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The Influence of Social Capitalism on Construction Safety Behaviors: An Exploratory Megaproject Case Study

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Abstract: Health and safety issues are critical factors influencing the sustainable development of mega construction projects. The impact of social capitalism on health and safety activities has been widely discussed in sustainability domains; nevertheless, its influence towards workers' safety behaviors in mega construction projects remains largely unknown. To address this research gap, the current study aims to determine the influence of social capitalism on safety behaviors from a two-fold perspective between project managers and construction workers. An exploratory case study was adopted from a mega construction project in Tianjin, China. The results reveal that (a) the social network between project managers and construction workers manifests itself as close communication and contact, trust and emotional identification, common language, vision, and values; (b) project managers' management behaviors show stronger influences on construction workers' safety compliance behaviors, while their leadership behaviors show stronger influences on construction workers' safety participation behaviors; and (c) the practice of social capitalism promotes enforcement of commands and compulsory norms and plays a positive regulatory role on safety behaviors. These findings provide new insights into the use of social capitalism for improving safety behaviors and ultimately facilitate the attainment of the broader goal of sustainability in mega construction projects.

Keywords: megaproject; social capitalism; safety behaviors; project managers; construction workers; case study

1. Introduction

Over the last decade, with gradual accelerating urbanization and the increasing needs of urban housing and infrastructure, the construction industry has experienced rapid development, especially in developing countries, such as China [1]. Accompanied by this trend, a number of mega construction projects have emerged; and how to deliver them in a sustainable manner has become a critical issue [2]. The sustainable delivery of mega construction projects is not only confined to environmental protection, but also includes health and safety issues. Although a series of construction norms and safety management systems have been implemented, a number of complex and mega construction projects are still marked by poor safety performance due to workers' behaviors, such as ineffective safety training and learning [3], stakeholder safety risks interactions [4], weak communication [5], incompetent safety leadership [6], negative safety climate [7,8], and poor interactions between supervisors and workers [9].

According to a UK Health and Safety Executive [10], the worker fatal injury rate in construction is 1.37 per 100,000 workers. This is over three times the average rate across all industries (0.43 per 100,000 workers). In addition to fatal injuries, construction activities also cause work-related illnesses. According to the US Bureau of Labor [11], the rate of workplace injuries and illnesses is 3.2 per 100 full-time workers in the construction industry. In developing countries such as China, the safety situation is even worse. In the first three quarters of 2017, the total number of urban construction accidents were 514, with 615 deaths, and the growth rate in the number of accidents was 43.44% and 32.67%, respectively, from the year before [12]. Compared with the production activities of other industries (e.g., manufacturing), construction activities show two distinct characteristics: decentralization and mobility. The former characteristic means that front-line workers have more autonomy to make behavior decisions, and the latter characteristic means that the workers and workplaces are frequently changing [13]. These characteristics lead to situations where a number of compulsory norms fail to produce satisfactory effects on construction safety, while construction project safety depends on, to a large extent, team cooperation and individuals' positive interactions, such as social norms and social identities [14], organizational adaption and cooperation [15,16], positive psychological capital [17], and organizational citizenship behaviors [18].

Social capitalism is a kind of management mechanism of achieving organizational goals by using social capital, which is social resource rooted in social organizations such as families, enterprises, and communities, and originates from sociological theory [19]. The social capital can be measured from three dimensions: structural dimension, relational dimension and cognitive dimension, and different dimensions have different effects on organizational and individual behavior, and helps them to achieve their own goals [20]. The importance of social capitalism on health and safety activities has attracted increasing attention from different fields, such as residential safety [21,22], occupational safety in education sector [23], safety pursuit behavior of adult learners [24], and traffic safety [25]. These studies indicate the significant effects of social capitalism on individuals' attitudes and behaviors, especially on improving interaction and organization cooperation in related to safety activities. Nevertheless, there is still a lack of understanding on the influence of social capitalism towards safety behaviors in the realm of construction projects.

Therefore, this research aims to determine the influence of social capitalism on construction safety behaviors from a two-fold perspective between project managers and construction workers. The underpinning objectives are to: (a) identify the formation of social capital between project managers and construction workers and (b) explore the relationships between social capitalism and safety behaviors. To accomplish these objectives, an exploratory case study was adopted. A megaproject case was selected, namely, an influential mixed development project in Tianjin, China. This case is supported by the fact that most front-line laborers are migrant workers who have become accustomed to social capitalism initiatives in China [26]. The results can serve as a guide for safety management systems and facilitate the improvement of safety performance for construction workers. The remainder of the paper is organized as follows. Section 2 illustrates the concepts of project managers' behaviors, construction workers' safety behaviors, and social capitalism through a systematic literature review. Section 3 presents the research method, case selection criteria, and data collection procedures. Section 4 reports the analysis results. Section 5 discusses the findings and their implications for project safety management. Section 6 summarizes the main contributions and concludes the research findings.

2. Literature Review

2.1. Social Capital and Social Capitalism

The concept of social capital was first put forward by Loury [19] and has been regarded as a kind of social resource along with material capital and human capital. Social capital exists in social organizations such as family and community and produces various impacts on humans' social and economic activities. For individuals, social capital is an actual or potential aggregation of resources

combined with some kind of stable social networks, each individual accepts the network and has the right to obtain the resources from the network [20]. In addition, considering its characteristic of resources reciprocity and benefit sharing, social capital will also have a positive influence on the achievement of the team's goals [27]. Land, labor, and funding are considered the main factors of production from the perspective of classic capital. This perspective does not consider the exchange and trade of intangibles, however, such as social capital. Strictly speaking, social capital cannot be regarded as real "capital"; rather, its ownership is embedded in social relationships between people and is not owned by a specific person [28]. In this sense, social capitalism seems more accurate and appropriate than social capital in the context of relationship- or behavior-based research. Social capitalism can be defined as a socially minded form of capitalism, where the goal is making social improvements rather than focusing on accumulating capital in the classic capitalist sense [28]. Thus, social capitalism is the core concept of this research.

Social capitalism is initially considered as a specific institutional arrangement of social intervention, similarly with the notion "welfare capitalism" [29]. It synthesizes a basic commitment to capitalist market relations and a readiness to correct its detrimental effects [30]. The spirit of social capitalism is not merely a specific attitude towards the making of profit, but a peculiar ethic, such as honesty, give and frugality. In the concept of social capitalism, the private market mechanisms characterized by the ownership of common industries are means for the good of all citizens [31]. Claridge [28] defined social capitalism as a socially minded form of capitalism, where the goal is making social improvements rather than focusing on accumulating capital in the classic capitalist sense. In this paper, the social capitalism is conceptualized as a hybrid resource allocation and management mechanism formed by the organization; the mechanism can better realize the values of labor, funding and other resources and achieve the individual and organizational goals by using the social capital.

Conventionally, the research of social capitalism has been focused on obtaining resources, improving competitiveness, and performance for individuals and organizations [32]. Yet, recent studies have begun to focus on the impact of social capitalism on individuals' health and safety. Rao [33] established an accident analysis model to identify the cause of accidents and to shed light on the accident motivation and the failure of organizational control by tracking the safety social capitalism, social networks, and key persons. Vieno et al. [34] analyzed communities' data in Italy and revealed that social capitalism can promote the formation of common values and norms, thus enhancing informal social control and cooperation behaviors and reducing early adolescents' antisocial behaviors. Koh and Rowlinson [15] noted that the cognitive and relational dimensions of social capitalism have a positive impact on project participants' adaption and cooperation and ultimately improve the project safety performance. Nagler [25] collected 10 years of traffic accident data that covers 48 states in the US; the results of empirical analyses show that there is a negative relationship between social capitalism and traffic accidents, and the trust and norms between individuals have a positive influence on drivers' safe driving behaviors.

In summary, social capitalism has an important effect on individuals' and teams' behaviors; however, its effects on construction workers' safety behaviors remain unclear.

2.2. Safety Behaviors

Construction safety behaviors refer to a series of activities made by the on-site workforce when they undertake safety-related tasks or responsibilities. Based on the characteristics of safety behaviors, these actions can be divided into different dimensions, such as safety initiatives and carefulness [35], safety citizenship behaviors [36], safety compliance and safety participation [37], compliance safety behaviors, and proactive safety behaviors [38].

Theoretical research on individuals' safety behaviors stemmed from the 1970s when most scholars adopted a behavioral perspective to improve individuals' and organizations' safety performances [39–41]. Thereafter, this behavioral perspective evolved into the behavior-based safety

theory (BBS) that was widely used in many industries [42–44]. However, the long-term applicability of BBS has been questioned. Smith [45] indicated that a BBS-based approach might have an immediate effect on improving individuals' behaviors in the short term, but would then make them feel manipulated and generate tensions between managers and employees. Furthermore, considering the dynamic and temporary characteristics of construction activities, BBS is faced with increasing challenges [13]. Additionally, in order to improve individuals' safety behaviors, a wide range of factors were also explored, such as organizational climate [37], social comparison feedback [46], psychological contracts [47], social norms [38], and stressors [48,49].

In sum, it can be seen that all these factors are ultimately dependent upon the influences of managers' behaviors on construction workers' safety behaviors. Project managers' behaviors refers to a series of activities taken by the organization or its management layer when executing the functions of the management system. According to Fayol's [50] classical perspective, managers' behaviors include planning, organizing, commanding, coordinating, and controlling. On this basis, Robbins et al. [51] summarized managers' activities as planning, organizing, leading, and controlling, and further distinguish the differences between management and leadership according to managers' roles. More specifically, management behaviors refer to the specific activities taken by managers with the aim to meet production objectives, such as establishing a management system, carrying out employees' education and training, and dealing with daily administrative work. Leadership behaviors mainly refer to the abstract activities taken by managers that mainly focus on shaping the employees' mindset, such as individualized consideration, contingent reward, and intellectual stimulation [52,53].

In the field of safety behaviors research, the importance of managers' behaviors has been recognized [9]. Wiegmann and Shappell [54] established the human factors analysis and classification system (HFACS) and indicated that the root causes of unsafe human behavior were the lack of a management organization and unsafe leadership behaviors; the former includes the loopholes in the management process, poor management culture, and the low level of resource integration, while the latter includes insufficient supervision, inappropriate planning, and ill-timed troubleshooting. As for management behaviors, Vredenburgh [55] collected data from 62 hospitals and identified the six most effective management practices for reducing employee injuries: management commitment, rewards, communication and feedback, selection, training, and participation. Cheng et al. [56] analyzed the construction projects in Hong Kong and revealed the crucial role of safety management committees and safety management process and information. In addition, the important influence of leadership behaviors on project safety performance and employees' injury has received intensive consideration [57–59].

Nevertheless, the influence of the different roles (management and leadership) of project managers' behaviors on workers' safety behaviors has rarely been analyzed, especially for safety-sensitive workplaces such as construction projects. Thus, this paper explores the influences of project manager behaviors on the level of construction workers' safety behaviors.

3. Methodology

An exploratory case study approach was adopted to consider this under-researched area of social capitalism's effects on safety behaviors. Furthermore, this case study approach is more appropriate for discovering new phenomena, especially for the detailed relationships between multiple variables [60]. Case selection is typically based on theoretical sampling instead of random sampling and focuses on the case that conforms to the research question [61]. On this basis, a mixed development project was selected. This project was completed in 2016 by Vanke in Tianjin, China. It is notable that Vanke is a leading developer in China and has been listed on the Fortune Global 500, ranking 307 in 2017. The name of this project was Vanke Wonderland and consists of residential and commercial buildings. The project covers an area of 170,000 square meters and has a gross floor area of 240,000 square meters. The general contractor of this project was Hunan No. 3 Construction and Engineering Co. Ltd., which has won many honors and awards related to safety management.

The reasons for selecting this project are mainly based on the following three aspects. First, this is a large-scale construction project that involves a lot of construction professional teams and workers. It represents China's most common emerging projects that are characterized as long duration, complex construction environment, and massive numbers of on-site workers. Second, the general contractor has had a long-term cooperation relationship with Vanke (the project owner). In addition, most of the contractor's construction teams are in a stable environment. The relatively fixed composition of project participants provides the conditions for exploring social capitalism.

The project information and data were collected mainly in the following ways: (a) collecting the written material about construction safety, including the safety news and reports, safety-related standards and management systems, as well as safety-related meeting records; (b) face-to-face interviews with the project managers and construction workers; (c) questionnaire and data collection. The whole process lasted six months during the mixed-development project as illustrated in Figure 1.

In the first three weeks, we investigated the safety management situation and collected the safety problems records and reports from the project's safety manager. The on-site construction management system shows the organization structure and control flow of safety management. More specifically, a three-level safety management structure includes project manager, safety manager, and full-time safety officer. Among them, the full-time safety officer is responsible for daily safety hazard inspection and communication with construction workers; the safety manager is responsible for weekly safety hazard inspection and organizing weekly safety meeting; the project manager is responsible for safety inspection jointly with the owner and the supervisor and organizing monthly safety meeting. The safety records show that no fatal accidents have occurred in the selected case, but there are several injures.

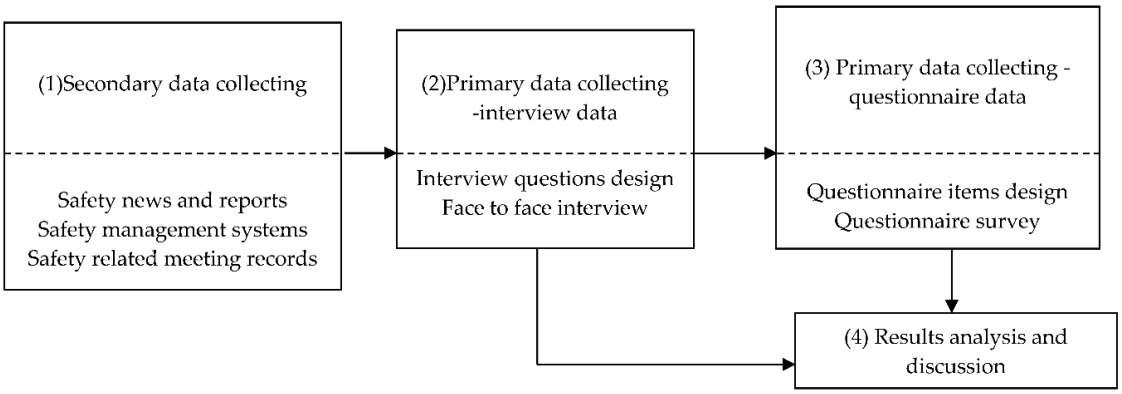

Figure 1. Research process model.

After the above investigation, we designed the interview outline with a set of questions (as shown in Table 1) and conducted a series of face-to face interviews with the project members for twelve weeks. The interview was mainly to explore the opinions of project members on the relationships among social capitalism, managers' behaviors, and construction safety behaviors.

Finally, based on the interview results and literature review, we designed the questionnaire to obtain the structural data for quantitative analysis. The entire questionnaire design and data collection process lasts nine weeks. The details of this parts are shown in the results section.

The interviewee and questionnaire respondents include 5 project managers (including project manager, party secretary, production manager, safety manager, and foreman) and 22 construction workers, as shown in Table 2. It is notable that most construction workers are males in China. Even if there are some females in very few projects, their work is typically less dangerous. In this paper, all the interviewees are males and their opinions are representative.

Table 1. Data collection and coding.

Data Categories	Data Source	Data Purpose	Items and Coding
Secondary data	Written material	Analyzing the safety management system and safety efforts (F1–F6)	F1: Construction safety management system F2: Construction safety standards F3: Safety propaganda material and warn signs F4: Safety related meeting and training time F5: Potential safety hazards investigation records F6: Safety accidents handling records
Primary data	Managers interview	Identifying managers' behavior (F7) Identifying workers' safety behavior (F8) Identifying the social capitalism (F9) Exploring the relationships between social capitalism and safety behavior (F10–F11)	F7: How do you fulfill safety management responsibilities? F8: How about workers safety behaviors in your project? F9: What is the social relationship between managers and workers? F10: Do you care about the workers' opinions on construction safety? F11: Any improvement based on their (workers) complaints?
	Construction workers interview	Identifying managers' behaviors (F12) Identifying workers' safety behaviors (F13) Identifying the social capitalism (F14) Exploring the relationships between social capitalism and safety behavior (F15–F16)	F12: How do managers fulfill their safety management responsibilities? F13: How about the safety behaviors of your colleagues? F14: What is the social relationship between managers and workers? F15: Are your behaviors easy to be affected by managers? F16: Any behavioral change for their (managers) requirements?

In this paper, we adopted three methods to analyze the data: (a) a content analysis for qualitative data to identify the social capitalism and safety behaviors; (b) a questionnaire analysis for quantitative data to explore the relationship among social capitalism and safety behaviors; and (c) a cross analysis for comparing the difference between qualitative data and quantitative data.

Table 2. Summary of interview participants (N = 27).

Items	Classification	Number	Percentage	Items	Classification	Number	Percentage
Sex	Male	27	100.00%	Working years	below 3 years	3	11.11%
	Female	0	0.00%		4–6 years	14	51.85%
Age	18–30 years	8	29.63%		7–9 years	4	14.81%
	31–40 years	6	22.22%		10 years or above	6	22.22%
	41–50 years	7	25.93%	Type of work	managers	5	18.52%
	51 years or above	6	22.22%		workers	22	81.48%
Education	Primary school	1	3.70%				
	Junior high school	5	18.52%				
	Senior high school	11	40.74%				
	College or above	10	37.04%				

4. Results

4.1. Qualitative Data: Content Analysis

To identify the status of social capitalism between managers and construction workers and to explore the relationship between social capitalism and safety behaviors, the semi-structured interview was conducted (as shown in Table 1: coding F7–F16). Based on the interviewees' answer, we carried out a three-level coding: open coding, axial coding, and selective coding [62]. Firstly, we read the interview records and made an open coding for the answers based on the interview items and interviewees. Secondly, we made an axial coding in related to "manager behaviors" (including support, attention, punishment, orders, and regulation), "construction worker safety behaviors" (including obey, participate, help), and social relationships (including communicate, trust, feelings, and goals). Thirdly, considering the dimensions of social capitalism [63], we made a selective coding of the social capitalism and the relationship between managers and construction workers (as shown in Tables 3 and 4).

In the structural dimension, the components of social capitalism can be divided into interaction and contact frequency, network centrality, and information sharing. The project manager shows a high contact frequency with the safety manger, while the safety manager shows a high contact frequency with the construction workers. In other words, the safety manager plays a crucial role in the organizational network that connects the project manager and construction workers.

In the relational dimension, the components of social capital can be defined as trust, reciprocity specification, and organizational identification. Trust means managers and workers believe each other on safety issues; reciprocity specification means they can realize that the rules or orders are made for mutual interests; organizational identification shows that managers and workers are expected to do their best to be a good project member. In the cognitive dimension, the components of social capital can be classified as a common language and shared vision and values. Common language means managers and construction workers show a good level of mutual understanding and similar ways of thinking in dealing with safety issues; shared vision and values means the common ideal and pursuit of safety. As shown in Table 3, there are some inconsistencies between managers and workers in terms of the shared values.

Table 4 shows the relationship between the social capitalism and safety behaviors from the viewpoints of the project managers and construction workers. According to the content of behaviors, the managers' safety behaviors have been divided into leadership behavior and management behavior, and the construction workers' safety behaviors have been divided into safety compliance and safety participation. During the interview, it can be seen that both safety compliance and safety participation are impacted by the managers' leadership and management behaviors. As for the effects of social

capitalism, it can be seen that construction workers' perceptions of managers' attitude, communication, and the relationship between managers and workers all play a positive role on construction workers' safety behaviors.

4.2. Quantitative Data: Questionnaire Analysis

In order to further analyze the relationships among social capitalism (SC), workers' safety behaviors (WSB), and managers' behaviors (MB) in a holistic and objective way, a questionnaire was designed (as shown in Table 5), and all the questions were assessed using a 5-point scale from 1 (strongly disagree) to 5 (strongly agree).

The data between managers and workers show slightly different results. Compared with workers, project managers provide more positive feedback on SC, WSB, and MB (as indicated in Table 6). This might be caused by the fact that managers tend to form a sense of self-worth on project works.

The following data analysis process integrated the score from project managers and workers to minimize the potential bias of a certain group of interviewees. Then, a principal components analysis was carried out with the aim of verifying the reliability of the variables (i.e., SC, WSB, and MB). Each variable's Cronbach's α was calculated. As shown in Table 6, all variables' Cronbach's α were above 0.600, indicating that the data has an acceptable reliability. The Cronbach's α value is relatively low, which might be due to the small sample size.

To quantitatively analyze the relationship among social capitalism and safety behaviors, considering the samples, we adopted the Pearson correlation method which is more robust than the Mander's overlap coefficient on correlation analysis [64]. Table 7 shows project managers' leadership behaviors are positively correlated with workers' safety participation behaviors ($\beta = 0.566$, $p < 0.01$) and cognitive social capital ($\beta = 0.585$, $p < 0.01$), while project mangers' management behaviors are only positively correlated with workers' safety compliance behaviors ($\beta = 0.749$, $p < 0.01$). Moreover, workers' safety compliance behaviors are positively correlated with structural social capitalism ($\beta = 0.461$, $p < 0.05$) and cognitive social capitalism ($\beta = 0.411$, $p < 0.05$), while workers' participation behaviors are positively correlated with relational social capitalism ($\beta = 0.599$, $p < 0.01$) and cognitive social capitalism ($\beta = 0.536$, $p < 0.01$). In addition, the correlation is positive between the relational social capitalism and cognitive social capitalism ($\beta = 0.551$, $p < 0.01$).

Table 3. Components of social capitalism.

Dimensions	Components	Examples of the Social Capitalism Quotations
Structural dimension	Interaction and contact frequency	Project manager: I communicate with safety managers every day and have less contact with construction workers; Safety manager: I communicate with construction workers everyday.
	Network centrality	Project manager: everyone is a safety officer, anyone can directly tell me construction safety hazard problems; Safety manager: as the principal responsible person for safety issues, I am the core contact between the project manager and workers.
	Information sharing	Safety manager: we will hold a safety meeting for construction safety every day before working and talk about safety hazards; Construction workers: I will communicate with managers or colleagues timely if I find a safety problem;
Relational dimension	Trust	Project managers: we believe that most workers would comply safety regulations; Construction workers: I believe that mangers would consider my safety when they make policies and orders;
	Reciprocity specification	Safety manager: I will treat every worker fairly, and try to help solve their problems; Construction workers: sometimes safety rules are too strict, but I know it is good for me;
Cognitive dimension	Common language	Safety manager: mostly, construction workers can understand orders and requirements of construction activities well; Construction workers: I can understand mangers' orders basically;
	Shared vision and values	Project managers: most construction workers can work in accordance with project objectives; However, some workers have weak discipline, complain about the safety rules, and always make themselves comfortable and convenient (i.e., smoking at work); Construction workers: I will do my best to obey the managers' rules and achieve the project target;

Table 4. Relationships between social capitalism and safety behaviors.

Variables Relationship	Examples of Influencing Relationships
Leadership behavior → Safety compliance	The more attention and support for managers on safety issues, the more severe the punishment, the more likely workers will observe the safety standards.
Leadership behavior → Safety participation	The more attention and better reward system, the more likely workers will participate in safety meetings and focus on the safety of project departments
Management behavior → Safety compliance	The implementation of safety management systems has a promotion effect on workers' compliance with safety regulations.
Management behavior → Safety participation	The above management behaviors will attract the attention of workers to others' safety. I will try to avoid safety problems at work.
The effects of social capitalism	Leaders' attitudes play an important role in the obedience of workers. If leaders have a positive attitude, the workers usually obey the rules. The communication times between managers and construction workers will also affect safety compliance. The better the relationship between leaders and workers, there is more consideration for workers. The elderly workers are more inclined to comply with the regulations and consider the overall safety of the project, while the young workers are underperforming in related to safety.

Table 5. The items of the questionnaire.

Variables	Items	References
Managers' behavior (MB)	MB1: discuss values with workers MB2: individualization attention to workers MB3: hierarchical rewards and punishment according to workers' behaviors MB4: make quick response to construction safety problems MB5: safety management person-post matching MB6: regular safety inspection on key positions MB7: regularly organize safety education and training	[53,65,66]
Workers' safety behavior (WSB)	WSB1: observe the safety construction rules WSB2: obey the superior's orders WSB3: report risk, injuries and accidents timely WSB4: participate in safety environment improvement activities WSB5: participate in safety meetings and training WSB6: encourage colleagues to work safely	[37,38,67]
Social capitalism (SC)	SC1: know well about team members SC2: easy to establish contact and communication with others SC3: the proportion of team members keep in touch SC4: cooperate with team members sincerely SC5: trust the team members SC6: the team has common language that can communicate effectively SC7: have the same goals with the team	[15,63,68–70]

Table 6. The score of the variables.

Managers' Behaviors	Score from Managers	Score from Workers	Workers' Safety Behaviors	Score from Managers	Score from Workers	Social Capital	Score from Managers	Score from Workers
MB1	4.40	4.09	WSB1	4.40	4.05	SC1	4.00	4.32
MB2	4.80	4.00	WSB2	5.00	4.00	SC2	4.20	4.05
MB3	5.00	4.55	WSB3	4.00	4.09	SC3	4.40	4.32
MB4	4.20	4.18	WSB4	4.80	4.14	SC4	4.40	4.23
MB5	5.00	4.05	WSB5	4.60	4.23	SC5	4.40	4.14
MB6	4.00	3.95	WSB6	4.00	3.91	SC6	4.40	4.36
MB7	4.40	3.95				SC7	4.40	4.27
Average score	4.54	4.11	Average score	4.47	4.07	Average score	4.31	4.24
Cronbach's α	0.621		Cronbach's α	0.625		Cronbach's α	0.627	

Table 7. Pearson correlation among the variables (N = 27).

Variables	Project Managers' Behaviors		Workers' Safety Behaviors		Social Capital		
	Leadership	Management	Safety Compliance	Safety Participation	Structural	Relational	Cognitive
Leadership	1.000	0.246	0.247	0.566 **	−0.015	0.298	0.585 **
Management		1.000	0.749 **	0.379	0.246	0.315	0.379
Safety compliance			1.000	0.261	0.461 *	0.279	0.411 *
Safety Participation				1.000	−0.017	0.599 **	0.536 **
Structural					1.000	0.238	0.162
Relational						1.000	0.551 **
Cognitive							1.000

* The correlation in significant at a level of 0.05 (2-code); ** The correlation in significant at a level of 0.01 (2-code).

4.3. Cross Analysis

The results of the interview analysis have identified the components of social capitalism, and further indicated that project managers' behaviors and social capitalism typically have an impact on construction workers' safety behaviors; however, the questionnaire data and the results of the Pearson correlation analysis show that different types of project managers' behaviors and social capitalism have different impacts on construction workers. Leadership behaviors are more likely to influence safety participation rather than safety compliance behaviors, while management behaviors only influence safety compliance. Structural social capitalism and cognitive social capitalism are more likely to influence safety compliance, while relational social capitalism and cognitive social capitalism tend to influence safety participation.

Safety participation means that the construction workers show great concern for the surrounding safety environment and tend to take active actions against safety issues [37]. This is different from the safety compliance that includes the observance of safety regulations, safety systems, and safety directives. More specifically, safety participation focuses on the construction workers' behaviors that aim to benefit others as well as the behaviors that are not deemed mandatory by company rules. Leadership behaviors provide opportunities for construction workers to communicate and cooperate with each other, thereby creating an atmosphere of mutual respect, trust, and understanding [58] The support from project managers helps construction workers develop a psychological attachment and the internalization of the goals and values of the project [71,72]. Management behaviors refer to work plan, safety organization setup, labor arrangement, safety system development and implementation, safety work coordination, and communication [55,56]. The management behaviors are the most direct and effective influencing factors that facilitate workers' safety compliance [54].

5. Discussion

The research examined the influence among social capitalism, mangers' behavior and construction safety behavior by using content analysis, questionnaire analysis and cross analysis. Based on the nature of the behavior, managers behaviors can be divided in to leadership behaviors and management behaviors [51,53,54]. Construction workers' safety behaviors refer to a series of activities made by the on-site work force when they undertake safety-related tasks or responsibilities. These behaviors can be divided into safety compliance and safety participation. [37]. The results indicate that leadership behavior has a significant effect on both safety compliance and safety participation. Nevertheless, management behavior only has a significant effect on safety participation.

The social capitalism differs from social capital. It is a management or resource allocation mechanism embedded in an organization or individual minds; and people can use it to accumulate social capital and achieve their goals. The social capitalism can be divided into three dimensions, and different dimensions of social capitalism influence construction workers' safety behaviors in different ways. First, structural social capitalism refers to the frequency of contact and the convenience and effectiveness of the communications between project managers and construction workers [68,70]. An effective top-to-bottom communication mechanism is expected to help workers form a better understanding of project goals, culture, and systems [72]. Accordingly, construction workers tend to consider the safety issues when in the position of managers; thereby, the latter would be more likely to "repay" the former by better complying with safety rules and standards. Thus, structural social capitalism will promote workers' safety compliance. Second, the relational dimension of social capitalism refers to the trust, affection, and mutual help between project managers and construction workers [69,73]. When project managers stand in the position of construction workers to establish safety management systems and to solve construction safety behavior problems, it can be expected that the workers are more likely to experience a volitional sense of attachment and responsibility to project safety goals [74]. Michael et al. [75] noted that the relationship between project managers and workers may have more influence on workers' safety behaviors than merely professional communications. Third, the cognitive dimension of social capitalism refers to the common language, vision, and values

formed between project managers and construction workers [63,73]. The cognitive aspects of safety issues are all driving factors in safety-related work and provide effective guidance for the safety behaviors of project managers and construction workers. Through the aforementioned analysis, the safety behavior model of construction workers is established (as shown in Figure 2).

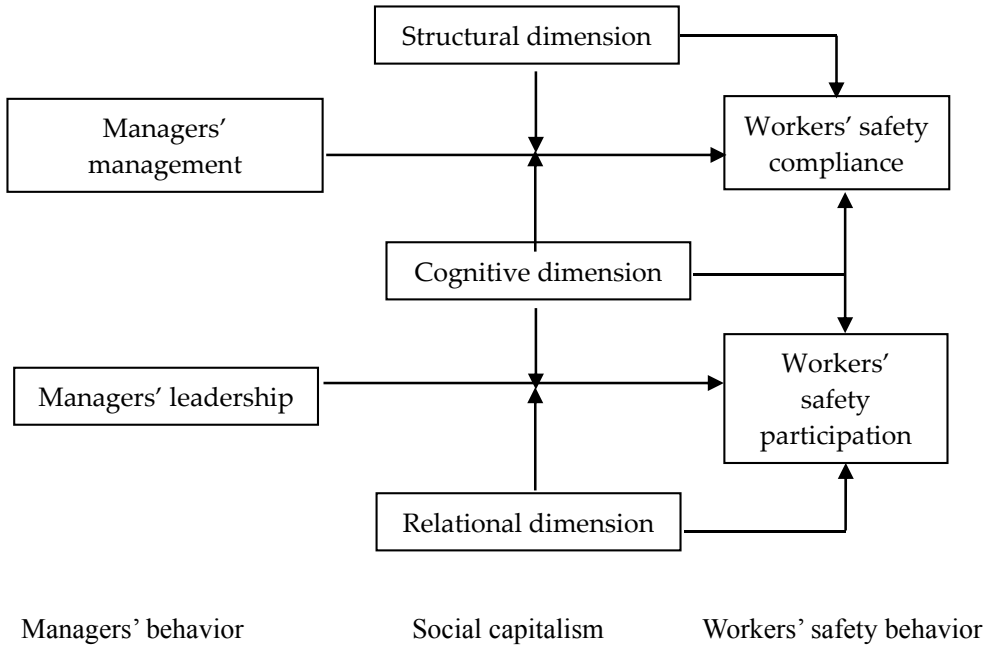

Figure 2. The social capitalism and safety behaviors model.

This paper also contributes to the research on adopting social capitalism into managing human behaviors. Of special note is "guanxi" (relation), which has had an important role in social activities for a long time, especially eastern countries such as China. In the current study, social capitalism provides a detailed application of "guanxi" in construction safety management. Given the importance of social capitalism for safety management in construction projects, there is a need to gain a better understanding of "how social capitalism influences project team cooperation and safety performance". This paper responds to the unanswered call from Kob and Rowlinson [15,16]. The results also reveal that social capitalism can promote individual contact and communication and thus improve people's feelings and project identification; relational social capitalism will encourage workers to form relationships and trust others. It extends the trust of social capitalism to help coordinate public transport activities and regulate drivers' behaviors [25].

6. Conclusions

The research has identified different influences on construction workers' safety behaviors and determined that social capitalism has a significant influence on construction safety behaviors. An explanatory case study was adopted from a mega construction project in Tianjin, China. The semi-structured interviews and questionnaires of safety behaviors and social capitalism were designed and a theoretical model was established based on the case study. The influence of social capitalism between managers and workers can be divided into three aspects: structural dimension, relational dimension, and cognitive dimension. The structural dimension, which describes the interaction, communication, and information sharing between project managers and construction workers, has positive effects on workers' safety compliance behaviors. The relational dimension, which describes the trust relationship, reciprocity norm, and organizational identity formed between project managers and construction workers, has positive effects on workers' safety participation behavior. The cognitive dimension, which describes the common language, vision, and values formed

between managers and constructors, has positive effects on workers' safety compliance and safety participation behavior. Therefore, construction project managers should pay attention to cultivating social capitalism in the work team instead of just relying on mandatory orders or rules.

Notwithstanding with the clear research contributions, the current study has several limitations. It is essential to recognize that all the data were collected from a single project, and the sample size is relatively small. Therefore, the results might not be suitable for different social and political contexts in other projects or countries. Future studies could extend and use the research findings for analyzing longitudinal data to validate the reliability of observed correlations.

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