Response to Reviewers’ Comments
The reviewers’ comments are in **Bold**. The newly-modified content in the article is in **Red**.

Reviewer 2#

Overall, it is a well-written abstract that makes the reader interested in IGCW.

1. **The results indicated the improvement in several categories, but it might be a good idea to quantify or compare to previous results how it changed and what the metric was.**

   **Response:**
   Thanks for the reviewer’s comments. The authors have revised the discussion in Section 5 and reorganized this part with subsections to show the improvement in each category, such as types, characteristics, and so on. Section 5.1 is the theoretical and literature support for the result, which means the same result compared with historical literature. Section 5.2 is the particularity of IGCW compared with other industries, which means the changes compared with previous results. The revised content can be shown as follows.

5.1 **Theoretical and literature support for the result**
Through the grounded theory coding method, this paper systematically investigated the existence of IGCW. Some identified codes were supported by the previous studies. For example, the characteristics of instability and spontaneity [8, 10, 35], the types of interest, hobby, and friendship group [9, 29], the causes of emotional needs and the limitation of formal organization [11, 34, 37], the functions of improving the efficiency of information exchange and easing work pressure [6, 8, 40]. Moreover, the issue that many formal groups have evolved from informal groups nowadays was also manifested by Barnard [8]. As pointed out by partial respondents, at first, the workers followed the ganger or fellow of their own villages to work on various construction sites or were introduced to the sites. Gradually, the team grew into formal teams and was registered in labor companies. Also, this paper reaches a consistent conclusion about the idea that leaders formed spontaneously in informal groups can solve many problems that cannot be solved in organizations [34]. Given research in the construction industry, the geographical and kin characteristics of construction workers mentioned by some scholars have also been verified in the data analysis of this paper [14]. In addition, some roles of informal groups in the construction industry analyzed by other researchers directly or indirectly are also supported, such as reducing work pressure [19, 20], restraining workers’ safety behavior [5, 16], affecting workers’ cognition [5], threatening the interests of formal organizations [20], spreading gossip [42], etc.

5.2 **The particularity of IGCW compared with other industries**
In addition to the above consistent research conclusions, it can also be found that the IGCW has its particularity. This paper constructs an overall theoretical framework for the IGCW. These identified subcategories are much more specific and targeted than existing research which discussed the theory of universality only. In terms of types, the sorts of hobby groups are more single. There are only drinking groups and mahjong groups due to geographical constraints. The form of interest groups is more definite, basically only two groups: “small subcontracting” and “claiming back salaries”. And geopolitical as well as kin groups are especially prominent and account for the vast majority of IGCW, which is the biggest distinction from other enterprises. Nevertheless, some informal groups indicated by previous findings such as strategic and conservative groups [31] are almost nonexistent among construction workers.
In terms of characteristics, there is a big difference about the formation reasons of informal leaders. In the construction industry, the most important attribute of being an informal leader is the ability to find jobs and workers instead of management skills and others. And instability, conformity and poor identifiability are also more obvious in contrast to factories. Moreover, the IGCW is characterized by distinct distance proximity that working at the same pace, eating and living together create favorable conditions for informal groups to emerge. This feature of informal groups is more dominant in the construction industry. Since most construction workers are far from hometown, their inner emptiness and insecurity make them have a stronger sense of community than employees of other businesses.

In terms of causes, the highly mobility of construction workers allows them to obtain less demand fulfillment in organizations. This further encourages construction workers to form informal groups to meet their unmet needs. Remote geographical environment and short supply of entertainment facilities both make them more in need of emotional sustenance. The close co-workers around them have almost become their only channel to express their emotions. In addition, the low threshold of construction is also a particular reason differed from factory enterprises. There are a variety of workers with different backgrounds and experience and those with similar backgrounds spontaneously come together.

In terms of functions, this article presents a clear framework for the IGCW and divides the influence degree of functions into three levels integrated with the actual work situation of construction workers. However, previous studies do not grade the strength and weakness of functions according to workers’ characteristics. Furthermore, by corresponding every positive and negative effect of informal groups, the double-edged sword characteristics of informal groups are more clearly displayed. Detailed analysis of each function provides a more concrete understanding of the role of informal groups in construction organizations. In particular, the function of solving many specific problems encountered on construction sites is quite remarkable. For example, informal group relations can be used to quickly recruit employees for the enterprises. On the contrary, the negative effect of riots in project department is also more typical than that of other enterprises. High mobility makes them less awed by construction businesses.

In terms of definition, the formation of IGCW is mainly based on geography and kinship, and then form various informal groups. Moreover, there are two obvious time nodes that urge construction workers to form informal groups, which are determined by the nature of the construction industry. The two time-node are respectively before and after sites arrival, and when there are interest infringement or subcontracting. This is different from the formation mode of informal groups in most other enterprises. Informal groups are gradually formed through contacts and communication after coming to companies. Therefore, it is essential to take into account the characteristics of industry and employees to study informal groups, especially in some typical industries. Some noteworthy issues found during the interview will be discussed in this section. Above all, there is a phenomenon in the construction industry, where workers get to know some workmates at this site and will form a closer informal group if they work together at a new site. Simultaneously, the exclusiveness of informal groups formed among construction workers is significantly weakened compared with that in most other enterprises. Workers are willing to make friends on the job site because the construction industry requires them to have their own professional circle to introduce jobs with each other.

Interestingly, when asked if the workers were afraid to communicate with the administrator, the
manager’s and the workers’ responses were divided. For one thing, the workers said that they will feel distant from the managers in their hearts, and they are afraid to communicate with the managers’ heart to heart and become friends. And managers responded that workers are not fear to communicate with the management, they are only not willing to do so. But if they encounter problems, they will directly contact them. Manager Ⅱ-1 stated that workers’ wages are three times as high as theirs, and workers have no inferiority complex at all. Manager Ⅲ-3 revealed that if technicians say something wrong, the workers will point it out directly with no fear. Manager Ⅲ-2 also provided insights into that before 2000, workers may have the mentality that they are afraid to share with managers, but now they find the project department to solve their problems immediately. Therefore, fear or unwillingness to communicate with managers is not the reason why workers form informal groups.

There is also a general perception in Chinese construction industry that mentorship groups are very common. Nevertheless, according to this interview, such informal group has gradually dwindled, sometimes to zero. Worker Ⅴ-3 and Manager Ⅳ-2 demonstrated that there were more teachers and apprentices before the 1960s and 1970s, but now there are fewer. Nowadays, young people come to construction sites to learn construction and management, and hardly learn craftsmanship. Worker Ⅰ-2 indicated that those with high technical content, such as masonry, plastering, and carpenters, are basically old masters. Manager Ⅴ-1 stressed that the time limit of construction sites is quite tight, so they should call the skilled worker to do directly. And he didn’t see the masters coming with their apprentice. Worker Ⅱ-3 also reported that despite having a mentoring relationship, they are unlikely to work on a construction site. Furthermore, groups of classmates and comrades-in-arms relationships are also less common on the site. Worker Ⅴ-6 expressed that they have low levels of education, so they don’t have many classmates. Worker Ⅳ-4 supplemented that although classmates or comrades-in-arms engaging in this industry, there are few opportunities to encounter a construction site. Consequently, informal groups of social relations such as classmates, teachers, and apprentices rarely exist. In addition, another kind of aspirational and faith-based informal group is invisible among construction workers according to participants. Manager Ⅲ-1 illustrated that construction workers have been immobilized and have no ambition, just want to earn more money to go home this year. And all interviewees expressed that few workers believe in religion. Despite workers share a collective religious belief, they do not come together to form informal groups but hide in their hearts.

2. The result is vague and it doesn't specify what is the impact of IGCW. A lot of promising improvements were claimed in the result statements.

Response:
Thanks for the reviewer’s comments. The authors have complemented the specific impact of IGCW in Section 4.4 and 5.3. The results are clearer through the discussion in Section 5.2. This paper mainly aims to obtain the theoretical framework of IGCW, including definition, types, characteristics, causes and functions. Specific results are as follows. Definition: IGCW refers to the group spontaneously organized by workers to go to work on construction sites for their livelihood based on blood relationship or geographical relationship, also refer to the group naturally formed by the common hobbies, interests and harmonious coexistence of the workers in the process of interacting with each other on the site. It is neither approved by the organization nor has a fixed organizational structure, but takes emotion as the link, and there will be natural
leaders and have an essential influence on the operation of formal organizations. Types: Geopolitical group; Kin group; Hobby group; Friendship group; Interest group. Characteristics: spontaneity; diversity; intersection of members; Naturally formed core leaders; Instability; Strong sense of group; Conformity; Poor identifiability; Distance proximity; Fast information transmission. Causes: 1) Due to the temporary employment of construction workers, there is a general “traveler mentality” among them, and they cannot be satisfied in the organization except for the needs of work. 2) They tend to form informal groups to help each other or complain about work more due to the remote geographical location and harsh working environment of construction. 3) The low threshold of construction makes the quality of workers uneven. Workers with similar living background or experience naturally gather together. 4) A large number of workers live and eat together, and the proximity of time and space allows more opportunities for contact and interaction. Functions: 1) Positive: Members of informal groups are the spiritual backbone of workers working outside. Negative: Quickly forming interest groups to make trouble in the project department. 2) Positive: Solving many specific problems according to local conditions and time and ensuring work progress. Negative: They will go on strike if the workers are not satisfied and must solve the problem. 3) Positive: Reducing the workload of managers and making up for the insufficiency of managers' work. Negative: Divergences arise when disagreements occur, which weakens the power of managers. 4) Positive: Strong appeal within informal groups can restrain workers' bad behavior. Negative: Imitating members' illegal operations and blindly following the crowd. 5) Positive: Facilitating the communication and flow of information among workers. Negative: Disseminating false and unrealistic information to the detriment of interests of enterprises. 6) Positive: Strengthening workers' sense of belonging to the labor company to a certain extent. Negative: Affecting the overall unity of the construction site.

4.4 Functions of IGCW

In line with the grounded theory method, interview information was analyzed repeatedly. Ultimately, three levels of incidence which include six positive effects and the corresponding negative effects on companies or workers are identified from high to low. In general, IGCW have a great positive effect on both enterprises and workers themselves. But in some cases, these positive effects can spill over into negative ones. The results encoded are shown in Figure 6. All functions subcategories in the diagram are described as follows minutely. In addition, functions of “petty leaders” in informal groups on workers are also expounded.
The first level: As a high-risk industry, most workers are far from home and relatives to work here, bearing certain mental stress. Informal groups provide a channel for workers to release their feelings such as irritability and depression. In these groups, workers are given a certain status and identity, meeting social needs of workers and becoming the spiritual pillar of workers working outside. For example, all interviewees responded that forming informal groups with co-workers can make them feel dependent. And when they encounter difficulties in work or life and feel upset, the first thing they think about is members of informal groups, as stated by the majority of interviewees. Manager I-I also reported that chatting with members of informal groups is a major way for workers to relieve stress, relax and reduce loneliness. Unfortunately, it is the presence of these informal groups on the site that allows workers to quickly form an interest group to cause trouble. However, this only happens when workers’ interests are infringed, such as wages are not paid on time.

In addition, since there are many variables in the construction industry, the existence of informal groups can solve plentiful specific problems encountered on sites. Firstly, workers and their relatives, friends and fellow townsmen come to the construction site in groups, which can quickly meet the needs of project construction. Manager III-1 and Worker IV-3, for example, cited that...
Informal groups are good for project completion and can call in workers. Next, informal groups have high execution, high efficiency and fast progress due to their strong cohesion. Almost all managers indicated that these two points are the greatest benefits of informal groups. Thirdly, when sites meet the urgent task, the informal group formed can rapidly organize to solve the problem and save the construction period. That is, an interest type of informal group is introduced in 4.1.5. This is a win-win situation for workers and project departments. Nevertheless, it is precisely because they exist as a group that when they are not satisfied, they will strike en masse. This has a huge impact on the progress of projects and is a potential hidden danger for enterprises, as mentioned by Manager V -2.

The second level: The presence of workers as informal groups reduces the burden on managers. Manager IV -1 emphasized that scattered workers are difficult to manage, which increases the difficulty of management virtually. Meanwhile, informal groups can make up for managers’ lack of work. An obvious example revealed by participants was that “When working with well-connected co-workers, their moods are pleasant, the working atmosphere is harmonious, and the working efficiency will be improved accordingly.” Manager II -2 supplemented that it is excellent for enterprises to form informal groups because there won’t be too much contradiction between them and problems can be solved internally. Worker I -1 also added that “When my work style is different from that of other workers, members will advise me how to be efficient.” Moreover, nor will it have a negative impact on the implementation of the project. However, this may weaken the power of managers to some extent. In other words, workers listen more to “petty leaders” of their informal groups than to managers when opinions diverge.

In addition, informal groups have a strong appeal to their members. Workers will comply with opinions of members of informal groups and tend to act consistently with them as far as possible. A simple example was cited by Manager III-3 that, “Some workers do not like to wear safety helmets, members advise him to wear he will choose to wear.” Another example was cited by Manager III-1 that, “Some workers do not operate according to the standard in order to be quick or because they have formed bad habits. Good workmates persuade him to follow the normal operation, he will also try to correct.” Unfortunately, some bad habits, such as ignoring quality problems of engineering or wasting materials for the sake of ease, are also easy to be imitated by members. And one person’s negative emotion can easily affect other members, thus reducing the work enthusiasm of the whole group. Hence, the role of informal groups in restraining members’ behavior is a double-edged sword.

The third level: As stated in section 4.2.7, the existence of informal groups absolutely promotes the dissemination of information within enterprises. For instance, the vast majority of workers said they would discuss their work problems with close colleagues in private. However, it is exactly because of the extensiveness and permeability of informal communication that some information will be distorted in the process of dissemination, which will eventually damage interests of enterprises. Manager V -2 illustrated a practical example that workers heard that the design of Party A had been changed and they had no work to do, they immediately contacted other relatives and friends and went to another construction site. This will seriously affect the construction schedule. Other managers also pointed out that sometimes misinformation can cause quality defects.

In addition, the mobility of workers makes them have little sense of belonging to the enterprise, but the presence of informal groups on the site can alleviate this situation to some extent. Some
workers stated that it is precisely the presence of these informal group members that make him feel like he belongs here slightly. Informal groups have strong cohesion because of effective internal communication and emotional cultivation. Unfortunately, it is not conducive to solidarity among informal groups. In severe cases, it may lead to the evil practice of cliques and gangs. Manager III-1, for instance, cited that at their construction sites, workers from Chongqing, Sichuan province looked down on local workers, thinking they were poor at their jobs. To sum up, informal groups will influence the construction period, cost, quality and safety of projects especially safety and the construction period by intervening workers in many aspects, such as construction behavior, construction efficiency, information dissemination channels, etc. Therefore, managers should consciously play the role of informal groups to facilitate organizational goals.

5.3 Management insights
With the improvement of people’s living standard, regarding construction workers as “economic people” traditionally and the limitations of using the money to manage workers are gradually exposed. Through the above analysis, it is found that informal groups are particularly significant in the construction industry. Nowadays construction workers have social needs as well as material needs. Although the turnover rate of construction workers is very high and the composition of informal groups can change rapidly, new informal groups will constantly be generated to affect the behavior of workers and the organizational goals of enterprises with the circulation of workers. It is precisely because of the strong turnover of construction workers that they lack a sense of belonging and identity to the enterprise, and the management effect is often poor only from the organizational level. Consequently, contractors should make use of the role of informal groups with emotion as the link to improve the management efficiency of workers.

The significance of this article lies in: On the one hand, based on the existing behavioral science theories and considering the industry characteristics, this paper constructed the informal group theory of construction organizations. This further enriches and refines the existing theoretical research, such as Mayo’s human relations theory, Barnard’s social system theory and Simon’s decision theory, as well as opens up a new perspective for the further research of behavioral science theories and modern organizational theories. On the other hand, if contractors understand the characters and functions of IGCW and their informal leadership, they can implement management more pertinently so as to promote their advantages and avoid their disadvantages. In other words, managers can carry out targeted education for various types of informal groups and be good at utilizing their characteristics to help achieve organizational goals. Specific measures can be taken from the following aspects: Firstly, contractors or people in charge of the labor companies may consciously arrange the relatives, friends, and fellow-townsman with good relationships to work and live together, which reduces conflicts of interest such as wage allocation. And it is more conducive to teamwork so as to improve construction efficiency. Secondly, the strong sense of group consciousness and the binding force of informal groups can be employed to regulate inappropriate behaviors of workers by supervisors. Thirdly, it is a good idea to disseminate safety knowledge in informal groups and raise workers’ safety awareness through the appeal of members. Furthermore, because of the strong mobility and low level of education, workers are lack of inner obedience to managers and informal leaders tend to have more influence over them. Contractors thus can utilize the influence of informal leadership to persuade workers,
making them useful helpers. Ultimately, recreational activities such as drinking and playing mahjong may easily lead to insufficient rest and lack of concentration at work, which may lead to unsafe behaviors and low production efficiency. Managers can pay special attention to and educate these groups. Targeted education often works better than mass education. In summary, this study establishes a solid foundation for following related studies and is universal and extensible in the construction industry of most developing countries like China.

3. **NVivo acronym should be explained when the author(s) use it for the first time in the paper.**

   **Response:**
   Thanks for the reviewer’s comments. The authors have given a corresponding explanation for the acronym of NVivo in Section 3.3. And the authors have also proof read the whole article to guarantee an explanation when the acronym used for the first time in the paper. The added explanation can be shown as follows.

   The analysis followed Strauss and Corbin’s coding paradigm involving a three-stage coding process which is respectively open coding, axial coding, and selective coding [23]. NVivo (a powerful qualitative analysis software that can help analyze various data when using qualitative research methods) was utilized as a subsidiary tool of the coding process.

4. **It may help the general audience if the author(s) give a short example of IGCW**

   **Response:**
   Thanks for the reviewer’s comments. The authors have given a short example of the IGCW in Instruction. The added example can be shown as follows.

   This paper calls them informal groups of construction workers (IGCW). For example, most construction workers come from the same hometown for work, and the relationship between formed them is a typical informal group [14]. Moreover, the gathering of workers due to common interests is also an informal group.