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# Influence of Relational Norms on User Interests in PPP Projects: Mediating Effect of Project Performance

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Received: 17 May 2018; Accepted: 14 June 2018; Published: 15 June 2018



**Abstract:** Protecting user interests is one of the most important public sector responsibilities in PPP (public-private partnership) projects. However, user interests could be damaged by poor project performance. Therefore, this study focuses on the protection of user interests in PPP projects and analyzes the relationships among relational norms, project performance, and user interests in PPP projects. A questionnaire survey is conducted to collect the opinions of professionals from the public sector and private sector. Upon analyzing 109 valid questionnaires, the results demonstrate that the relational norms between the public sector and private sector have a positive effect on project performance, and project performance has a positive relationship on user interests. Moreover, project performance has a positive mediating effect on the relationships between relational norms and user interests. This finding can provide a theoretical foundation and suggest practical measures to help the public sector better protect user interests in PPP projects.

**Keywords:** user interests; relational norms; project performance; public-private partnership; PPP projects

## 1. Introduction

To meet the needs of citizens for public facilities and to relieve governments' financial pressure in developing public facilities to improve public services, governments introduce private sector companies into public projects by adopting a PPP (public-private partnership) [1].

However, many PPP projects have lower performance than traditional public procurement [2,3], which could result in higher charges or lower quality for users who use public facilities or public services provided by PPP projects [4]. This absolutely damages user interests, and users therefore lose confidence in PPP projects and the government. Moreover, user interests are critical elements of public interests in PPPs and should be properly addressed in PPP agreements [5]. If they are not, strong public resistance could occur due to serious concerns about the protection of public interests, as presented by the U.S. Government Accountability Office [6].

The needs of users should be first met when governments use PPPs to develop public facilities and provide public services [7]. Therefore, safeguards of user interests are an important responsibility

of the government and one of the most important objectives in PPP projects [8–10]. It is essential for the government to understand how to protect user interests in PPP projects. However, prior studies have not focused on user interest protection. Prior studies have usually classified user interests as a part of the interests of the public sector. Thus, they have focused on how to protect the interests of the public sector without discussing user interest protection separately [11]. However, user interests are not identical with the interests of the public sector and, therefore, should not be replaced by them [12]. In PPP projects, the public sector, private sector, and users are three parties [12]. Thus, this study focuses on how to protect the interests of users in PPP projects.

User interests can be influenced directly by project performance because it influences the facility and service delivery and users directly use the facilities and services provided by PPP projects [10,13]. The public sector and private sector are contracting with concession contractors and executors to implement PPP projects together. According to the theory of relationship governance, project performance can be influenced significantly by relational norms between the public sector and private sector [14]. Therefore, to study how to protect user interests in PPP projects, this study discusses the effects of relational norms and project performance on user interests in PPP projects. The findings in this study can provide useful information to help governments effectively protect user interests in PPP projects.

The paper begins with a literature review in related fields followed by a series of hypotheses. Then, the research approaches used in the study are presented. By using a questionnaire survey, the proposed hypotheses are tested. Finally, the study finishes with a discussion and a conclusion.

## 2. Theory Background and Hypotheses

### 2.1. User Interests in Public-Private Partnerships (PPPs)

User interests in PPP projects include: (1) users can obtain information about PPP projects and can participate in project decisions and supervise project implementation; (2) users can access public facilities and services at reasonable prices; and (3) users can access high-quality public facilities and services [15]. The user interests in this study are different from the ‘public interests’ that are defined in public interest theory or in welfare economics [16]. In public interest theory or welfare economics, the public interests are societal interests. Public interests are described as the best possible allocation of scarce resources for individual and collective goods and services in society [17]. However, in this study, user interests are only the interests of end users who use the public facilities or public services provided by PPP projects; they do not include the interests of the public sector or private sector.

Meeting the needs of users is the ultimate motivation of governments in initiating PPP projects [7]. Therefore, protecting user interests is one of a government’s most important responsibilities in PPP projects. The safeguards of user interests are also critical success factors in PPP projects [18,19].

In practice, there are many problems associated with low performance in PPP projects, including cost overruns, time delays, quality defects and safety hazards, all of which could lead to more money being paid by the users to use the public facilities or public services provided by PPP projects [4]. In other words, user interests can be damaged by poor performance in PPP projects. Prior studies have identified many key risks in PPP projects and have discussed how to allocate these risks between the public sector and private sector [20–22]. However, in PPP projects the ultimate objective of the private sector is to earn profits [23,24]. Once poor performance occurs and reduces the value to the private sector, the private sector can shift their losses to the users by increasing charges or lowering the quality of the public facilities and services [8]. Hence, in PPP projects, to protect user interests, poor performance must be avoided as far as possible.

### 2.2. Role of Project Performance on User Interests in PPPs

In a construction project, the most commonly used project performance indicators are the quality (i.e., construction quality), cost (i.e., construction cost), and time (i.e., completion time) [25,26]. For PPP projects, the project period usually includes the construction stage and operation stage [27]. Hence, it is

necessary to expand the connotations of the three performance indicators (i.e., quality, cost, and time) from the construction stage to the operation stage in PPP projects. According to Yuan et al. [10], the quality of PPP projects refers to the quality of the public facilities and services provided; the cost of PPP projects refers to the life cycle cost, and the time of PPP projects refers to the construction completion time as well as the maintenance and repair time.

- If PPP projects can provide quality public facilities and services, users can continuously enjoy quality public facilities and services [10]. Ho and Tsui [9] demonstrate that PPP projects are usually public service/facility oriented and have significant influences on user interests. Moreover, users' health and safety and the social environment would be improved by high-quality public facilities and services [20,28]. Therefore, good quality can effectively safeguard user interests in PPP projects.
- If PPP projects can optimize the life-cycle cost, the private sector can reduce their costs and increase profits [20]. If the private sector can obtain reasonable profits from PPP projects, they would not need to decrease the quality or increase the price of public facilities and services to earn profits [23]. Sharma et al. [5] indicate that low private capital due to the uncertainties of traffic on toll roads could reduce the attractiveness of their PPPs. Thus, user interests can obtain protection through achieving a good quality and price for the public facilities and services provided by PPPs.
- If the construction of PPP projects is delayed, the time when users can access public facilities and services is also delayed [29]. The delay of PPP projects can also lead to private sector cost overruns and profit shrinkage [30]. In this case, the private sector may improve its profits through lowering the quality or increasing the price of public facilities and services so that users ultimately shoulder the delay risks and cost failures [8]. Thus, user interests are damaged. In addition, PPP projects have long concession periods. PPP projects need to be maintained and repaired during the concession periods. If PPP projects can be maintained and repaired on time, they can continue to provide quality public facilities and services to users during the long concession periods [31]. Thus, user interests are protected.

PPP project objectives can be achieved effectively if the projects have good performance in quality, cost, and time [32]; otherwise, the projects may fail [33]. If PPP projects fail, it can cause huge losses and severe harm to users [34]. Therefore, in PPP projects, good project performance can have a positive effect on user interests.

Although prior studies did not find direct relationships between project performance and user interests, their findings indicated indirect relationships. Liu et al. [35] evaluated performance improvements to realize the predetermined outcomes and benefits of PPPs, including user interests. Liu et al. [36] further indicated that stakeholder satisfaction is the most important indicator to measure the performance of PPP projects, within which more attention should be paid to user interests. Usually, the achievement of synergistic gains and positive spillover effects are expected when adopting PPPs, which greatly benefit users because the satisfactory performance of a PPP project would be costless [37].

### 2.3. Role of Relational Norms on Project Performance in PPPs

Relational norms refer to "behavioral expectations that are partially shared by a group of decision makers and directed toward collective or group goals" [38]. Relational norms include flexibility, information exchange, and solidarity [39–41]. Flexibility is the notion that two parties are willing to make adaptations because of circumstances changing. Information exchange is the idea that two parties are willing to share useful information with each other. Solidarity refers to the idea that two parties are willing to maintain a bilateral relationship [41].

The period of PPP projects is usually more than 10 years [27]. In the long term, various changes in circumstances may happen, such as price changes, inflation, interest rate fluctuations, and changes in market demand [42]. If these changes occur, the public sector and private sector need to adjust to them [43]. In fact, changes are inevitable. However, the initial VfM objectives for a PPP project should still

be developed through project governance and control-related matters during the processes of ongoing management [44]. Hence, the fundamental principle is that a PPP project should have the necessary flexibility to adapt to future changes [45]. Moreover, the required flexibility can ensure appropriate service outcomes of PPP projects would be achieved over the full concession period [46]. Flexibility in relational norms enables the public sector and private sector to adjust to changing environmental conditions so that the project performance is not influenced negatively by these changes [40].

PPP projects require the public sector and private sector to have long-term cooperation [47]. If the public sector and private sector can proactively exchange information, it is beneficial to their understanding and communication with each other to reduce mutual suspicion [48]. Furthermore, it is beneficial to building and maintaining friendly and trustful relationships between the public sector and private sector [49]. Friendly and trustful cooperation can also promote the improvement of project performance [50]. PPP projects are complex [51]. During the project process, the public and private sectors may have divergences. Information sharing between the public and private sectors can help to diminish divergences and reduce conflicts [52]. Even though conflicts happen because of disagreement, information sharing and effective communication can promote conflict resolution in a quick way and reduce the negative effects of conflict on project performance [53]. Information exchange in the relational norms can also help the public and private sectors generate more innovative ideas to improve the performance of PPP projects [1,54].

Solidarity in the relational norms enables the public and private sectors to treasure the bilateral relationship and common interests rather than focusing on the maximization of self-interest [55]. Therefore, the private sector can regard its cooperation in PPPs as contributions to social stability and solidarity [56]. Solidarity reflects the synergistic effects of the public and private sectors [57]. In a PPP project, partners have extremely collaborative relationships as they share long-term and short-term goals and plans [58]. Rwelamila et al. [59] indicate that project failure in a traditional project can be related to a lack of solidarity between project stakeholders because of an inappropriate organizational structure, which could negatively affect project performance [60]. Thus, if PPP projects have problems, solidarity enables the public and private sectors to solve them from a perspective of common interest maximization in order to protect performance [40].

To sum up, relational norms include flexibility, information exchange, and solidarity. In PPP projects, flexibility, information exchange, and solidarity between the public and private sectors are all helpful in safeguarding and improving project performance. Thus, in PPP projects, the relational norms between the public and private sectors can have a positive effect on project performance.

#### *2.4. Role of Relational Norms on User Interests in PPPs*

According to the analysis of the preceding context, when the public and private sectors have good relational norms, PPP projects can be operated smoothly. This is because the public and private sectors can flexibly adjust to changing environmental conditions, can share information to reduce mutual suspicion and conflicts, and can make decisions based on project interests rather than self-interest [40,48,52,55]. If PPP projects are operated smoothly, it is easy to improve project performance [61,62]. Good project performance is beneficial to providing public facilities and services to users at a good quality and price. Thus, user interests can be protected.

In contrast, if the public and private sectors do not have good relational norms, it may be difficult to adjust to changing environmental conditions [40]. Moreover, the public and private sectors may be suspicious of each other and make decisions based on self-interest and, thus, have frequent conflicts [48,52,55]. As a consequence, imperfect relational norms between the public and private sectors would result in poor project performance [61,62]. If PPP projects have poor performance, they cannot provide public facilities and services to users at a good quality and reasonable price [34]. Thus, user interests are hurt.

Therefore, good relational norms can have an indirect positive effect on user interests through improving project performance.

## 2.5. Knowledge Gap

According to the literature review, in PPP projects, poor project performance, like cost overruns and time delays, is an important reason for user interests being impaired. Thus, it is possible for project performance to influence user interests in PPP projects directly. However, few studies have discussed the direct relationship between project performance and user interests in PPP projects. In addition, many studies have found that relational norms are beneficial to improving project performance. Thus, relational norms are likely to influence user interests in PPP projects indirectly through project performance. However, because few studies have explored the direct relationship between project performance and user interests in PPP projects, fewer studies have attempted to explore the indirect relationship between relational norms and user interests.

To fill this research gap, this study first verifies the effect of relational norms between the public and private sectors on project performance in PPP projects. It then probes the effect of project performance on user interests in PPP projects. Finally, it tries to connect relational norms with user interests to discuss the mediating effect of project performance in PPP projects.

## 2.6. Research Model and Hypotheses

According to the above analysis, Hypothesis 1, Hypothesis 2, and Hypothesis 3 can be proposed to verify the relationship among relational norms, user interests, and project performance in PPPs. Figure 1 shows the theoretical model in this study.

**Hypothesis 1(H1).** *In PPP projects, the relational norms between the public and private sectors have a positive relationship with project performance.*

**Hypothesis 2(H2).** *In PPP projects, project performance and user interests have a positive relationship.*

**Hypothesis 3(H3).** *In PPP projects, project performance has a positive mediating effect on the relationship between the relational norms and user interests.*

For H1, many prior studies in the field of business have found that good relational norms have positive effects on performance [40,61,62]. As a result, this study tests H1 to verify the effect of relational norms between the public and private sectors on project performance in PPP projects. For H2, prior studies only indirectly indicate that project performance can influence user interests [35,36], but do not directly investigate the relationships between project performance and user interests. Consequently, this study tests H2 to probe the effect of project performance on user interests in PPP projects. For H3, few studies have attempted to explore the relationship among relational norms, project performance, and user interests. Thus, this study tests H3 to innovatively explore the mediating effect of project performance on the relationship between relational norms and user interests in PPP projects.

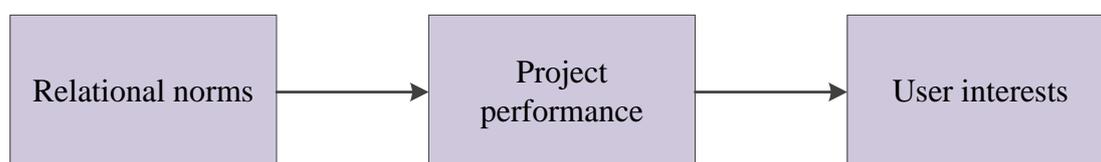


Figure 1. Proposed theoretical model.

## 3. Research Design

A questionnaire survey method was adopted to test the hypotheses proposed in this study. The questionnaire was designed based on the existing literature. The questionnaire included two parts. The first part was about respondents' experiences in PPP projects. The second part was the

measurements of three variables including relational norms, project performance, and user interests. A questionnaire was shown in Appendix A.

Questionnaires were distributed using a stratified random sampling method. The target respondents were experts or professionals from the public and private sectors, because the questions in the questionnaire involved the relationships between the public and private sectors, so professionals from the two sectors were needed. User interests also need the input of the public and private sectors for them to be protected [5]. One author held a PPP conference in which many professionals from public sectors or private sectors participated. These professionals were invited to fill out the questionnaire. In addition, the author was invited to participate in some PPP workshops held by public sectors or private sectors. Many professionals from public sectors or private sectors also participated in these workshops, and these professionals were also invited to fill out the questionnaire.

Respondents were asked to fill out the questionnaire according to their general knowledge and work experience. In addition, the public and private sectors may have a bias in filling out the questionnaires because they prefer to believe that they provide good public facilities and services to users. To avoid this bias, all respondents were asked to complete the questionnaires from an open-minded perspective. The respondents were informed that their responses were only used for academic research rather than a project assessment. The information they provided was confidential.

The three variables (i.e., relational norms, project performance, and user interests) were latent variables and were measured by observed variables (i.e., measurement items). After data collection, an exploratory factor analysis was firstly used to select the most significant measurement items for each latent variable. The relationships between the latent variables and selected measurement items are referred to as the measurement model. The validity and reliability of the measurement model needed to be verified by survey data. A confirmatory factor analysis can verify whether the survey data supports the measurement model [63]. Additionally, a multiple regression analysis was used to test whether the three hypothetical relationships were supported based on the survey data. A regression analysis used a linear relation to provide explanations and predictions. A multiple regression analysis was used to consider more than one independent variable simultaneously in explaining and predicting a single dependent variable [63]. Finally, the results were discussed to provide theoretical contributions and practical implications.

#### 4. Measurement Methods

Multiple variables in this study were identified from the existing literature to measure the relational norms, user interests, and project performance in PPPs as well as their relationships. Appropriate modifications were made to suit the research context. All the measurements were based on a five-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree). Table 1 shows all the measurements of the relational norms, user interests, and project performance.

**Table 1.** The measurements of variables.

Variables	Measurements
Relational norms (RN)	RN1 Two sectors were willing to make adjustments in the ongoing relationship to cope with changing circumstances.
	RN2 Two sectors would cooperatively work out a new deal when some unexpected situation arose.
	RN3 Exchange of information in the relationship took place frequently and informally, and not only according to a pre-specified agreement.
	RN4 Two sectors kept each other informed about events or changes that might affect the other party in a timely fashion.
	RN5 Two sectors could provide any information if it could help the other party. Three measuring items were used to measure solidarity.
	RN6 Problems that arose in the course of this relationship were treated by two sectors as joint rather than individual responsibilities.
	RN7 Two sectors were committed to improvements that might benefit the relationship as a whole, and not only the individual.
	RN8 Two sectors in this relationship did not mind owing each other favors.

Table 1. Cont.

Variables	Measurements	
Project performance (PP)	PP1	The project quality is within the quality scope specified in the contract.
	PP2	The life-cycle cost of PPP projects was within budget.
	PP3	PPP projects could complete construction on time or earlier, and could receive maintenance and repairs on time.
User interests (UI)	UI1	The information about PPP projects was available to the users and the users could participate in project decisions and supervise project implementation.
	UI2	PPP projects provided sufficient safeguards for users to ensure all users (including disadvantaged groups) can effectively access the public facilities and services at a reasonable price.
	UI3	PPP projects could ensure continuous supply of healthy, safe and convenient facilities and services to users.

#### 4.1. Relation Norms

The independent variable for relational norms can be identified from the perspectives of flexibility, information exchange, and solidarity between the public and private sectors. The measurement of relational norms was based on Griffith and Myers [40] and Goo et al. [41], with appropriate wording modifications to fit the PPP environment. For flexibility, it can be measured by two items. The first item was that both public and private sectors would be willing to make adjustments in their ongoing relationship to cope with changing circumstances [40,41]. Another item was both public and private sectors would cooperatively work out a new deal when some unexpected situation arose [40]. Information exchange can be measured by three items. The first item is that the exchange of information in the relationship took place frequently and informally, which would obey a pre-specified agreement [40]. Then, both the public and private sectors kept each other informed about events or changes that might affect the other party in a timely way [40,41]. In addition, both the public and private sectors could provide any information that would help the other party [40]. Solidarity can be measured by three items. The first item was that the problems in the course of the relationship between the public and private sectors items could be treated by two sectors jointly rather than as individual responsibilities [40]. The second item was that the public and private sectors were committed to improvements that might benefit the relationship as a whole, and not only the individual [40,41]. The third item was that the public and private sectors in their relationships did not mind owing each other favors [40].

#### 4.2. Project Performance

The mediating variable for project performance can be identified from the perspectives of time, cost and quality (TCQ). The iron triangle of TCQ is always employed to evaluate construction project performance [64,65]. However, Liu et al. [66] indicate that there is a widespread consensus among the interviewees that the conventional TCQ approach is simplistic and thus unable to capture the critical success factors and uncertainties of PPPs. Therefore, the items should not only focus on TCQ but also reflect the key features of PPP projects, including long-term operation and the delivery of public services. For example, Yuan et al. [67] identified 46 KPIs (Key Performance Indicators) of PPP projects, demonstrating that cost and time management during the construction and operation periods as well as high quality control are Top 10 important KPIs. Therefore, in this study, the performance of PPP projects can be measured by a three-item scale with appropriate modification of the scale of Yuan et al. [10]. The quality of PPP projects should be within the quality scope specified in the contract. The life-cycle cost (LCC) of PPP projects should be within budget. Moreover, PPP projects could complete their construction on time or earlier and could obtain maintenance and repairs on time [10].

#### 4.3. User Interests

The dependent variables for user interests can be identified from the perspectives of information exposure, availability of public services, and the quality of public services. Based on the Partnerships Victoria Guidance Material [15], three measuring items were used to measure user interests in PPP

projects, with appropriate wording modifications to fit the research context. First, the information about PPP projects should be available to users and users could participate in project decisions and supervise project implementation [15]. Ng et al. [12] and Anderson [68] found that information exposure is an important way for users to protect their own interests. PPP projects should also provide sufficient safeguards for consumers to ensure that all users (including disadvantaged groups) can effectively access the public facilities and services at a reasonable price [15]. Moreover, PPP projects should ensure a continuous supply of healthy, safe and convenient facilities and services to users [15]. The price and quality of public facilities and services have a direct impact on user interests in PPPs. The main reason why users perceive that their interests are damaged in PPPs is because they have to pay more money to use public facilities and services or they use a lower quality of public facilities and services provided by PPP projects than those public facilities and services provided by governments [4].

## 5. Research Survey and Results

The whole survey lasted 3 months. Approximately 500 questionnaires were distributed and 143 questionnaires were collected, with a response rate of 28.6%. After deleting records with missing data, 109 valid records were selected as the sample, with a valid response rate of 21.8%. This response rate is acceptable for social science research [69].

The respondents were Chinese project professionals from the public sector (58.41%) and private sector (41.59%). All respondents had experience in PPP projects. The PPP projects that respondents participated in included rail transportation projects, municipal road projects, underground pipeline projects, sewerage projects, hydraulic engineering projects, and refuse disposal projects; 75.25% of respondents had 1–5 years' work experience in PPP projects, 18.81% of respondents had 6–10 years' work experience in PPP projects, and 3.96% had above 10 years' work experience in PPP projects.

### 5.1. Exploratory Factor Analysis

The eight measurement items of relational norms (i.e., RN1–RN8) were analyzed using the exploratory factor analysis. The Kaiser–Meyer–Olkin (KMO) value was 0.889, above the 0.6 benchmark [70]. Thus, the eight measurement items were suitable for the exploratory factor analysis. In Table 2, the measure of sampling adequacy (MSA) value of each item was above the 0.5 benchmark. Thus, each item of relational norms should be used in the exploratory factor analysis [70]. Only one factor arose from the exploratory factor analysis, according to the method of the Eigen-value above 1. This factor included all the eight measurement items from RN1 to RN8. This factor can explain 58.165% variation. Therefore, this factor was relational norms.

**Table 2.** Results of the exploratory factor analysis for relational norms.

Items	Factor Loading	Measure of Sampling Adequacy (MSA)	Factor Title
RN4	0.803	0.859	Relational norms
RN7	0.802	0.871	
RN1	0.790	0.905	
RN8	0.773	0.875	
RN3	0.772	0.918	
RN6	0.732	0.921	
RN5	0.727	0.898	
RN2	0.695	0.871	
Explained variation (%)	58.165%		

The three measurement items of project performance (i.e., PP1–PP3) were analyzed using the exploratory factor analysis. The KMO value was 0.665, above the 0.6 benchmark [70]. Thus, the three measurement items were suitable for the exploratory factor analysis. In Table 3, the MSA value of each item was above the 0.5 benchmark. Thus, each item of project performance should be used in the

exploratory factor analysis [70]. Only one factor arose from the exploratory factor analysis, according to the method of the Eigen-value above 1. This factor included all the three measurement items from PP1 to PP3. This factor can explain 58.110% variation. Therefore, this factor was project performance.

**Table 3.** Results of the exploratory factor analysis for project performance.

Items	Factor Loading	MSA	Factor Title
PP2	0.922	0.617	Project performance
PP3	0.675	0.696	
PP1	0.661	0.706	
Explained variation (%)	58.110%		

The three measurement items of user interests (i.e., UI1-UI3) were analyzed using the exploratory factor analysis. The KMO value was 0.710, above the 0.6 benchmark [70]. Thus, the three measurement items were suitable for the exploratory factor analysis. In Table 4, the MSA value of each item was above the 0.5 benchmark. Thus, each item of user interests should be used in the exploratory factor analysis [70]. Only one factor arose from the exploratory factor analysis, according to the method of the Eigen-value above 1. This factor included all the three measurement items from UI1 to UI3. This factor can explain 57.969% variation. Therefore, this factor was user interests.

**Table 4.** Results of the exploratory factor analysis for user interests.

Items	Factor Loading	MSA	Factor Title
UI2	0.786	0.695	User interests
UI1	0.783	0.696	
UI3	0.713	0.743	
Explained variation (%)	57.969%		

## 5.2. Validity and Reliability of the Measurement Model

To ensure the effectiveness of the measurement model, the validity and reliability of the measurement model were tested. A confirmatory factor analysis (CFA) with a structural equation model (using AMOS 20.0 software) was employed to explore the validity and reliability of the measurement model [63,71]. The structural equation model is shown in Figure 2. Table 5 shows the results of the CFA. In Table 5, the Cronbach's alpha value of the three variables was more than the 0.7 benchmark, which indicates that the measurements have good consistency and reliability [63]. This study used three indices, which were the standard factor loading (SFL), construct reliability (CR), and average variance extracted (AVE), to assess the convergent validity [63]. In Table 5, all the SFL values were above the 0.5 benchmark. The AVE value for every variable was above the 0.5 cutoff. The CR value for each variable was above the 0.7 benchmark. The values of the three indices indicate the good convergent validity of the measurements. To test the discriminant validity, the square root of AVE was compared with the off-diagonal correlation coefficients. As shown in Table 6, the square root value of the AVE of each variable was higher than the off-diagonal correlation coefficients, which indicates adequate discriminant validity of the measurements [63].

The structural equation model in Figure 2 is also needed to satisfy the recommended goodness-of-fit (GOF) [72,73]. The results of the GOF measures are shown in Table 7. The ratio of  $\chi^2$ /degrees of freedom (Df) was 1.92, which is located in the range from 1 to 2. The root mean square error of approximation (RMSEA) value was 0.09, below the threshold level of 0.1. Furthermore, the Tucker-Lewis index (TLI) and comparative fit index (CFI) were above 0.9, and the normal fit index (NFI) was close to 0.9, which indicate a good fit [73–75]. Thus, the recommended GOF levels were satisfied and acceptable.

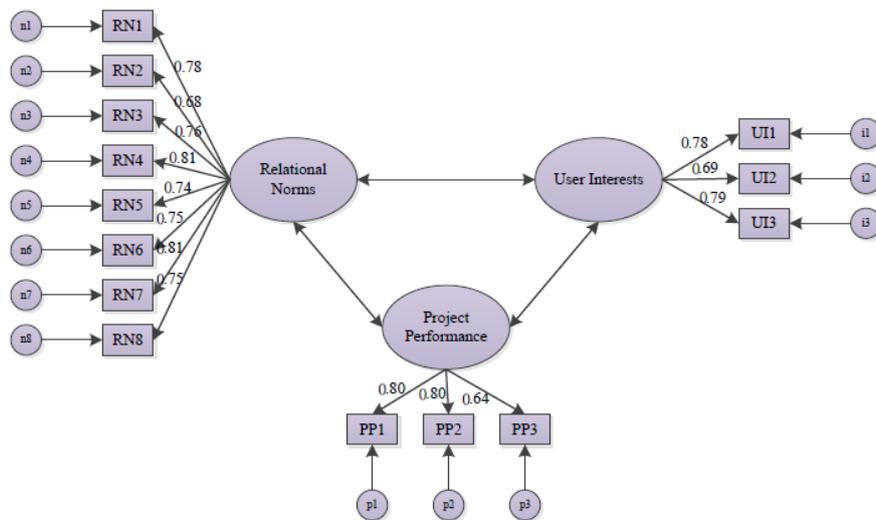


Figure 2. Structural equation model for confirmatory factor analysis (CFA).

Table 5. Results of validity and reliability of measurements.

Variables	Standard Factor Loading (SFL)
Relational norms (Cronbach’s $\alpha = 0.92$ ; CR = 0.92; average variance extracted (AVE) = 0.58)	RN1 0.78
	RN2 0.68
	RN3 0.76
	RN4 0.81
	RN5 0.74
	RN6 0.75
	RN7 0.81
	RN8 0.75
Project performance (Cronbach’s $\alpha = 0.79$ ; CR = 0.79; AVE = 0.56)	PP1 0.80
	PP2 0.80
	PP3 0.64
User interests (Cronbach’s $\alpha = 0.80$ ; CR = 0.80; AVE = 0.57)	UI1 0.78
	UI2 0.69
	UI3 0.79

Table 6. Pearson correlation matrix.

Variables	Relational Norms	Project Performance	User Interests
Relational norms	<b>0.76</b>	—	—
Project performance	0.72	<b>0.75</b>	—
User interests	0.72	0.72	<b>0.75</b>

Note: Bold numbers in diagonal row are square roots of AVE.

Table 7. Results of goodness-of-fit (GOF) measures.

Goodness-of-Fit Measure	Recommended Level of GOF Measure	SEM
$\chi^2$ /degree of freedom (Df)	Recommended level from 1 to 2	1.92
Root mean square error of approximation (RMSEA)	<0.05 indicates very good fit (Threshold level = 0.10)	0.09
Tucker-Lewis index (TLI)	0 (no fit) to 1 (perfect fit)	0.90
Comparative fit index (CFI)	0 (no fit) to 1 (perfect fit)	0.93
Normal fit index (NFI)	0 (no fit) to 1 (perfect fit)	0.86

### 5.3. Multiple Regression Analysis

Multiple regression analysis (using SPSS 18.0 software) was adopted to test the relationships among the relational norms, project performance, and user interests in PPP projects. Model 1 was tested to verify the effect of relational norms on project performance. Model 2 was tested to verify the effect of project performance on user interests. Model 3 was tested to verify the mediating effect of project performance on the relationship between relational norms and user interests. The results of the three models are shown in Table 8.

**Table 8.** Results of regression analysis.

Variables		Model 1	Model 2	Model 3
		Project Performance	User Interests	User Interests
Direct effects	Relational norms	0.72 ***	—	—
	Project performance	—	0.72 ***	—
Mediating effects	Relational norms	—	—	0.42 ***
	Project performance	—	—	0.42 ***
F		114.02 ***	113.53 ***	79.30 ***
R <sup>2</sup>		0.52	0.52	0.60
Adjusted R <sup>2</sup>		0.51	0.51	0.59

Note: N = 109; \*\*\* p < 0.001.

Model 1 showed that relational norms had a significant positive impact on project performance ( $\beta = 0.72$ ,  $p < 0.001$ ). Consequently, Hypotheses 1 was supported, which indicates that the relational norms between the public and private sectors had a positive relationship with project performance in PPPs. This finding supported the previous studies that found that good relational norms could facilitate performance [58,76,77]. Model 2 showed that project performance had a significant positive relationship with user interests ( $\beta = 0.72$ ,  $p < 0.001$ ). This result supported Hypothesis 2 well, illustrating that project performance and user interests have a positive relationship in PPPs. This finding shows that project performance was an important factor influencing user interests in PPP projects. Model 3 showed that project performance had a mediating effect on the relationship between relational norms and user interests ( $\beta = 0.42$ ,  $p < 0.001$ ). Therefore, Hypothesis 3 was supported, indicating that project performance is a mediating bridge to link relational norms and user interests in PPPs. This finding reveals the mechanism of relational norms affecting user interests in PPP projects. In other words, relational norms between the public and private sectors can indirectly influence user interests. It also illustrates that achieving user interest protection in PPPs needs both the public and private sectors, rather than only the public sector, which provides a new perspective to study user interest protection in PPPs.

In addition, although the R<sup>2</sup> of multiple regression analysis in this study was not high, the R<sup>2</sup> (around 0.5) was acceptable [78].

## 6. Discussion

### 6.1. Directly Protecting User Interests through Improving Project Performance

The research result demonstrates that project performance has a direct effect on user interests in PPP projects. The improvement of project performance (i.e., better quality, lower costs, and shorter time) can effectively facilitate user interests in PPP projects. This finding illustrates that the precondition of user interest protection is achieving success in PPP projects. If PPP projects have poor performance in quality, cost, and time, user interest protection cannot be achieved. This finding also supports Soomro and Zhang's [34] point that the failure of PPP projects can cause huge losses.

The findings of this study can provide guidance for governments to protect user interests in PPP projects. Governments can protect user interests by controlling project performance in PPP projects.

Specifically, it is difficult to quantify user interests using specific indicators in the concession contracts of PPP projects [79]. Actually, user interest protection may be a vague region in the concession contracts of PPP projects. Therefore, it is difficult for the public sector to use contracts to control the private sector to protect user interests during project execution because user interests should be an extensive concept [79]. However, the project performance of PPP projects can usually be quantified using specific indicators in detail [26,67]. The public sector can stipulate project performance in the concession contracts and use the contracts to control the private sector in implementing the project performance during project execution [13,80]. In this way, the public sector can improve project performance to achieve user interest protection in PPP projects.

### *6.2. Good Relational Norms Improve Project Performance*

The positive effect on project performance in PPP projects by good relational norms between the public and private sectors has been verified. This finding is consistent with previous studies [40,61,62], which indicate that project performance can also be influenced by relational norms between the public and private sectors, although project performance is stipulated in the concession contracts and is controlled through the implementation of the concession contracts in PPP projects. Contracts are a formal governance mechanism, and relational norms are an informal governance mechanism [81–83]. The informal governance mechanism can effectively supplement and enhance the functions of the formal governance mechanism to safeguard and improve project performance [14,55,80]. This finding indicates that the public and private sectors should build good relational norms to improve project performance in PPPs.

### *6.3. Indirectly Protecting User Interests by Good Relational Norms*

Our study also finds that project performance has a mediating effect on the relationship between relational norms and user interests in PPP projects. This finding also indicates that relational governance should be of concern besides project performance for user interest protection in PPP projects. Good relational norms between the public and private sectors can indirectly help protect user interests by improving project performance. This finding connects relational governance with user interest protection in PPP projects to provide a new perspective for studies about user interest protection in PPP projects. It also illustrates that achieving user interest protection in PPPs needs coordination between the public and private sectors, rather than only depending on the public sector.

The findings drawn from the study can also help facilitate the promotion of user interests in PPP projects. The public sector can protect user interests in PPP projects not only through using the concession contracts to control project performance but also through building friendly relationships with the private sector. Specifically, in the process of getting along with the private sector, the public sector can use good relational norms (i.e., flexibility, information exchange, and solidarity) to assist in the implementation of the concession contracts [65,84], ensuring the good performance of PPP projects and indirectly achieving the goal of user interest protection.

## **7. Case Study**

This section introduces a case of the Hong Kong Western Harbor Tunnel PPP project to show the effect of relational norms on project performance and user interests in PPP projects.

In the late 1980s, the Hong Kong government forecasted that the number of cross-harbor trips would grow greatly. Specifically, the Hong Kong government forecasted that the number of daily cross-harbor person trips would increase by 86% from 1.4 to 2.6 million, and goods vehicle trips by 129% from 34,000 to 78,000 over the same period [85]. However, by the early 1980s, the two existing harbor tunnels were carrying far more vehicles per day than their design capacity. To relieve growing traffic congestion on the two existing harbor tunnels and to develop the transport infrastructure, the Hong Kong government decided to build the Hong Kong Western Harbor Tunnel (HKWHT).

The Hong Kong government also decided to use the PPP mode to introduce the private sector in order to build, operate, and maintain the HKWHT [86].

In the HKWHT PPP project, the public sector and the private sector had too many debates, from the signing stage, to the construction and operation stages. These debates resulted in the public sector and the private sector being unable to openly exchange views and solidly make decisions. As a result, the project planning was unsuccessful. The HKWHT was poorly integrated with the road infrastructure in HK to create inconvenience for the users. Moreover, the project costs experienced an overrun mainly because of the associated buildings and roads [86]. Because of the cost overrun, the private sector of the HKWHT PPP project priced the toll charge high in order to ensure their internal rate of return (IRR) was not below 15% [87]. Because the toll charge of the HKWHT was high and the HKWHT was inconvenient for connecting the road network in HK, the general public still preferred to use the other two tunnels despite severe congestion, rather than to use the HKWHT [88]. Thus, the actual traffic volumes in the HKWHT were significantly below estimates. Because the traffic volumes were low, the private sector of the HKWHT PPP project decided to increase the toll charge in order to ensure their profits. However, this decision only resulted in further reductions in the traffic volumes [87]. In fact, the HKWHT PPP project could not provide convenient and low-price traffic services for the users, and did not successfully reduce traffic congestion. User interests were seriously hurt in the HKWHT PPP project. Therefore, many citizens in Hong Kong were asking for early termination of the PPP contract and the early return of the tunnel [89].

The case of the HKWHT PPP project illustrated that in a PPP project, if the public sector and the private sector have too many debates without good relational norms, these two sectors cannot openly exchange views and solidly make decisions. It would easily result in poor performance and damage user interests in the PPP project.

## 8. Potential Applications for Public Administration

This study can provide some specific suggestions for public administration to help protect user interests in PPP projects.

- The public sector can set the project performance of PPP projects in the concession contracts in detail. For example, the public sector can determine the quality standards of the public facilities and services that are provided by the private sector and that can be measured by user satisfaction as an important standard. In this case, the public sector can closely connect user interests with project performance.
- Moreover, the public sector can determine not only the concession periods but also the construction periods in the concession contracts to ensure that the private sector can finish the construction and maintenance on time and provide public facilities and services as early as possible.
- Additionally, the public sector can increase informal contact with the private sector to promote good relational norms between them during the process of PPP projects. For example, the public sector can work on the same location as the private sector to increase opportunities for communication and mutual understanding while working. The public and private sectors can also work on the same working system to enhance information exchange and sharing. The same working location and working system can help the public and private sectors build flexible, solid, and shared relational norms.
- Furthermore, the public sector can increase opportunities for public participation and extend the interaction among users, the public sector and the private sector in PPP projects. For example, the public sector can hold public hearings at different stages of PPP projects so that users can directly contact the public and private sectors. The public and private sectors can also understand users' needs and satisfaction with the PPP projects. Additionally, the public and private sectors can establish websites for PPP projects and open up information on PPP projects online. In this way, users can understand the PPP projects better and can supervise them. In this case, building information model (BIM) technologies can be further adopted to help the public

sector, private sector and users work together, share information and improve the performance of PPP projects [90].

## 9. Conclusions

The primary objective of this paper was to discuss user interest protection in PPP projects. Using a sample of 109 questionnaires from Chinese project professionals who had experience with PPP projects, this research examined the relationships among the relational norms between the public and private sectors, project performance, and user interests in PPP projects. The results showed that relational norms between the public and private sectors had a positive relationship with project performance, and project performance could facilitate the protection of user interests. This research also indicated that project performance had a positive mediating effect on the relationship between relational norms and user interests. This study provided a theoretical foundation to understand user interest protection from a relational norms perspective and to clarify project performance as a mediating path of relational norms affecting user interests. Moreover, this study provided two important measures to enhance the government's ability to protect user interests in PPP projects, including using the concession contracts to control project performance and building friendly relational norms with the private sector.

There are some limitations and future research topics in this study. All respondents in this study were from China. However, there are cultural differences among countries [91]. The functions of relational norms may be affected by cultural differences, so that the effects of relational norms on project performance and user interests may be different in different cultures [92]. Thus, future studies can collect data from several countries and compare the relationships among relational norms, project performance, and user interests among different countries to help achieve user interest protection in global PPP projects. Additionally, this study focused on the effects of relational norms on project performance and user interests in PPP projects. However, this study also noted that project performance was determined in the concession contracts and was controlled by using these contracts during the implementation stage. In addition, the relationships between the public and private sectors are formed based on the concession contracts. Thus, the concession contracts may influence project performance and user interests in PPP projects. However, this study does not discuss the effects of the contracts. Future studies may try to discuss user interest protection in PPP projects from a contractual governance perspective in order to offer useful suggestions to governments. Finally, this study discusses the mediating effect of project performance on the relationship between relational norms and user interests in PPP projects. However, there may be other mediating paths in the relationship between relational norms and user interests. Future studies can continue to explore and find more mediating variables to clarify the mechanism of relational norms affecting user interests, in order to facilitate the protection of user interests better in PPP projects.

**Author Contributions:** J.Y. conceived and designed the study; S.Z. collected the data; X.Z. and J.G. analyzed the data; M.J.S. did the English editing; X.Z. wrote the paper, J.Y. reviewed the paper.

**Funding:** The National Natural Science Foundation of China (NSFC-71472037, and 71671042); the Social Foundation of China (14AJY013); the Program for Outstanding Young Teachers of Southeast University (2242015R30009); the Fundamental Research Funds for the Central Universities.

**Acknowledgments:** The authors' special thanks go to all reviewers of the paper and to the National Natural Science Foundation of China (NSFC-71472037, and 71671042); the Social Foundation of China (14AJY013); the Program for Outstanding Young Teachers of Southeast University (2242015R30009); and the Fundamental Research Funds for the Central Universities for financially supporting this research.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

<b>Part 1 Personal experiences in PPP projects</b>					
1	Your role in PPP projects: (1) the public sector, (2) the private sector				
2	You participated in PPP projects, including: (1) rail transportation projects; (2) municipal road projects; (3) underground pipeline projects; (4) sewerage projects; (5) hydraulic engineering projects; (6) refuse disposal projects				
3	Working experiences in PPP projects: (1) 1–5 years; (2) 6–10 years; (3) above 10 years				
<b>Part 2 Measurements</b>					
<b>1 (strongly disagree), 2 (disagree), 3 (neutrality), 4 (agree), 5 (strongly agree)</b>					
<b>Relational norms</b>					
1	Both sectors were willing to make adjustments in the ongoing relationship to cope with changing circumstances.	1	2	3	4 5
2	Both sectors would cooperatively work out a new deal when some unexpected situation arose.	1	2	3	4 5
3	Exchange of information in the relationship took place frequently and informally, and not only according to a pre-specified agreement.	1	2	3	4 5
4	Both sectors kept each other informed about events or changes that might affect the other party in a timely way.	1	2	3	4 5
5	Both sectors could provide any information if it could help the other party. Three measuring items were used to measure solidarity.	1	2	3	4 5
6	Problems that arose in the course of this relationship were treated by two sectors as joint rather than individual responsibilities.	1	2	3	4 5
7	Both sectors were committed to improvements that might benefit the relationship as a whole, and not only the individual.	1	2	3	4 5
8	Both sectors in this relationship did not mind owing each other favors.	1	2	3	4 5
<b>Project performance</b>					
1	The project quality is within the quality scope specified in the contract.	1	2	3	4 5
2	The life-cycle cost of PPP projects was within budget.	1	2	3	4 5
3	The PPP project could complete construction on-time or earlier, and could receive maintenance and repairs on time.	1	2	3	4 5
<b>User interests</b>					
1	The information about the PPP project was available to the users and the users could participate in project decision and supervise project implementation.	1	2	3	4 5
2	The PPP project provided sufficient safeguards for users to ensure all users (including disadvantaged groups) can effectively access the public facilities and services at a reasonable price.	1	2	3	4 5
3	The PPP project could ensure continuous supply of healthy, safe and convenient facilities and services to users.	1	2	3	4 5

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