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Incentive mechanisms for managing local subcontractors in international construction projects

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A B S T R A C T

In the domain of international construction projects, managing supply chains presents distinct challenges due to the intricate task of coordinating multiple stakeholders within diverse cultural, economic, and regulatory contexts. Prior research highlights the significance of incentive mechanisms and collaborative procurement practices, yet the effectiveness of these strategies in augmenting performance for international projects has not been extensively examined. This investigation explores the effects of financial and non-financial incentives on the performance of global construction projects, with a focus on the mediating role of cooperation. Data were gathered from Chinese international contractors and local suppliers and subsequently analyzed using Structural Equation Modeling. The results reveal two separate pathways of influence. Firstly, financial incentives exhibited substantial direct and indirect impacts on project performance; secondly, while non-financial incentives did not directly affect project performance, they significantly impacted cooperation levels, which in turn mediated the relationship between non-financial incentives and project performance. This study provides essential perspectives for managing international construction projects, emphasizing the critical need for the combined application of financial and non-financial incentives to foster cooperation and ultimately achieve superior project outcomes.

1. Introduction

In today's globalized economy, the demand for infrastructure development has opened up a world of possibilities for international contractors and has presented an unprecedented opportunity to expand their reach and tap into international markets. In recent years, Chinese international contractors have experienced significant growth . However, international construction projects are inherently complex and uncertain compared to domestic projects (Li et al., 2020; Q. Wang & Wang, 2022). The success of international construction projects depends significantly on the collaboration with local suppliers and subcontractors, who function as vital in-house resources for main contractors. They not only help reduce project risks but also offer essential local expertise to navigate complex challenges, such as market instability and cultural differences (Bemelmans et al., 2012; Nair et al., 2017). Therefore, it is vital that international contractors recognize the critical role of local suppliers and subcontractors and work closely with them to ensure project success, and gaining a thorough understanding of current incentive practices and their effectiveness in promoting collaborative behavior among international contractors and suppliers remains a significant challenge.

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The existing literature reveals several research gaps in the realm of incentive mechanisms and their impact on project performance in international construction projects. First, while some studies have examined the influence of incentive mechanisms, there is limited empirical evidence on how financial and non-financial incentives collectively affect project performance within an integrated framework. Furthermore, few studies have explored the impact of different procurement procedures on cooperation, particularly in supply chain management (Eshtehardian et al., 2013; Nair et al., 2017) Due to the intricate nature of these projects, applying uniform principles may not yield consistent results. Second, the findings related to the effectiveness of financial incentives remain inconclusive, indicating a lack of consensus on their benefits compared to other motivational drivers (Cox et al., 2006; Monteiro de Castro et al., 2016). Lastly, research on the applicability of various procurement practices for managing relationships with local suppliers in such markets is scarce, despite the significant presence of international contractors in complex project environments. Although previous studies have shown that financial incentives can potentially motivate individuals and organizations, leading to improved project performance, the existing research on incentive mechanisms is limited in scope. This study seeks to address these gaps by empirically examining the effects of both financial and non-financial incentives on managing subcontractors and suppliers in international construction projects. The central research question posed by this study is: 'To what extent are financial and non-financial incentives effective in promoting cooperation between international contractors and local subcontractors, ultimately resulting in better performance outcomes?' By investigating the mechanisms underlying various procurement procedures, this research aims to offer a deeper understanding of how to establish and maintain cooperative relationships, as well as how to enhance project performance.

2. Theoretical Analysis and hypothetical developments

2.1 Theoritical Base

The construction industry has increasingly recognized the importance of incentives as collaborative procurement methods have become more prevalent. Incentives can help overcome uncertainties related to project and performance management(Tang et al., 2008), sharing similarities with collaborative practices like partnering, alliances, and joint ventures, which all offer rewards for bearing risks (Hosseinian & Carmichael, 2012; Love et al., 2011) .Although the definition of incentives is sometimes mixed up with other practices, such as partnering, contractual incentive mechanisms are mostly associated with performance outcomes. These mechanisms are also known as performance-based contracts, although not all incentives are contractual in nature (Ogwueleka, 2013). Incentive mechanisms are based on agreements between parties to collaborate, share mutual benefits, and fairly allocate risks, operating at both employee and firm levels (Hughes et al., 2007). Offering intangible incentives can facilitate relational arrangements and restrict opportunistic behaviours (Zhang & Xi, 2023) leading to better outcomes(Bower et al., 2002).

The expectancy theory posits that, in addition to subjective perception, there are two factors that affect motivation: beliefs regarding the expected outcomes of efforts and instrumentality, which is defined as the perception that the result will be rewarded appropriately. The violation of one of these factors can directly affect motivation (Bresnen & Marshall, 2000). The goal-setting theory is an important element in understanding the concept of incentivization and suggests that goals must be clear, significant, and achievable. In addition, research on knowledge management has highlighted the social aspect of motivation. Javernick-Will and Amy (2012) conducted a study on employee motivation within a construction organization to understand why employees are willing to share their knowledge (Javernick-will & Asce, 2012). The study found that social motivations, such as reciprocity, congruence with corporate culture, and recognition, were the most significant drivers for information sharing. Other research has also shown the importance of financial incentives in changing individuals' or companies' attitudes and motivation, which can ultimately lead to improved performance (Cox et al., 2006). However, the perception of the fairness of incentive mechanisms can also vary depending on the context in which they are applied. Some studies have included different practices within construction chains for various purposes beyond simply motivating individuals or firms(Walker & Lloyd-walker, 2016). On the other hand, other researchers have investigated incentive mechanisms from a relational perspective as a tool to facilitate the relationships between stakeholders and to allocate risks in a way that emphasizes performance in terms of the value of money (Rose et al., 2012; Rose & Manley, 2005). Perception of fairness is determined by distributive perception (the belief that resources have been fairly distributed) and procedural justice (the sense of fairness regarding the procedures and criteria applied in distributing outcomes). To fully understand how incentives impact project performance, it is crucial to categorize them into financial and non-financial incentives and examine their effects on motivation. Therefore, categorizing incentives into financial and non-financial incentives is necessary to fully understand the mechanisms by which they affect the viability of project performance.

2.2. Financial incentives, non-financial incentives, and project performance

Financial incentives, also referred to as monetary incentives, are defined as a system that motivates individuals or organizations to work more efficiently by providing tangible means (Broome & Perry, 2002). Several studies have suggested that financial incentives are effective in contractual arrangements, such as risk allocation methods, particularly in promoting collaboration and relational contracts between clients and contractors or contractors and subcontractors

(Boukendour & Hughes, 2014; Chan et al., 2008). These arrangements can take various forms, such as profit-sharing methods, in which the project parties agree on a target project cost, and the cost savings from the target amount are divided among the project stakeholders in a predetermined ratio(Hu et al., 2012; Lapinski et al., 2017). Target cost is not only a procurement method but also a form of incentive mechanism that motivates suppliers and subcontractors to achieve better cost performance. This method directly links monetary incentive arrangements to project outcomes, aiming to reduce overall costs and improve performance. Compared to traditional payment methods such as fixed price and cost-plus-fee, target cost can provide greater motivation for cost savings and performance improvements (Rose & Manley, 2005). Non-financial incentives can take many forms, such as providing opportunities for professional development and career advancement, recognition and praise, flexible work arrangements, a positive work environment, and opportunities for employee involvement and participation in decision-making processes. As it is common to observe instances of engaging in opportunistic behaviors in construction industry(Han & Yin, 2022).These incentives can be particularly effective tackling these behaviours and enhancing job satisfaction, increasing employee engagement, and promoting long-term loyalty and commitment to the organization (Fagbenle et al., 2004). Moreover, based on a cross-cultural study among construction workers from seven Asian countries, the impact of cultural differences on motivational drives have been tested empirically (Kim et al., 2015).

The time-based incentive is the most common type, as a day's production in such an industry costs millions of dollars. The owners thus prefer to pay an incentive to avoid any delay and consequently save much money; the most crucial factor in this type is the calculation of the accurate expected project duration in which the percentage of the incentive or punishment will be set (Monteiro de Castro et al., 2016; Ogwueleka & Udoudoh, 2017). The monetary incentives schemes are often flexible and aligned with multi objectives. The plan can also cover other technical measures such as quality and safety, the buyer will provide extra profit if the target level of performance is achieved (Rose et al., 2012; Tang et al., 2008). Relational contracting revolves around the acknowledgment of shared advantages and mutually beneficial outcomes, and using relational contracts in public construction projects have notably improved quality performance and client satisfaction; however, they have not demonstrated the same success in terms of budget and schedule performance(Ling et al., 2006, 2014). The effects of different types of contracts, including the influence of financial incentives on project performance have been examined, and the researchers concluded that the performance improvements in different performance areas include quality performance (Suprapto et al., 2016). In addition, safety incentives are also essential in heavy and highly specialized projects. For instance, through the Shanghai Expo megaproject, the safety incentive is validated as an effective safety improvement technique (Hu et al., 2012). Building on these studies, we hypothesized:

Hypothesis 1 (H1). *Financial incentives have positive direct effects on project performance*.

The first factor of this type of intangible reward is recognition; it is proved to be valuable in generating long-lasting positive influences, which are sometimes difficult to achieve by using tangible methods. That can be traced back to the psychological theory of motivation. Some studies investigated the power of social approval to be as effective as monetary rewards in changing behaviors in many circumstances (Fehr & Falk, 2002). The values are the main driver of people's behaviors and act as a reference to the objectives, people or organizations' commitment will be fostered because of the parties' satisfaction (Cox et al., 2006). This viewpoint is based on cognitive theory, which states that in relying on only financial rewards, the intrinsic motivation will be crowded out, which sometimes can lead to addiction behavior for seeking monetary rewards. Although most of the studies have only considered the economic part of incentives, we cannot deny the effects of other aspects of incentives, whether they are relational issues such as opportunities for future work or legal matters related to contract design and flexibility. Non-financial schemes can be applied as contractual arrangements, such as special clauses in the contract for automatic continuation of the contract and price adjustment possibilities due to market fluctuations. Moreover, it can also be noncontractual, such as certification of completion or guarantee, letter of appreciation, frequency of payments, and promise for more opportunities in future projects (Hughes et al., 2007). Based on that, we hypothesized:

Hypothesis 2 (H2). *Non-financial incentives have positive direct effects on project performance.*

2.3. The mediating role of cooperation

Cooperation can be defined as the coordinated actions of individuals or organizations to achieve shared goals. It can be divided into three dimensions: openly sharing information, problem-solving, and flexibility between parties (S. Zhang et al., 2016). When information is exchanged clearly between contractors and subcontractors, the contractor is able to assess the capabilities of the subcontractor and/or suppliers, which can lead to the development of trust and cooperative relationships among them (Errasti et al., 2007; Ng et al., 2002). Shared problem-solving allows the parties to deal with responsibility and problems jointly, which helps to maintain a better relationship. Flexibility indicates that the parties are willing to adjust their behavior to meet the needs of each other (Pearce, 2001).

In construction practices, the contractor is usually given the freedom to nominate the subcontractors and suppliers. Consequently, the subcontractors are largely excluded from potential collaborative agreements between the client and the main contractor, particularly in international construction projects. Moreover, main contractors often show little interest in passing down these collaborative relationships to the subcontractors, opting instead to take advantage of the

competitive market and open biddings. This approach often leads to an opportunistic and potentially adversarial relationship between the main contractor and subcontractors (Ulubeyli et al., 2010). Cooperation is key to improving project delivery efficiency by fostering flexibility, facilitating joint problem resolution, and most importantly, reducing adversarial behavior(Ling et al., 2006; Zhang et al., 2016). A cooperative working climate, based on positive behaviors, is crucial during project interactions and proves to be a viable way to overcome potential confrontations that standard contract clauses may fail to address (Luo, 2002). When project participants engage in effective communication, it can improve their perception of fairness and contribute to the successful completion of projects(Muneer et al., 2022).

The expected benefits influence cooperation between the parties; people can then behave positively to keep track of their mutual advantages and achieve the predetermined rewards. In addition, investigations revealed that one's expectancy drives cooperative behaviors and that the other parties will respond in a similar way. In other words, individuals and groups in the process of achieving incentives' goals are willing to put their maximum effort into considering each other's needs throughout the project lifecycle (Eriksson & Laan, 2007; Eriksson & Westerberg, 2011).

A study by Aibinu et al. (2011) addressed collaborative relationships from an economic perspective, and the study argued that individuals adopt these behaviors of seeking financial rewards. The view has been supported by empirical research, which identified the impact of compensation schemes on contractor cooperative attitudes in China. However, another study on partnering metaphors implies that collaborative arrangements could be a way of contracting the relationships to shift the risk to the supply side(Alderman & Ivory, 2007). Furthermore, it has been revealed in a documented case that even when financial incentives such as profit-sharing schemes exist, the firm on the supply side will be forced to increase the savings in the second project after the company met the benchmark of the previous project.

Hypothesis 3(H3). *Cooperation mediates the relationship between financial incentives and project performance.*

The assumption that motivation is based on the feeling of financial need seems to neglect other drivers, wishes, and desires. The individual's need is just the first step in the process that the action should follow to accomplish that need, and finally, the sense of achievement and other nonmonetary procurement procedures and organizational elements should be considered (Ng et al., 2002). That implies the importance of adding other relational, legal, and psychological dimensions to the economic incentives. Therefore, non-financial incentives can drive motivations in different ways that monetary incentives could probably fail to achieve. For instance, the long-term relationship has the advantage of easily standardizing the cost by benchmarking the process from project to project, and consequently effective in fetching cooperation among parties and achieving a good working environment (Alderman & Ivory, 2007). Therefore, using procedures such as soft parameters in the selection of subcontractors, flexible contract clauses (such as the extension of contract duration, frequency of payment, and price adjustments), and promises for future work opportunities can offer great incentives to those companies to establish a cooperative working environment. Collaborative methods can even be a more effective motivational driver than cost-saving incentives. In addition, other researchers believed that the value-driven selection criteria of subcontractors and/or suppliers that value the characteristics of the subcontractors rather than simply applying low-price criteria is essential in motivating toward a more collaborative project environment to improve the overall project outcomes (Dainty et al., 2001; Wardani et al., 2006). Financial and nonfinancial incentives may increase the tendency of suppliers and /or subcontractors to share information openly, share problems and responsibilities with the buyer, and behave flexibly to accommodate the project requirements. This consequently results in better risk management and increases the project viability. The conceptual framework as shown in Fig.1 highlights these paths.

Based on that, we hypothesized,

Hypothesis 4 (H4). *Cooperation mediates the relationship between non-financial incentives and project performance.*

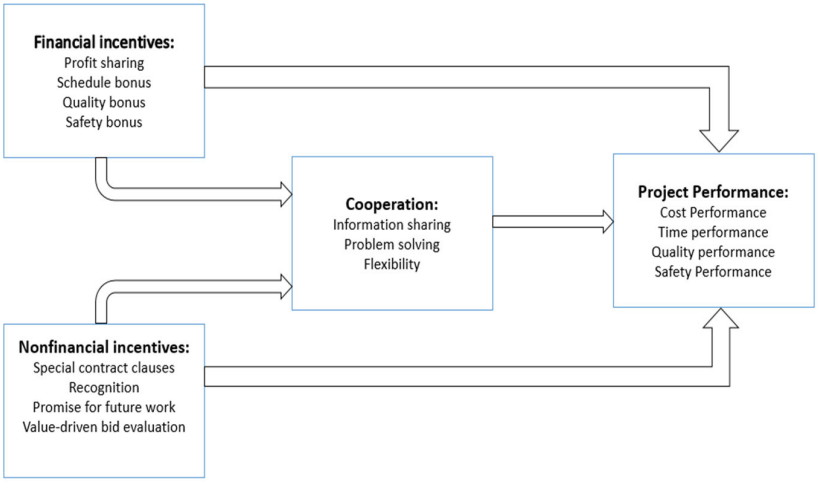


Fig. 1. Conceptual research model

3. Research Methods and Results

3.1. Research Design

The study explores whether and how financial and non-financial incentives influence the project performance of international construction projects by evaluating the importance of cooperation as a mediating variable. It involves variables that cannot be observed directly. Therefore, structural equation modeling (SEM) was chosen as a sophisticated data analysis approach to measure and test the relationships between the observed and the latent variables that cannot be measured without being represented by other observed variables. By using SEM, the relationships among these endogenous and exogenous latent variables can be identified. Endogenous latent variables are dependent factors that can be influenced by either similar endogenous or exogenous, while exogenous variables are independent variables. Even when a considerable abstraction does exist, SEM can overcome the limitations of ANOVA and multi-regression tests; the first step is to test the extent to which the observed variables measure the latent variable that is intended to measure by using the confirmatory factor analysis. The aim of conducting confirmatory factor analysis is to assess the validity of the first components model and whether the goodness among the correlated latent variables to prove the logical perception, which does not necessarily mean causation before these correlations have been replaced with the hypothesized relationships of the theoretically built model. To start with validity, four different validity parameters have been tested. Face validity indicates to what extent every construct is understandable. The construct validity indicates how the underlying factor is well-reflected by the indicators, and mathematically estimated by calculating the sum of factor loadings for every individual observe variable and the sum of their errors and recommended to be between more than 0.6, and item validity indicates the degree to which the variance in an item representing the underlying variable which can be obtained from calculating the square of factor loadings and should be greater than 0.5. Therefore, SEM is considered superior to multiple regression and other multivariate analysis methods for its ability to examine the different interrelated relationships and consider measurement errors when explaining many relationships within the model.

3.1.2. The structure of the questionnaire

The research applied a cross-sectional approach to assessing the current application of incentive mechanisms in international projects. The research used a sample of Chinese contractors in Africa. Although the continent is very diverse and heterogeneous in terms of the social and economic situation, the countries share similar political institutions born of colonialism, and cultural dimensions characterized by a collectivist nature (Muriithi & Crawford, 2003). The questionnaire survey designed in this study was divided into two main parts. The first part was to identify the general demographic information of the respondents as well as the project types and locations. The second part contained three sections. The first section aimed to assess and evaluate the incentive mechanisms practices; in this section, sets of questions were developed, with the first set measuring the frequency of usage of financial and non-financial incentives. The second section tested the collaborative climate by three latent variables, including information sharing, problem resolution, and flexibility. Each of the three latent variables was measured using at least three observed variables, and the respondents were asked to rate their level of agreement with the list of statements. In the last section, the four main performance outcomes, i.e., cost performance, time performance, quality performance, and safety performance, are also measured by three observed variables for each. The latent and observed variables for collaborative climate and performance were summarized in (Table 1).

Table 1

Latent and observed variables

Latent variables	Indicators	Abbreviations	References
Financial incentives (FI)	-Profit sharing	FI1	(Meng & Gallagher, 2012)
	-Schedule bonus	FI2	
	-Quality bonus	FI3	
	-Safety bonus	FI4	
Non-Financial incentives (NI)	-Offering equitable contract clauses	NI1	(Hughes et al., 2007)
	Recognition	NI2	(Fagbenle et al., 2004)
	-Promise for future work	NI3	(Rose & Manley, 2011)
	-Value-driven selection criteria	NI4	(Eriksson & Westerberg, 2011)
Information sharing (IS)	-The information is exchanged smoothly and openly	IS1	(Pearce, 2001)
	-The companies keep one another informed of changes	IS2	
	-The willingness to share knowledge to facilitate the project activities	IS3	

Latent variables	Indicators	Abbreviations	References
Problem-solving (PS)	-There are shared responsibilities in dealing with project challenges	PS1	(Pearce, 2001)
	-The disputes are being solved jointly based on the predetermined problem resolution mechanisms.	PS2	
	-When disputes happen, the companies behave cooperatively to avoid claims.	PS3	
Flexibility (FL)	-There are mutual adjustment mechanisms when unexpected circumstances occur	FL1	(Pearce, 2001)
	-The companies can accept to modify some contract's terms	FL2	
	-Companies share friendly attitudes in contingencies rather than applying defensive strategies.	FL3	
Cost performance (CP)	-Good Cash flow	CP1	(Meng & Gallagher, 2012; S. Wang et al., 2013)
	-The Overhead is well controlled.	CP2	
	-Within the budget	CP3	
Time performance (TP)	-The activities were completed on time	TP1	(Meng & Gallagher, 2012; S. Wang et al., 2013)
	-Few claims for time extension	TP2	
	-Adequate schedule control	TP3	
Quality performance (QP)	-The Project defects are reduced	QP1	(Meng & Gallagher, 2012; S. Wang et al., 2013)
	-Acceptable quality of material	QP2	
	-Satisfactory general quality	QP3	
Safety performance (SP)	-High responses to accidents	SP1	(Meng & Gallagher, 2012; S. Wang et al., 2013)
	-The number of accidents is minimized.	SP2	
	-Efficient safety control procedures	SP3	

3.1.2. Measures

For financial and non-financial incentives, a scale ranging from 1 to 5 was adopted to measure the frequency of usage of each type of incentive. For non-financial incentives, we adopted four different items reported in the previous literature after being discussed with practitioners in international construction projects (Eriksson & Westerberg, 2011; Fagbenle et al., 2004; Hughes et al., 2007). The statistical results show that the scale has good reliability and validity. We followed four forms of financial incentives: Cost, time, quality, and Safety (e, g., usage frequency of the incentive: schedule bonus for early completion).

Cooperation was operationalized as a higher-order construct consisting of 3 first-order reflective constructs, i.e., information sharing, problem-solving, and flexibility. The respondents were asked to rate their level of agreement with the statement from 1 (strongly disagree) to 5 (strongly agree). An example of items for information sharing is 'the information exchanges between parties occur frequently and openly. An example of items for problem-solving is 'problems that arise are treated jointly between the parties rather than individually. An example of items for flexibility is 'the companies are open to modifying their agreement if unexpected events occur.'

Project performance was operationalized as a higher-order construct consisting of 4 first-order reflective constructs: cost performance, time performance, quality performance, and safety performance. Each dimension was measured with three items adopted from (Meng & Gallagher, 2012; S. Wang et al., 2013). The participants rated their level of agreement from 1 (strongly disagree) to 5 (strongly agree). An example item for cost performance was 'the project is completed within the budget'; an example item for time performance was 'schedule change control'; an example item for quality performance was 'the project has good quality control'; and that for safety performance was 'responding to incidents.

3.1.3. Participants and procedures

The Chinese contractors have expanded their business across Africa. The data was collected considering the countries with more active international contractors. Construction professionals from Chinese international contractors and African subcontractors and/or suppliers who have been involved in delivering construction projects in Africa were invited to participate in the survey.

Before starting the data collection, a pilot study was carried out among five practitioners with varied experience in international construction projects to validate and assess the translation of the contents. In the formal questionnaire survey, 400 questionnaires were mailed out to target professionals from more than 16 Chinese international contractors and subcontractors operating in 12 different African countries. In addition, 199 were retained, yielding a response rate of 45.75 %, from which 179 respondents were considered valid after removing the missing data and outliers. Table 2 shows the characteristics of the valid respondents.

Table 2
Profile of respondents

Characteristics	Category	Percentage
Gender	Male	79.70%
	Female	21.30%
Company Type	Main contractor	47.50%
	Suppliers	52.50%
Experience overseas	0-5 years	56.30%
	6-15 years	33.40%
	More than 15	10.30%
Age	25-30	38.30%
	31-35	29.50%
	36-40	15.80%
	41-45	7.60%
	46-50	5.50%
	51or above	3.30%

3.2. Confirmatory factor analysis

The research hypotheses were measured by using the SEM technique. Amos 21 software was used, and confirmatory factor analysis (CFA) was applied at the first step to explain the satisfactory measurement of the constructs before using the path analysis of SEM to assess the causal effects of the structural model. Confirmatory Factor Analysis was conducted to test whether the hypothesized model can produce sample data using the latent factors and their observed variables. The model fit was tested against the hypothesized model, and the standardized regression weight of each indicator was obtained using the first order as shown in Fig. 2, and the second second-order in Fig. 3 was also performed for further confirmation.

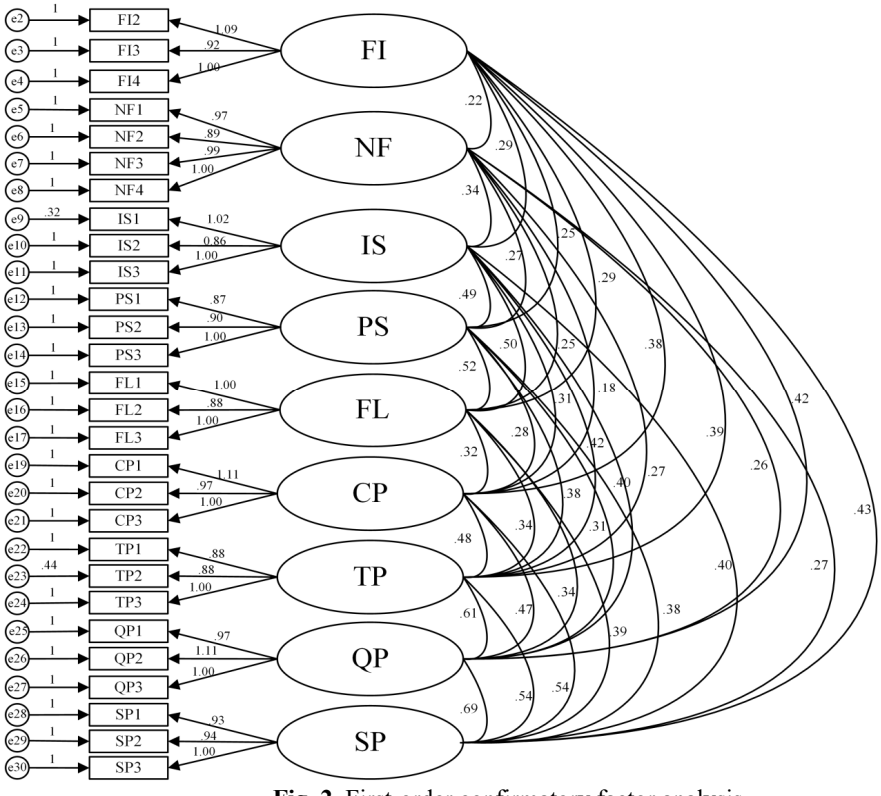


Fig. 2. First-order confirmatory factor analysis

The second-order CFA has performed for 1) Cooperation, which was measured using three latent variables (i.e., information sharing, problem-solving, and flexibility), and 2) performance, which was measured using four latent variables (i.e., cost performance, time performance, quality performance, and safety performance). The results of the second-order (seen in Fig. 3) approach help to validate the multidimensional construct loadings of first-order factors on hypothesized second-order factors (Konanahalli & Oyedele, 2016).

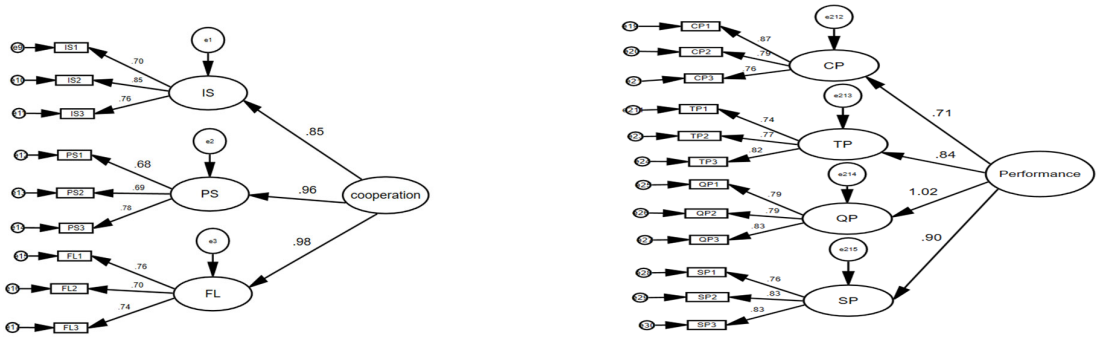


Fig. 3. Second-order confirmatory factor analysis for cooperation and performance

Cronbach's alpha coefficients were consistently above 0.7, showing good internal consistency (as seen in Table 3). Except for item FI1 (profit sharing) of which the factor loading was lower than 0.5 (Xiong et al., 2015), all the other observed variables had a factor loading higher than 0.6. FI1 was thus excluded in the following SEM analysis.

Table 3
Estimation of the Measurement Model for CFA

Latent variable	Item	Standard Loading	P	Cronbach's alpha	CR	AVE
FI	FI2	0.836	_	0.824	0.825	0.611
	FI3	0.719	***			
	FI4	0.786	***			
NF	NF1	0.638	***	0.755	0.749	0.427
	NF2	0.657	***			
	NF3	0.681	***			
	NF4	0.638	_			
IS	IS1	0.716	***	0.817	0.817	0.601
	IS2	0.820	_			
	IS3	0.783	**			
PS	PS1	0.669	***	0.764	0.756	0.509
	PS2	0.689	***			
	PS3	0.781	_			
FL	FL1	0.763	***	0.780	0.756	0.508
	FL2	0.700	***			
	FL3	0.734	_			
CP	CP1	0.869	_	0.846	0.850	0.654
	CP2	0.780	***			
	CP3	0.773	***			
TP	TP1	0.744	***	0.820	0.822	0.607
	TP2	0.756	***			
	TP3	0.834	_			
QP	QP1	0.797	***	0.843	0.824	0.61
	QP2	0.798	_			
	QP3	0.817	***			
SP	SP1	0.759	***	0.847	0.842	0.641
	SP2	0.829	***			
	SP3	0.812	_			

Table 4
Goodness-of-Fit Criteria and indices

Parameters	Recommended values	First-order	Second-order Cooperation	Second-order Performance	Reference
DOF		314	24	50	(Chou Chih-Ping, 1990)
(chi-square/DOF)	>5	1.419	1.565	1.877	
GFI	0 to 1	0.855	0.959	0.922	(Patel & Jha, 2016)
AGFI	>0.80	0.812	0.923	0.878	
RMSEA	<0.08	0.048	0.056	0.069	
CFI	>0.90	0.951	0.982	0.969	
NFI	>0.90	0.856	0.951	0.932	(Chou Chih-Ping, 1990)
TLI	>0.90	0.941	0.972	0.956	
IFI	>0.90	0.952	0.982	0.967	(Hair, J., Anderson, R., Babin, B. J., and Black, 2014)
PNFI	>0.50	0.711	0.634	0.706	
PGFI	>0.50	0.661	0.521	0.591	

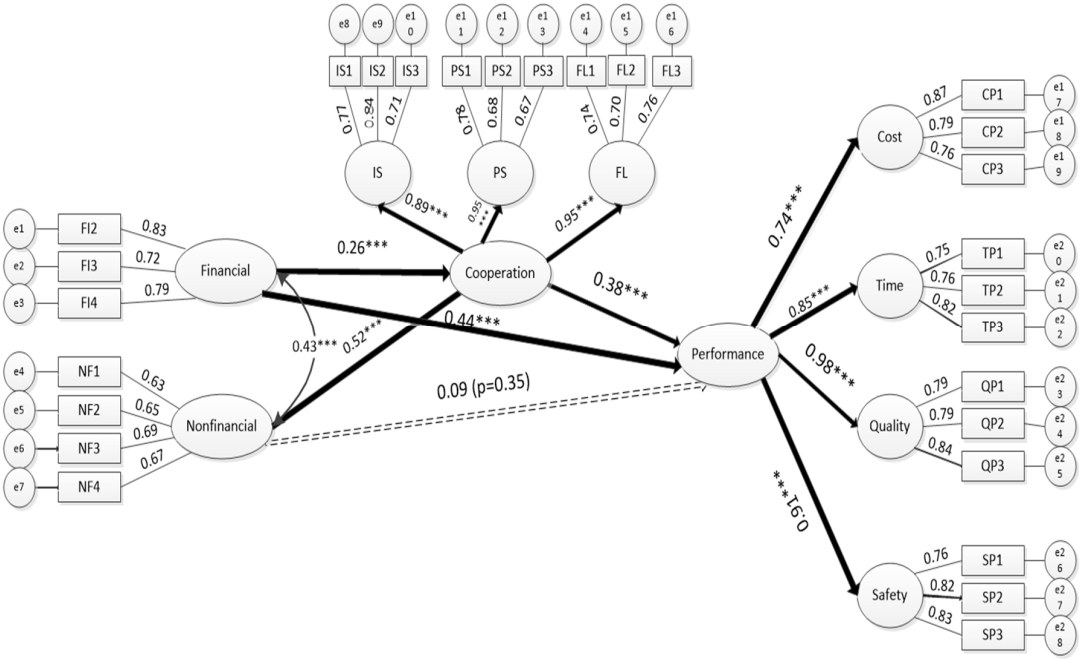
The average variance extracted (AVE) and constructed reliability (CR) were calculated using the squared multiple coefficients (R^2) AVE value was higher than 0.5, and CR value was higher than 0.7. These indicated that the model had good convergent and discriminant validity of the model (Fornel & Larker, 1981). As shown in Table 3, the composite reliability of all latent variables was above 0.7, and all the average variances extracted (AVE) were above 0.5 except for non-financial incentives, which is close to the permissible value.

The first-order and second-order models resulted in an excellent fit (seen in Table 4). The common indices used in the baseline comparisons are the Tucker-Lewis index (TLI), incremental fit index (IFI), and comparative fit index (CFI). According to the criteria adopted by (Molenaar.K, Washington.S, 2000) and (Chou Chih-Ping, 1990). The measurement model consisting of 35 indicators and 11 latent variables showed good support for the hypothesized model. The measurement model with 28 indicators and 9 constructs resulted in a good overall model fit.

3.3. Path analysis

After the confirmatory factor analysis, the hypothesized relationships were tested to obtain the connections between the latent variables that were originally obtained from a theoretical base. Thus, the relationships between financial incentives, non-financial incentives, cooperation, and project performance were drawn to test the model. The Goodness of Fit indices were assessed using incremental fit indices (TLI=0.936) (CFI=0.943) (NFI=0.841), parsimony fit indices (IFI=0.944), (PNFI=0.717), (PGFI=0.701), and absolute fit indices (GFI=0.844) (AGFI=0.813) (RMSEA=0.050) were used to assess the overall model fit. The model also confirmed the $\chi 2$ (Chi-square), which is defined as the absolute discrepancy between the implied variance matrix and the matrix of tested sample variances. In other words, to assess the significance of the difference in the implied variances to the matrix of empirical variances, the value of $\alpha = 0.05$ is used to check the null hypothesis that there is no significant difference between the implied and empirical matrixes.

The final SEM model shown in Figure 4 supports the effect of financial incentives on project performance (H1), the indirect effect of financial incentives on project performance through cooperation (H3), and the indirect effect of non-financial incentives on project performance through cooperation (H4). The three hypotheses were accepted, considering that the coefficients were significant at the $p < 0.05$ level. However, the effect of non-financial incentives on project performance (H2) showed insignificant effects(P=0.35). Thus, the hypothesis was rejected.



Notes: Solid line indicates a significant path (hypothesis supported)
A dashed line indicates an insignificant path (hypothesis not supported)

Fig. 4. Derived structural equation model

The Bootstrap estimation method was applied to test the significance of indirect effects of financial and non-financial incentives on project performance through the mediator effect of cooperation (seen in Table 5). A sample of 150 was chosen with 95 % confidence intervals. The indirect effects were then assessed based on the lower and upper bounds. According to Mackinnon and Fritz (2010) (MacKinnon et al., 2007), the indirect effects of both financial and non-financial incentives on project performance exist as zero was not between the values of lower and upper bounds. Therefore, in this case, the mediating effects of cooperation on the impact of non-financial and financial incentives on the project performance were verified.

Table 5
Indirect effects of the model

Indirect effect paths	Estimated effect	95% CI		P	Evaluation
		Lower bounds	Upper bounds		
Non-financial incentives-cooperation - project performance	0.20	0.084	0.397	0.001	Supported
Financial incentives-cooperation-project performance	0.12	0.26	0.214	0.006	Supported

4. Discussion

In this research, we hypothesized that financial and non-financial incentive mechanisms can have direct effects on four project performance areas: Cost, time, quality, and safety, and influence these performance indicators indirectly through enhancing cooperative behaviors in which information sharing, problem-solving, and flexibility attitudes are well fostered.

The research model investigates the existing links among the variables and the results revealed two main paths. Firstly, the results confirm the effect of financial incentives on project performance at $\beta = 0.439$ ($p < 0.001$), which indicates that the project performance in terms of cost, time, quality, and safety will improve because of offering financial rewards that link to those performance areas (Bubshait, 2003). This finding clarifies the inconsistency in previous results regarding the impact of financial incentives on project performance. While some studies predict that positive project performance can be achieved through financial rewards, Suprapto et al. (2016) (Suprapto et al., 2016)empirical results showed that monetary incentives lead to an insignificant effect.

The financial incentives provide a fair risk allocation among parties by linking the project objectives with financial rewards; consequently, the participants will be highly motivated to achieve better results (Tang et al., 2008).The importance of financial incentives in international construction projects stems from the uncertainties and complexity of these projects, which implies the participants' tendency towards profits and direct financial means, especially in developing countries.

Schedule bonus for early completion is the most frequently used type of financial incentive (standard coefficient=0.832, $p< 0.001$), revealing the importance of early completion in such projects and the need to motivate local companies to deliver as early as possible. The second financial incentive is Safety bonus (standard coefficient=0.788, $p< 0.001$). The study proved the causal relationship between financial incentives and project performance with practical evidence. Thus, a monetary incentive plan should be offered to subcontractors for better performance internationally.

By comparison, non-financial incentives show an insignificant direct effect on project performance, indicating that the non-financial incentives have no direct contribution to the final project outcomes. Some previous findings showed that nonfinancial incentives can result in better project productivity (Fagbenle et al., 2004)(Moser, 2008). However, unlike this study, those previous studies did not assume any mediation variable.

Although there is no direct relationship between non-financial incentives and project performance, non-financial incentives have a significant indirect impact on project performance through cooperation. In the measurement model, the nonfinancial incentives are measured by special contract clauses (standardized coefficient = 0.634, $p< 0.001$), Recognition awards (standardized coefficient = 0.653, $p< 0.001$), Promise for future work (standardized coefficient = 0.68, $p< 0.001$), and value-driven selection (standardized coefficient = 0.668, $p< 0.001$). Promise for future work and value-driven selection are the most important variables. Companies consider future work opportunities as an effective motivational driver (Bresnen & Marshall, 2000). In addition, the results confirmed previous findings that subcontracting based on soft parameters such as experience and ability rather than lower cost criteria will transform attitudes toward more collaborative relationships (Eshtehardian et al., 2013). In the construction delivery process, the interactions between the contractor and subcontractors are crucial in maintaining positive output through enhancing information sharing, problem-solving, and flexibility. Non-financial incentives can influence these cooperative behaviors significantly, $\beta = 0.521$ ($p < 0.001$) compared to the effect of financial incentives (Standardized coefficient=0.261, $p<0.001$). According to Pearce (2001), the behaviors change when people are motivated enough to voluntarily act to the changes and adjustments during the project lifecycle, cooperation behaviors arise when people perceive the procurement approach as fair, consequently, people and organizations will act cooperatively to fulfill their mutual benefits.

The findings of this study revealed that although the profit of an organization is essential, companies might consider future work opportunities, payment practices, and fair contract conditions to be more attractive in stimulating better relationships between the parties. Therefore, the subcontractors' motivation toward collaboration is more likely to be enhanced by offering nontangible rewards to the incentive package.

The cooperation is constructed by Information sharing (standardized coefficient = 0.877, $p< 0.001$), problem solving (standardized coefficient = 0.91, $p< 0.001$), and flexibility (standardized coefficient = 0.88, $p< 0.001$). Problem-solving and flexibility have high standardized coefficients and are thus more important in building strong cooperation. That reflects how crucial it is to share flexible behaviors when contingencies arise during the project by accepting adjustments

and modifications, in addition to the ability to solve problems cooperatively and avoid claims. These findings are supported by (S. Zhang et al., 2016) who identified the impact of flexibility and problem-solving in constructing a cooperative that has a mediation role and a direct influence on project performance. This effect of cooperation in producing better project outcomes is confirmed and validated in an international context. Previously, it has been proved that the quality of the relationships between the main contractor and subcontractors is positively correlated with cost performance and exceeding to improve time and quality performance (Kale & Arditi, 2001).

5. Managerial insights and Practical implications

This study contributes to both theory and practice by exploring the under-researched area of managing subcontractors in international projects. Specifically, this study investigates the role of incentive mechanisms in enhancing the performance of international projects, making it a pioneering research effort in this area. The study analyzes different types of financial and non-financial incentives and concludes that financial incentives are not substitutes for other intangible aspects of procurement, such as bid evaluation and relational incentives.

Furthermore, the study highlights the impact of other relational and psychological motivational drivers that financial incentives may fail to address. While financial incentives are important to achieve better outcomes in terms of cost, time, quality, and safety performance, non-financial incentives are found to be more effective in fostering better cooperative relationships between contractors and subcontractors. This research proposes a mediation model in which cooperation mediates the impacts of incentives on project performance. The findings support the existing concept that collaborative procurements, such as incentives, are likely to produce better project outcomes. Additionally, the analysis of cooperation suggests that all relationship behaviors are significantly crucial in generating better results.

From a managerial perspective, selecting competent and experienced subcontractors is crucial. This implies that local organizations play an essential role in such projects. International contractors should aim to motivate subcontractors through selection criteria, contract clauses, recognition, and promise of future work opportunities. These actions not only minimize or prevail over adversarial relationships but also produce a cooperative working environment that is needed to meet project objectives successfully.

6. Conclusions

The study delves into the critical role of incentive mechanisms as potent procurement strategies, aimed at significantly improving project performance in the complex landscape of international construction projects. Main contractors frequently rely on a diverse array of local suppliers to bring construction projects to fruition. By engaging subcontractors, these contractors can substantially reduce overhead costs, uphold high-quality work standards, and circumvent delays with remarkable efficiency. Consequently, delegating specialized and labor-intensive tasks to firms with relevant expertise effectively mitigates the risks and uncertainties inherent to such work.

Our comprehensive measurement model rigorously examines the efficacy of both financial and non-financial incentives within a unified framework. By scrutinizing the direct and indirect impacts of these incentives on the performance of global construction projects, this research contributes valuable, actionable insights to the existing body of literature on managing subcontractors in international construction endeavors. Our findings underscore the significance of implementing strategic incentive mechanisms to optimize performance outcomes, paving the way for a more effective and collaborative construction industry.

The study investigates the influence of financial and non-financial incentives on project performance, exploring both direct and indirect effects through cooperation. Cooperation was measured by three: information sharing, problem-solving, and flexibility, which mediate the impact of incentives on project performance. The findings indicate that non-financial incentives alone do not directly improve project outcomes, and that financial and non-financial incentives should be used together to achieve better cooperation and project outcomes. This suggests that they complement each other, rather than serving as substitutes.

To achieve further improvements, the study recommends implementing more cooperative procurement procedures and fostering cooperation between international contractors and suppliers/subcontractors from the host country. These findings make a valuable contribution to the field of managing international construction projects, particularly in developing countries. They highlight the importance of collaborative and motivating procurement procedures in achieving better outcomes and can serve as a guide for practitioners managing the construction supply chain. The insights provided into the impact of different incentives can help overseas management departments enhance the productivity of subcontractors in complex projects.

One limitation of this study is the limited size of the dataset. To address this limitation, we propose expanding the scope of the model by incorporating data from diverse regions and project types. This will help to increase the generalizability of the findings and provide a more comprehensive understanding of the factors that influence project performance. In future research, it will be essential to explore the generalizability of the findings in different contexts and integrate the

framework with other factors related to specific project circumstances. Moreover, future studies can add other moderating and mediating variables to enhance the complexity of the path model and improve our understanding of the mechanisms involved.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Disclosure statement

The authors declare no conflict of interest.

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