resulted in the problems of moral hazard and adverse selection (MHAS) in
6 Public Private Partnership (PPP) construction projects. The objective of this study was to
7 explore strategies to reduce moral hazard and adverse selection in PPP construction projects.

8 **Design/methodology/approach:** Questionnaires were used to elicit responses from
9 respondents. Mean score ranking was used to rank these strategies while reliability analysis
10 was conducted using Cronbach Alpha coefficient and level of agreement tested using
11 Kendall's concordance. Factor analysis grouped the strategies into eight components.

12 **Findings:** From the mean score ranking, Monitoring; Transfer of risks; Screening; Managing
13 of construction risks; and Increased incentives to control costs were the most significant
14 strategies. The eight components were: Transparent process and contract; Incentives and
15 monitoring; Screening and technical assistance; Unbundling and benchmarking; Funding and
16 small liabilities; Information clarification and signalling; Risk and contract management; and
17 Cooperation and finance factors.

18 **Practical implications:** The findings of this have identified the most significant strategies to
19 reduce MHAS on PPP construction projects to serve as a guide to PPP practitioners in
20 reducing MHAS.

21 **Originality/value:** The output of this research contributes to the checklist of strategies that
22 reduce PPP project failures arising from MHAS and contributes to the development of the
23 agency theory.

24 **Paper Type -** Research paper

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INTRODUCTION

Moral hazard is the situation of information unevenness or asymmetry that happens after the principal takes a decision (Owusu-Manu *et al.,* 2018a). On the other hand, this is called hidden action because the actions and activities of the agent are not fully exposed to the principal (Pana, 2010). Correspondingly, within the extant literature, adverse selection is recognized to be the sole or private information possessed by the contractor and which is not available to buyer (Biong, 2013). In adverse selection, information gap occurs preceding the principal making his decision. This phenomenon is also referred to as hidden knowledge. This is due to the potential agent having information which the principal lacks and thus leading to the principal making a wrong decision.

The agency problem is a conflict of interest inherited in any relationship where one party is expected to act in another's best interests (Lobner, 2009; Buvik and Rokkan, 2003). Agency theory is concerned with resolving problems that exist in agency relationships due to unaligned goals or different aversion levels to risk. The most common agency relationship in constructions occurs between principals (clients) and agents (contractors) (Iossa and Martimort, 2008).

Public-Private-Partnerships date back to the twelfth century (Wettenhall, 2010; Owusu-Manu *et al.,* 2017). According to Bovaird (2010), in traditional procurement in the public sector, the government is responsible for settling on design and specifications of the facilities. After the bidding process, a private sector contractor is paid to construct the project (Ismail, 2013). Despite controversies about PPP policy in developing countries, many developing countries actually have huge infrastructure deficit and excessive government debts which in a way has led to poor economic development and lower standards of living (Osei-Kyei and Chan, 2017a). This serves as an incentive for PPP to be explored in these nations to augment infrastructure development and boost the living standards of citizens (Osei-Kyei and Chan,

56 2015; Kumar *et al.,* 2018). Owusu-Manu *et al.* (2018b) stated that MHAS was one of the

57 major challenges affecting PPP construction projects in developing countries; and their study

58 went ahead to explore a number of negative effects of MHAS. McCann *et al. (*2015) in their

59 study too established that MHAS was a challenge in Australian PPP projects and PPP

60 projects' failure to meet delivery outputs' minimum requirements.

61 Like other governments, the Government of Ghana (GoG) has also shown great interest in the

62 PPP concept, particularly for construction projects (Osei-Kyei and Chan, 2017b). Since 2004,

63 few construction PPP projects in Ghana have been initiated with many of the projects failing

64 to proceed successfully due to a number of reasons including moral hazard and adverse

65 selection (Osei-Kyei and Chan, 2017b; Owusu-Manu *et al.,* 2018b). In Ghana, the Ghana

66 National Housing Project (GNHP), which was the first ever major PPP housing project to be

67 initiated in the country's housing sector failed due to the problems of MHAS (Osei-Kyei *et*

68 *al.,* 2019).

69 There has been theoretical development over the recent years in researching on the problems

70 of moral hazard and adverse selection. However some gaps do exist in their literature since

71 there is dearth and scarcity of literature in these areas especially in strategies to reduce

72 MHAS in PPP construction projects. This study not only extends existing work but also

73 identifies and ranks significant strategies to reduce MHAS in PPP construction projects.

74 Practically, the identified and prioritized strategies will serve as a guide and managerial

75 support in future PPP projects. As such, the findings of the research may guide construction

76 stakeholders in reducing failure of PPP projects due to MHAS. These stakeholders and

77 practitioners will improve project success by recognizing and planning against failure of

78 these PPP projects.

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80

LITERATURE REVIEW

Public Private Partnerships (PPP)

PPP refers to ways of collaboration between public and private stakeholders which purposes to guarantee the financing, building, refurbishing, administration or preservation of a service or an infrastructure (Torres and Pina, 2001). Public-Private-Partnerships are carried out in countless diverse sectors, for example: transportation, residential facilities, metropolitan development, municipal renaissance, operating institutions of culture, educational areas.

In a study by Budäus and Gründing (1997), Public-Private-Partnership is characterized in a smaller way by:

> ➢ Relations among government and private stakeholders

> ➢ Placing emphasis on accomplishment of similar objectives

> ➢ Probability of synergy by way of mutual aid

> ➢ Orientation of process

> ➢ The associate's distinctiveness and conscientiousness

> ➢ Stipulation of cooperation relationship

Due to the extended contract period (around thirty years), it is not feasible to lay down the exact privileges, risks, rights, expenditures, accomplishments and liabilities in advance (Budäus, 2006).

Moral hazard and Adverse Selection (MHAS) in PPP construction projects

A moral hazard problem arises when the agent's action is not verifiable, or when the agent receives private information after the partnership has been commenced (Owusu-Manu *et al.,* 2018a). Moral hazard should not pose as a challenge or problem if both the principal and agent had the same objective functions. The misunderstanding about which action should be taken out is the basis for agency costs (Lobner, 2009).

105 An adverse selection problem happens when the agent holds private information before the

106 relationship begins (Owusu-Manu *et al.,* 2018a). The principal will be able to authenticate the

107 agent's behavior; however, the optimal decision, the cost of this decision relies on the agent's

108 type which is private information to the agent. The principal is aware that the agent is one of

109 several possible types but he/she cannot identify it (Lobner, 2009).

110 The two information problems do not exist disjoint, on the whole. This is as a result of the

111 existence of synergies between stages of the venture, accounting for why different tasks are

112 bundled in a distinct activity and delegated to a sole responsible private firm. The effort that

113 the firm exerts at the construction stage influences the circumstances it encounters at the

114 operation stage. For example, exerting effort might enhance the chance of encountering a

115 high demand for the service (since the infrastructure is more dependable) or a reduced price

116 of production (since the cost is an internal attribute of the project).

117 **Impact of MHAS on PPP construction projects**

118 Being a long term and global contract, the partnership contract enhances the traditional issues

119 of MHAS related to the choice of a bidder. It implies high transaction costs for both the

120 public and private partners, due to duration of the negotiation and the skills and resources

121 involved (Allen, 2003). The requirements of the contract are generally complex and

122 expressed in terms of outputs rather than inputs. MHAS selection in PPPs raise transaction

123 costs because the government has to negotiate with and monitor the private sector partners

124 who have their own interests and agendas.

125 The widespread problem of MHAS in the construction market are the main reason for the

126 dishonesty of the construction market and is the primary cause of the construction project risk

127 as well (Akintayo, 2018). If the problem of adverse selection cannot get effective settled, it

128 will be difficult to form a "win-win" situation in the construction market, which leads to the

129 harmonious project management being not formed.

130   The problem of adverse selection is particular prominent in domestic construction market.

131   Each contractor's strength level is uneven, which is the fundamental cause of adverse

132   selection. Because of asymmetric information, the owner has little or false information of the

133   contractor's technology, management, credit etc., leading to the owners tend to be at a

134   disadvantage position in the game of both sides, which leads to adverse selection –that is

135   "bad money drives out good money" Problems resulting from MHAS in PPP projects are

136   economic disadvantages for one of the parties, the inefficient use of resources, and the

137   resulting losses of welfare.

138   **Strategies to reduce moral hazard and adverse selection in PPP construction projects**

139   *Transfer of risk* by way of enforceable contracts curtails greatly the problems of moral hazard

140   and adverse selection (Akintayo, 2018). Simply put, transfer of construction risk results in

141   projects where only the most qualified builders have to control their own construction

142   liabilities and risks (Blanc-Brude, 2013). *Increased incentives to control costs:* Selecting

143   most qualified construction companies coupled with the incentive to manage costs restricts

144   moral hazard and adverse selection (Blanc-Brude, 2013). A fraction of construction risk

145   existent in infrastructural projects is a product of who is exposed to the risk (Laffont and

146   Tirole, 1993).

147   *Managing of construction risks:* Construction risks are controlled by way of a network of

148   contracts (Gatti, 2013) and transferred to construction companies which efficiently make

149   available insurance against unanticipated construction costs (Owusu-Manu *et al.,* 2018b).

150   *Benchmarking:* Asymmetries of information on the operating costs can also be reduced

151   through benchmarking and market testing processes (yardstick competition) (Kumar *et al.,*

152   2018). Elementary parts of the service provided by the contractor can be periodically

153   evaluated against market prices (Bureau and Mougeot, 2007).

154　*Financial unbundling:* Financial unbundling is an effective way of ensuring transparency in

155　projects by inducing a disclosure of the contract financial main points. The commitment of

156　financial institutions into the contract allows, the assessment of the completion of value for

157　money and reinforces, and the monitoring upon the special purpose entity (SPE) (Gatti,

158　2013).

159　*Bond spread:* An inadequate risk transfer to the contractor can be discovered by the

160　reasonability of the bond spread (Ameyaw and Wilhelm, 2017). For instance, if the public

161　partner takes on almost all the demand risk, it can be, in financial expressions, like providing

162　to the contractor an advance contract for free (Välilä, 2005).

163　*External finance:* External finance brings about a new agency relationship to the contract

164　(Gatti, 2013). It is positive to the public contractor since the interests of external financiers

165　are similar to its objective. In this way, part of the monitoring expenses can be externalized

166　(Blanc-Brude, 2013). *Funding competition:* At the negotiation period, funding competition

167　helps to raise the public sector's information on the deal (Ameyaw and Wilhelm, 2017).

168　However, the cost of gathering this information must not override the savings it brings about.

169　In this instance, the size of the deal, and the number of bidders, has a crucial role in the trade-

170　off (Singh *et al.,* 2006).

171　*Contain private liabilities to small size:* Private liabilities should be contained to an

172　adequately small size (Blanc-Brude, 2013). PPP projects are to be effectively run and should

173　not be extremely leveraged (Danau and Vinella, 2014). *Securing contract enforcement:* To be

174　able to induce the firm to fulfil the contract, there should be the requirement of investing a

175　satisfactorily worthy quantity of money in advance, and it should be allowed to recuperate

176　that investment by the passage of time at the execution stage (Blanc-Brude, 2013).

177　*Contract guarantees and technical assistance:* Modern development banks or current

178　multilateral banks will offer monetary support, assuring guarantees and giving out the most

179   excellent international actions for project evaluation and risk appraisal, and the best

180   techniques of innovative finance (Hart, 2003). All these help reduce MHAS in PPP projects.

181   *Screening:* Screening refers to the term for all activities whereby the principal attempts to

182   gain more accurate information on the quality attributes of the agent which are pertinent

183   (Kumar *et al.,* 2018). These include: references, work probes, certificates, and credit

184   worthiness (Dewatripont and Legros, 2005). *Monitoring:* Monitoring is essential after a

185   contract has been signed. The intent of monitoring is to make certain that the agent is acting

186   in harmony with the contract (Owusu-Manu *et al.,* 2018b). This in the long term decreases

187   the problems of MHAS in PPP projects (Dewatripont and Legros, 2005).

188   *Signaling:* The market party which has more information, for example the contractor, signals

189   its type to the client who is the least informed market stakeholder, using some signals (Kumar

190   *et al.,* 2018). In case of signaling, the initiative goes out from the better-informed market

191   participants who send out their signals first and who only then get contracts offered by the

192   worse informed market party (Dewatripont and Legros, 2005). *Cooperation among project*

193   *participants:* Trust takes time to develop between the parties, and it is very fragile, but once

194   developed it outshines all the other strategies in terms of project control and risk

195   minimization (Osei-Kyei and Chan, 2017a). Formal planning and control systems create

196   more transparency with regard to the actions of the PPP project participants (Danau and

197   Vinella, 2014).

198   **METHODOLOGY**

199   This study was quantitative in nature and deductive research approach was adopted.

200   Questionnaires were the main research instrument to collect data. The designed instruments

201   were pre-tested and piloted before the main survey. As opined by Oppenheim (2000) and

202   Creswell (2005), pre-testing and piloting surveys are significant in establishing complete

203 consistency in the data collection (Yin, 2009). Using stratified sampling technique, two

204 respondents each from government agencies, consultancies and construction firms involved

205 in PPP projects with insightful expertise and having features of proposed respondents were

206 asked to pre-test the questionnaires. These six respondents were asked to check the research

207 instrument (RI) for ambiguity, clearness and time used to finish answering the questionnaires.

208 They were also to give insights which will improve the preciseness of the questionnaires.

209 Feedbacks received indicated that the questionnaires were very clear to comprehend and were

210 very likely to get pertinent answers in the main survey. Comments from the piloting were

211 used to make a few additions and fine-tuning of the questionnaires for the main survey. The

212 real survey spanned two months and respondents were asked to rank twenty (20) strategies to

213 reduce moral hazard and adverse selection of PPP construction projects. The Likert scale 5-

214 point grading system was used where 1=not significant; 2=moderately significant;

215 3=significant; 4=very significant and 5=extremely significant. Mean values greater than 3.00

216 were significant.

217 The sampling technique for this study with relation to its design, purpose, and realistic

218 inference on this research topic is purposive sampling. The researcher chooses what needs to

219 be identified and undertakes to locate respondents who are willing to release the information

220 by merit of experience or knowledge (Tongco, 2007). In this research, this strategy involved

221 identifying the professionals involved in Public-Private-Partnership (PPP) construction

222 projects. Furthermore, snowball sampling was used in getting the sample size due to the

223 challenges encountered in evaluating the population size. This strategy is a solution to

224 reaching hard-to-reach or concealed populations. It exists on the assumption that a link exists

225 among the original sample and extras in the similar target population (Creswell, 2005). This

226 mixed sampling process was used to obtain a representative sample size of fifty-six (56)

227 government agencies, consultancy firms and construction companies in charge of Public

228 Private Partnership projects. Questionnaires were distributed to five (5) respondents in each

229 of these companies and agencies resulting in a total of two hundred and eighty (280)

230 respondents. Two hundred and ten (210) questionnaires representing seventy five percent

231 (75%) response rate was attained.

232 Mean score ranking was used to rank these strategies while reliability analysis was conducted

233 using Cronbach Alpha coefficient. Kendall's concordance analysis was conducted to measure

234 the agreement of different respondents on their rankings of strategies. Factor analysis using

235 Principal Component Analysis (PCA) grouped the strategies into eight components.

236

237 **DATA ANALYSIS AND DISCUSSION**

238 **Respondents' profile**

239 40 percent of respondents work with government agencies in charge of PPP construction

240 projects. 39 percent of respondents work with consulting firms in charge of PPP construction

241 projects. Finally, 21 percent of respondents work with construction firms in charge of PPP

242 construction projects. This research comprises respondents who are working in various

243 sectors and firms responsible with construction projects and are knowledgeable about the

244 operations of PPP construction ventures. This therefore lends credence to the reliability of the

245 study.

246 Since PPP is quite new in the Ghanaian industry, respondents were not restricted to their

247 experience in PPP projects but were rather asked their years of working experience. 10.5

248 percent have less than 5 years' experience. 28.1 percent have 5-10 years' experience. 74

249 respondents representing 35.2 percent have 11-15 years' experience. 14.3 percent have 16-20

250 years of working experience while the remaining 11.9 percent have above 20 years of

251 experience. In conventional work practice and relying on the practical perception of

252   employment practice in Ghana, having at least six years of working experience qualifies a

253   worker for the position of senior management. In addition, possessing at least ten years of

254   working experience makes a worker suitable for the position of senior management. Inferring

255   from this, it can be deduced that the respondents for this study have adequate working

256   experience in the industry. In summary, their responses for this study are seen to be reliable

257   and valid.

258   10.5 percent of respondents have an HND degree. 47.6 percent have a BSc degree.

259   Furthermore, 40 percent have an MSc degree while the remaining 1.9 percent have a PhD.

260   Considering the practical standpoint of the teaching and training courses offered by various

261   professionals in the Ghanaian industry, it can be seen from this results that the majority have

262   passed through the tertiary level with the minimum being a BSc degree. The implication for

263   this study is that, the respondents have satisfactory background in education and hence have

264   the propensity to better understand and interpret the variables. Their responses are therefore

265   anticipated to be credible and consistent.

266   **<Insert Table I here>**

267
268   **Reliability Statistics**

269   The internal consistency analysis of the responses received shows a Cronbach's alpha

270   coefficient value of 0.812. Tavakol and Dennick (2011) postulated that a Cronbach's alpha

271   coefficient value between 0.800 and 0.900 is good for a research. This implies that the

272   internal consistency of the response that was received is strong. Table II presents the analysis

273   of the reliability statistics of the responses.

274   **<Insert Table II here>**

275   **Mean score ranking for strategies to reduce moral hazard and adverse selection of PPP**

276   **construction projects**

277 Table III shows the results for the mean score ranking. Based on the mean scores, two factors

278 had means of above 4 and hence were very significant. The top five strategies are stated

279 below with their standard deviation values. *Monitoring* was ranked 1st with a mean of 4.06

280 and standard deviation of 0.891. *Transfer of risks* was ranked 2nd with a mean of 4.02 and

281 standard deviation of 0.923. *Screening* was ranked 3rd with a mean of 3.93 and standard

282 deviation of 0.813. *Managing of construction risks* was ranked 4th with a mean of 3.90 and

283 standard deviation of 0.868. *Increased incentives to control costs* was ranked 5th with a mean

284 of 3.87 and standard deviation of 0.745. All the mean values for the factors in the table were

285 above the population mean (3.0). It is inferred that all these factors are significant as far

286 strategies to reduce moral hazard and adverse selection of PPP construction projects is

287 concerned.

288 In a study conducted in France by Bureau and Mougeot (2007), *benchmarking* was ranked as

289 the most significant factor in reducing MHAS. However in this study, it ranked at a low

290 position of 18th. *Increased incentives to control costs* was identified in a stud by Blanc-Brude

291 (2013) as the most significant indicator for addressing MHAS. In this study, this factor

292 ranked 5th which was also significant and therefore agrees with the past study undertaken.

293 **<Insert Table III here>**

294 **Kendall's concordance analysis**

295 Kendall's concordance analysis was conducted to measure the agreement of different

296 respondents on their rankings of strategies based on mean values within a particular group. If

297 the Kendall's coefficient of concordance (W) was statistically significant at a pre-defined

298 significance level, a reasonable degree of consensus amongst the respondents indicated.

299 Table IV shows the test results of the Kendall's concordance analysis for each group of

300 stakeholders at a significance test value of 0.05. The values of W range from 0 to +1, where a

301 value further from 0 indicates a strong degree of consistency on the rankings of factors within

302 each group (Sheskin, 2011). Results suggest that there is consistency on the rankings within

303 each group: (government agency, consulting firm and construction firm).

304 **<Insert Table IV here>**

305

306 **FACTOR ANALYSIS FOR STRATEGIES TO REDUCE MORAL HAZARD AND**

307 **ADVERSE SELECTION OF PPP CONSTRUCTION PROJECTS**

308 **Initial Considerations**

309 With reference to the data presented in Table V, the data from the survey is adequate by these

310 tests. The data has 210 observations per variable with the value of KMO being 0.784 which is

311 greater than 0.50.

312 From Table V, Bartlett's test is highly significant and hence recommended for factor

313 analysis. This determinant of the matrix is used in testing for multicollinearity. The

314 determinant or the R-matrix should be greater than 0.00001. Field (2005) opines that if it is

315 less than the value, the variables that correlate very highly should not be included in the

316 analysis. However, no two variables correlate very highly. Mild collinearity according to

317 Field (2005) is not a problem for factor analysis and hence the data is appropriate for factor

318 analysis.

319 **<Insert Table V here>**

320 The Guttmann-Kaiser rule and the Cattel scree test were used in determining the number of

321 factors to be extracted. Guttmann-Kaiser rule suggests that only factors with an eigen value

322 greater than 1 should be retained whilst the Cattel scree test suggests that all further

323 components after the one starting the elbow should not be included. Applying these criteria

324 on the number of principal components to be extracted suggests that **eight (8)** components

325 should be extracted.

326 **<Insert Table VI here>**

DISCUSSION OF FACTOR ANALYSIS

Component 1 (Transparent process and contract)

Component one consists of the factors: *Well-designed contract, Create a clear and transparent process* and *Harmonization of interests.* From observations of the relationship among the variables loaded onto this component, it has been termed 'Transparent process and contract' factors. This extracted component accounted for 12.117% of the total variance. It is predictable that these have been weighed highly because the respondents must have considered these strategies as very critical in reducing the problems of moral hazard and adverse selection.

Well-designed contract with eigen value of 0.896 is very important. Contract is the most vital instrument that regulates the information between the project owner and contractor (Ameyaw and Wilhelm, 2017). Therefore, a well-designed contract which defines the ways of information transfer is the most effective way to decrease the information asymmetry risk (Lobner, 2009). This agrees with past study conducted by (Owusu-Manu *et al.,* 2018b) where well-designed contract was identified as a significant factor in curbing moral hazard and adverse selection in PPP projects.

Create a clear and transparent process had an eigen value of 0.458. Routinization and standardization will create a market for PPPs that provides the public and private sector with a clear roadmap for success. This will ultimately lead to a reduction of the agency problems of moral hazard and adverse selection (Ameyaw and Wilhelm, 2017).

Harmonization of interests with eigen value of 0.896 is also another significant strategy. A main instrument for reducing the risks of moral hazard is the harmonization of interests, by profit sharing of the contractor. For the planning participants, contractual incentives must be given so that the targets of the principal are achieved (Dewatripont and Legros, 2005).

Component 2 (Incentives and monitoring)

Component two consists of the factors: *Increased incentives to control costs* and *Monitoring*. It has been named 'incentives and monitoring' factors. This extracted component accounted for 8.743% of the total variance.

Increased incentives to control costs had an eigen value of 0.599. The self-selection of the most qualified construction companies merged with the incentive to manage costs as a remaining claimant curtails with moral hazard and adverse selection (Blanc-Brude, 2013).

Monitoring had an eigen value of 0.676. Monitoring is essential after a contract has been signed. The intent of monitoring is to make certain that the agent is acting in harmony with the contract. This in the long term decreases the problems of information asymmetry (Dewatripont and Legros, 2005).

Component 3 (Screening and technical assistance)

The factors of the third component were *Contract guarantees and technical assistance* and *Screening*. This extracted component accounted for 8.185% of the total variance. It was named 'screening and technical assistance' factors.

Contract guarantees and technical assistance had eigen value of 0.503. Overall, the responsibility of a modern development banks or current multilateral banks would involve steps at national and international stages, comprising from fiscal and risk mitigation features, including the terms of technical guidance (Blanc-Brude, 2013).

Screening had eigen value of 0.637 and refers to the term for all activities whereby the principal attempts to gain more accurate information on the quality attributes of the agent which are pertinent. These include: references, work probes, certificates, and credit worthiness (Dewatripont and Legros, 2005). The aim of screening is to gain useful

374 information to the principal in an attempt to be more conversant with the qualifications of the

375 agent (Blanc-Brude, 2013).

376 **Component 4 (Unbundling and benchmarking)**

377 Component four consists of the factors: *Benchmarking* and *Financial unbundling*. This

378 extracted component accounted for 7.604% of the total variance. It was named 'unbundling

379 and benchmarking' factors.

380 *Benchmarking* had eigen value of 0.754. Asymmetries of information on the operating costs

381 are reduced through benchmarking and market testing processes (yardstick competition).

382 Elementary parts of the service provided by the contractor must be periodically evaluated

383 against market prices (Bureau and Mougeot, 2007).

384 *Financial unbundling* had eigen value of 0.575. Financial unbundling is an effective way of

385 ensuring transparency in projects by inducing a disclosure of the contract financial main

386 points (Kumar *et al.,* 2018).

387 **Component 5 (Funding and small liabilities)**

388 The factors of the fifth component were *Funding competition* and *Contain private liabilities*

389 *to small size*. This extracted component accounted for 7.388 % of the total variance. It was

390 named 'funding and small liabilities' factors.

391 *Funding competition* had eigen value of 0.720. At the negotiation period, funding

392 competition helps to raise the public sector's information on the deal. However, the cost of

393 gathering this information should not override the savings it brings about. In this instance, the

394 size of the deal, and the number of bidders, has a crucial role in the trade-off (Singh *et al.,*

395 2006). This agrees with study conducted by Akintayo (2018) on minimizing risks in PPP

396 construction projects.

397   *Contain private liabilities to small size* had eigen value of 0.716. Private liabilities should be

398   contained to an adequately small size (Blanc-Brude, 2013). As well as requiring that the firm

399   not spend so much in the project, in spite of its assets, this necessitates that the firm not

400   depend on debt greatly, even if it has unrestricted access to the credit market. PPP projects

401   are to be effectively run and should not be extremely leveraged (Danau and Vinella, 2014).

402

403   **Component 6 (Information clarification and signaling)**

404   Component six consists of the factors: *Signaling* and *Clarifying the need for information in*

405   *the project*. It has been named 'Information clarification and signaling' factors. This extracted

406   component accounted for 7.263% of the total variance.

407   *Signaling* had eigen value of 0.464. The market party which has more information, e.g. the

408   contractor, signals its type to the client who is the least informed market stakeholder, using

409   some signals. In case of signaling, the initiative goes out from the better informed market

410   participants who send out their signals first and who only then get contracts offered by the

411   worse informed market party (Dewatripont and Legros, 2005).

412   *Clarifying the need for information in the project* had eigen value of 0.722. This agrees with a

413   study conducted by Ameyaw and Wilhelm (2017) where need for information was identified

414   as a risk mitigation strategy. The necessity for information which a project participant

415   requires to accomplish his tasks within a definite period of time is explained according to

416   quality, type and quantity (Ameyaw and Wilhelm, 2017).

417   **Component 7 (Risk and contract management)**

418   Component seven consists of the factors: *Managing of construction risks* and *Securing*

419   *contract enforcement*. It has been named 'Risk and contract management' factors. This

420   extracted component accounted for 7.211% of the total variance.

Managing of construction risks had eigen value of 0.721. In financing of projects, not excluding Public-Private-Partnerships, construction risks are controlled by way of a network of contracts (Blanc-Brude, 2008) and transferred to construction companies which efficiently make available insurance against unanticipated construction costs to the financiers and sponsors of the Special Purpose Entity (SPE).

Securing contract enforcement had eigen value of 0.681. To be able to induce the firm to fulfill the contract, there should be the requirement of investing a satisfactorily worthy quantity of money in advance, and it should be allowed to recuperate that investment by the passage of time at the execution stage (Blanc-Brude, 2013). To be brought on to partake in the partnerships, private firms should be wealthy to start with. This would discourage the speculative and probable unpredictable investors (Danau and Vinella, 2014).

Component 8 (Cooperation and finance)

The eighth and last component had the following factors: *Bond spread; External finance; Cooperation among project participants* and *Information disclosure*. It has been named 'Cooperation and finance' factors. This extracted component accounted for 6.917% of the total variance.

Bond spread had eigen value of 0.583. An inadequate risk transfer to the contractor is discovered by the reasonability of the bond spread. For instance, if the public partner takes on almost all the demand risk, it is expressed in financial expressions, like providing to the contractor an advance contract for free (Välilä, 2005).

External finance had eigen value of 0.600. Dewatripont and Legros (2005) distinguish two types of external financiers, outside shareholders and debt creditors. They consider that the financial structure of the contract is not without significance on the private partner incentives. Commercial finance literature reiterates that outside debt or equity might lower incentives to exert effort for the contractor (Jensen and Meckling, 1976).

446 *Cooperation among project participants* had eigen value of 0.755. In connection with moral

447 hazard, the frequency of the cooperation of the project participants is of major importance

448 (Owusu-Manu *et al.*, 2018a). If the contractual partners repeatedly cooperate with one

449 another, this leads to a reduction of information asymmetries. The mutual trust resulting from

450 long-term cooperation will cause a reduction of risk costs (Lobner, 2009).

451 *Information disclosure* had eigen value of 0.552. The agent delivers information to the client

452 using some special files for client's reference. The client will esteem the agent's reputation as

453 a significant evaluation index when he selects agent, which is because the project

454 implementation needs the agent's strength, experience, credibility, moral qualities among

455 others, and these all constitute private information of the agent (Gatti, 2013).

456

457 **CONCLUSIONS**

458 **Summary of findings**

459 From the mean score ranking, Monitoring; Transfer of risks; Screening; Managing of

460 construction risks; and Increased incentives to control costs were the most significant

461 strategies to reduce the problems of moral hazard and adverse selection in PPP construction

462 projects.

463 After the factor analysis using Principal Component Analysis, the eight components were:

464 Transparent process and contract; Incentives and monitoring; Screening and technical

465 assistance; Unbundling and benchmarking; Funding and small liabilities; Information

466 clarification and signalling; Risk and contract management; and Cooperation and finance

467 factors.

468 Empirically, the robust and rigorous identification of MHAS strategies in the current study

469 have useful theoretical, practical and wider implications. Overall, the study makes a unique

470 contribution to the MHAS and PPP body of knowledge through benchmarking the most

471 significant strategies that can be used to reduce PPP project failures arising from MHAS.

472 Theoretically, the research constitutes the first exclusive assessment of the generic,

473 significant strategies in Ghanaian PPP projects. From a theoretical lens, the output of the

474 research contributes to the checklist of strategies that reduce PPP project failures arising from

475 MHAS and may contribute to the development of the agency theory. Additionally, the

476 outcome of the research provides a sound basis for future research on MHAS in PPP projects

477 in any country. This is of relevance to academic, industry and PPP policy researchers.

478 Practically, the identified and prioritized strategies will serve as a guide and managerial

479 support in future PPP projects. Although no case studies were used to validate the findings,

480 the outcome draws on wealth of experiences and lessons and thus, may reflect the realities of

481 PPP project failures. As such, the findings of the research may guide construction

482 stakeholders in reducing failure of PPP projects due to MHAS. These stakeholders and

483 practitioners may improve project success by recognizing and planning against failure of

484 these PPP projects.

485 A limitation in this study is the fact that the research applies mainly to the Ghanaian and

486 makes the generalisation limited to the study environment due to the peculiar nature of PPP

487 projects in different jurisdictions.

488 Since the current findings have not been validated, future studies should adopt interviews and

489 desk reviews to help in triangulation and validation of the strategies of MHAS. This will also

490 expand the relevance of the findings to other national and industry settings.

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