

## ANALYZING THE FACTORS INFLUENCING TRUST IN A CONSTRUCTION PROJECT: EVIDENCE FROM A SINO-GERMAN ECO-PARK IN CHINA

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**Abstract.** Trust is regarded as a critical feature and a central mechanism in business transactions, especially in the Chinese *guanxi* network. In this context, the major objective of this research is to explore the key factors influencing trust in different stages of a construction project from the perspectives of owners and consultants involved in a Sino-German eco-park in China. The analytic network process (ANP) was employed to assess which factors are most closely related to trust and to establish four models to meet the objective of this study. According to the ANP results, trust is strongly influenced by factors that are associated with the mutual interests between owners and consultants. In addition, there are certain differences in the priority of the factors influencing initial trust between owners and consultants, but these gaps gradually decrease over time. The weight of *guanxi* also decreases over time, and the owners' and consultants' *guanxi* transforms from out-group to in-group focused.

**Keywords:** trust, influence factors, *guanxi*, Sino-German eco-park, construction project, China, analytic network process (ANP).

### Introduction

Trust has been found to be a key feature and a central mechanism in business transactions, especially in the Chinese context (Jin, Ling 2005). Trust is regarded as a rational choice, a social and cultural phenomenon, and a psychological status that is related to national values (Girmscheid, Brockmann 2010; Harris, Dibben 1999). In the new institutional economics system, Williamson (2000) divided institutions into four levels or categories: (1) social or culture embeddedness; (2) basic institutional environment; (3) institutions of governance; and (4) resource allocation and complementation. The first level, or the informal institution level, mainly includes the norms, customs, mores, and traditions, and has far-reaching impact on the other three levels (Williamson 2000). The second level, or the formal institution level, reflects the constitutions, laws, and property rights (Williamson 2000). Indeed, China is characterized by a relatively ineffective legal system, strong collectivism and high power distance (Cao, Lumineau 2015). It seems that formal institutions and informal institutions are complementary in China, whereas these institutions are independent in Western countries, where there is a greater focus on formal institutions and individualism. Additionally, Chinese people are more concerned with relationship marketing in “*guanxi*”

networks that are deeply embedded in construction enterprises (Badi *et al.* 2017). On the one hand, in order to maintain a *guanxi* network, the Chinese pay more attention to “*mianzi*” and “*renqing*” in an exchange (Luo 1997; Hwang 1987; Wang 2007). On the other hand, they prefer to minimize ambiguity through mutual discussion or mediation rather than with formal contract agreements (Sullivan, Peterson 1982) due to the high imperfections in institutions and the legal system (Luo 1997; Wang 2007). In summary, trust plays a vital role in Chinese construction projects, and Chinese people may regard the use of contract agreements as evidence of mistrust and the use of conferment as enhancing trust (Sullivan, Peterson 1982) especially in resolving ambiguous and unpredictable problems. Meanwhile, *guanxi*, as an informal institution, has an important influence on trust. Hence, the formation of trust is influenced by the institutional environment and its efficiency has a strong impact on the field of construction project management.

In recent years, a considerable amount of literature related to trust has emerged addressing construction projects. These studies mainly emphasize the efficiency of trust. The results suggest that trust is the core factor of interpersonal relationships and transactions (Girmscheid,

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Brockmann 2010; Cheung *et al.* 2011) and is a basic component and facilitator of social interaction. Furthermore, trust is regarded as a predictor of project performance, project effectiveness, stakeholder satisfaction, creativity, problem resolution, open knowledge and information, and project success (Rezvani *et al.* 2016). In an inter-organizational relationship, trust is regarded as a key factor that positively affects external knowledge acquisition, promotes project innovation, lessens project risk, reduces barriers to interdependence, and supports information exchange without the full monitoring of project team members (Maurer 2010; Thorgren, Wincent 2011). In stakeholder-oriented governance, a higher level of trust reduces transaction costs (Thorgren, Wincent 2011). Trust in a contractual relationship can facilitate the exchange of information and reduce the need for external control and its associated costs (Aubert, Kelsey 2000). However, Harris and Dibben (1999) consider the development of trust to be an iterative process in which the achievement of trust in earlier stages promotes the development of trust in later stages. In the stage of initial trust, reputation, common experience, and working expectations have important impacts (Campo *et al.* 2014). Simultaneously, open information and communication sharing, self-ability, detailed contractual agreements, performance supervision, and severe sanctions for non-conformance strengthen the motivation for cooperation among team members (Buvik, Rolfsen 2015; Kadefors 2004), thus improving the level of trust in early stages.

Although previous researchers have made achievements in the field of the contributions and driving factors of trust, there is still a gap regarding the establishment and development of trust among construction project participants based on the Chinese guanxi network. This paper fills that gap. First, the factors influencing trust were divided into personal propensity, ability, benevolence and integrity categories based on a literature review and interviews. Then, the interdependence of elements was discussed to establish an analytic network process (ANP) network model. To this end, an expert panel was organized that brought together the main participants (owners

and consultants) in a Sino-German eco-park. During this process, the respondents identified the elements and established their relationships with each other. Meanwhile, data were collected by the rule of fundamental scale. The collected data were analyzed using Super Decisions® software version 2.6.0 to assess the prioritization of the factors influencing trust. The findings of this paper are expected to guide and provide a reference for future practice, especially in cross-border projects.

## 1. Theoretical background

### 1.1. Key factors influencing trust

Trust is regarded as multidimensional and dynamic, and its formation is an iterative process. Key factors influencing trust are not constant but are changeable based on an increase in cooperation duration. Campo *et al.* (2014) divide trust into the periods before initiating the agreement and during the development of the agreement. Poppo *et al.* (2008) classify the origins of trust into the shadow of the past and the shadow of the future. Based on the research results of Mayer *et al.* (1995), the factors of perceived trustworthiness, except for the personal propensity to trust, are grouped into the ability, benevolence and integrity categories. Personal propensity might be considered as a willingness to trust others, and it may be influenced by prior experience, reputation, and cooperation expectations. Ability reflects a partner's skill, competence and characteristics (for instance, enterprise qualifications, knowledge, and communication), and it has a strong influence on some specific domains. Benevolence suggests that a partner has some attachment to others and is believed to want to do good to the others. It is reflected by information availability, information quality, being thoughtful, and emotional investment. Integrity involves people's perception that a commitment will be fulfilled and will adhere to the mutually agreed upon principles and guidelines, such as legal provision, contracts, and industry practice. These trust-influencing factors are specifically described in Table 1.

Table 1. Key factors influencing trust

Clusters	Influence factors	Definition
Personal propensity	Prior experience (P1)	Prior experiences are developed over time through a history of mutual interactions and cooperation, and they serve a facilitating role in establishing trust through an interaction with continuity (Poppo <i>et al.</i> 2008). Positive prior experiences have a substantial impact on the development of trust, especially in the beginning stages of an inter-organizational project (Buvik, Rolfsen 2015; Maurer 2010).
	Reputation (P2)	Reputation is second-hand information in which a project partner cannot evaluate his/her partner's traits using direct evidence. If the information is evaluated positively, then the reputation and image of the partners will be positive. Kwon and Suh (2004) stated that a partner's reputation has a strong and positive influence on the process of building trust.
	Cooperation expectation (P3)	Cooperation expectation is a vision of future work and is closely related to work rewards. Laan <i>et al.</i> (2012) found that the prospects of future cooperation have a significant influence on trust in construction projects.

Continue of Table 1

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	Cooperation expectation (P3)	Cooperation expectation is a vision of future work and is closely related to work rewards. Laan <i>et al.</i> (2012) found that the prospects of future cooperation have a significant influence on trust in construction projects.
Ability	Enterprise qualification (A1)	The enterprise's qualifications are an important reference for evaluating an enterprise during the bidding process. The enterprise's personnel structure, professional skills, management level, financial situation, and previous project performance can be considered components that affect enterprise qualifications.
	Knowledge (A2)	Knowledge is viewed as an important foundation in organizational social capital (Lee <i>et al.</i> 2015). Commonly, professional knowledge can be categorized as business and technology expertise (Lee <i>et al.</i> 2015), but it is very difficult to establish trust among collaboration members due to asymmetric and mismatched knowledge levels (Patnayakuni <i>et al.</i> 2007). Thus, the knowledge levels among organizations or individuals are regarded as being closely associated with trust (Lee <i>et al.</i> 2015).
	Communication (A3)	Communication is a process in which members among inter-organizations can exchange information and enhance each other's mutual understanding (Tzafirir <i>et al.</i> 2004). Communication is also a form of social interaction that raises the level of knowledge sharing for successful information system development projects (Park, Lee 2014). Effective communication not only helps form a good relationship (for instance, by increasing the satisfaction and intimacy of relationships) (Emmers-Sommer 2004) but also maintains it (for instance, by reducing the conflicts among team members) (Dawes, Massey 2005). Open communication enables team members to develop stronger relationships, leading to higher trust levels (Buvik, Rolfsen 2015).
Benevolence	Information availability (B1)	Information consists of both sharing operational and financial information (such as transaction costs, plans, and scheduling) among partners and exchanging vital strategic information (such as forecasting data) (Kwon, Suh 2005). If information sharing between partners is lacking, then uncertainty and opportunistic behavior may increase (Kwon, Suh 2005). Relevant information is available to all partners within inter-organizations, including public and private information (Chen <i>et al.</i> 2011; Uzzi, Lancaster 2003). However, extremely open private information shared with other partners with whom there is little shared experience is likely to lead to negative consequences unless it is clear that the principle of information sharing is understandable to all partners (Alexopoulos, Buckley 2013).
	Information quality (B2)	Information quality requires key information attributes during exchanges, such as accuracy, relevance, timeliness, reliability, understandability, accessibility, and ease of use (Ghosh, Fedorowicz 2008). Furthermore, these attributes must create a certain value for each partner in the inter-organizational relationship (Ghosh, Fedorowicz 2008). Meanwhile, inter-organizational cooperation will extend the need to share confidential information (Hallikas <i>et al.</i> 2002).
	Being thoughtful (B3)	Wei <i>et al.</i> (2008) suggested that being thoughtful and emotional investment are essential attitudes for the formation of affect-based trust. If a partner treats other partners with care and concern, then he/she will be willing to understand the other partners' needs and feelings, and the partners will be treated in the same way.
	Emotional investment (B4)	Emotion is a perception of consciousness and is driven by personal feeling. Emotional investments can reduce defensiveness, unhealthy disruption and competitiveness; eliminate friction; enhance team morale and spirit; and improve the trust in working relationships (Wei <i>et al.</i> 2008).
Integrity	Legal provision (I1)	Arrighetti <i>et al.</i> (1997) stated that the existence of reliable contract law can benefit the development of trust in business relationships, as relationships based on legal rules can significantly lower the inherent trust risk. Meanwhile, the formal system can ensure that the partners evaluate and maintain the relationship, increase perceptions of equity and reciprocity, and facilitate trust (Kadefors 2004).
	Contract (I2)	The contract defines the rights, obligations, long-term commitments, project deliverables, punishments for opportunism and the adaptive process for resolving unforeseeable problems between the partners of a contract (Cao, Lumineau 2015; Argyres, Mayer 2007; Lusch, Brown 1996). The contract mitigates operational misunderstandings and improves operational transparency, as codified provisions are regarded as a benchmark with which a partner can effectively monitor ongoing operations and quickly identify potential deviations (Seggie <i>et al.</i> 2013; Cavusgil <i>et al.</i> 2004; Lumineau, Henderson 2012).
	Industry practice (I3)	Industry practice is an informal system, and it mainly includes certain aspects, such as certain parties among project partners, investigations and studies related to projects, leadership inspections and project performance evaluations.

## 1.2. Guanxi network

The guanxi network is a philosophical ideology that is deeply influenced by Confucianism, which is the principal value system that directs Chinese exchanges and behaviors. Guanxi not only involves blood-based relationships but also exists in ganqing or emotional attachments, which include direct or indirect relationships with colleagues, friends, and schoolmates (Wang 2007; Luo 1997; Styles, Ambler 2003; Badi *et al.* 2017). Specifically, Chinese people have a strong tendency to divide people into different levels and to treat them differently based on their in-group or out-group status (Triandis 1989). Only the members of in-groups can utilize relational resources, while out-groups are excluded (Yang *et al.* 2011). As Peng and Luo (2000) emphasize, a strong guanxi includes very important resources and perhaps even factors critical for success. There are multiple roles between owners and consultants. On the one hand, they are members of agent relationships according to the contract. On the other hand, they may also be members of a special guanxi, such as a clan, friend or schoolmate relationship in the guanxi network. These special relationships can strongly influence building trust and executing contracts. Meanwhile, owners or consultants can convince their partner(s) to perfectly fulfil the obligations of both parties without signing the contract based on reputation, competence or social influence, but the cooperative relationship between partners is still based on a contract. In other words, work first and then sign the contract. The phenomenon indicates that the partners must follow certain unwritten rules in the guanxi network.

“Mianzi” (face) and “renqing” (favor) are important factors and tools in extending and manipulating the guanxi network (Luo 1997; Hwang 1987). Mianzi is regarded as the tactic of protecting one’s own reputation since it represents social currency and personal status in the guanxi network (Luo 1997; Hammond, Glenn 2004). In the guanxi network, participants must abide by the promise and obligation of reciprocity and equity. Otherwise, they will lose face and hurt their social status (Wang 2007). Renqing “is a unique term in Chinese culture, often referring to the resource that one can present to another person as a gift in social exchange process, and a set of social norms that one should follow to get along well with other people” (Hwang 1987). Renqing has a reciprocity characteristic where a partner who receives a favor from another partner must return a renqing to the benefactor when appropriate (Hwang 1987). Renqing is a debt that is not a cash debt, which can be equally repaid, since the value of a renqing cannot be accurately assessed. If the value that you repay is similar to or greater than the value that you received, you adhere to the rule of reciprocity that decrees that “if you have got a drop of favor from other people, you should return a foundation of favour” (Hwang 1987). If the value that you repay is less than the value that you received, you violate the rule of reciprocity and equity, thus losing mianzi and hurting the emotions of friends in the guanxi network (Luo 1997). The principles of the

guanxi network are similar to those of social exchange theory. One of the basic principles of social exchange theory is that relationships will evolve into trust, loyalty and mutual commitment over time (Cropanzano, Mitchell 2005). In the process, the partners must follow the rule of reciprocity and fairness. If not, they will be punished by their social relationships (Blau 1965; Cropanzano, Mitchell 2005).

To sustain mianzi and renqing, both the in-group and out-group will comply with the rule of reciprocity and equality in the guanxi network. However, these groups have certain differences in the process of building trust. The in-group organizations have a more intimate relationship than the out-group ones in the early stages of a project’s construction. Thus, we divide the relationship of inter-organizations into in-group and out-group. Trust is shaped by special guanxi or high confidence between organizations of an in-group and by the general procedure between out-group organizations.

## 2. Research method

ANP is a decision methodology that can derive the priority weights of the factors influencing trust through a reciprocal pairwise comparison process. ANP is an extension and improvement of the analytic hierarchy process (AHP) and considered an ideal tool for resolving complex decision problems (Saaty 2004). ANP, which different from the hierarchical form of AHP, is a network form in a problem resolution structure model. In an ANP network, the network links among the decision clusters and elements express dependencies. The network links between elements of the same decision cluster represent the inner dependencies while the links between elements of one decision cluster and other decision clusters represent the outer dependencies (Saaty 2004).

The reason that ANP is deemed to be an ideal methodology for resolving the priorities of factors influencing trust is that ANP is more suitable for resolving complex problems that contain multi-criterion and multi-elements in real life. ANP is a theory of the relative measurement of intangible criteria (Saaty, Sagir 2009). Its network structure can express the dependencies among related-elements and allows decision makers to compare the priorities among related-elements through a reciprocal comparison process. In a reciprocal comparison process, ANP helps determine the influence by which two elements have more or less influence on a third element based on the same criteria (Saaty 2004). At the same time, an ANP network model not only considers the influence of an element on other elements but also incorporates the influence of other elements on that element.

ANP has been extensively and effectively used in many domains that require interactions among different elements, including assessing stakeholders’ influence (Aragonés-Beltrán *et al.* 2017), analyzing risk (Chen *et al.* 2011), and evaluating performance (Chen, Hong 2007). The ANP attributes criteria and alternatives (all called elements) in the network to a cluster and is a tool for solving problems. All the elements in the network can

be grouped according to different relationships, such as feedback and interdependence relationships within and between clusters (Aragonés-Beltrán *et al.* 2014). The complicated model provides more accurate and reliable decisions in complex settings.

In the study, the ANP model is used to analyze the factors that influence the trust relationship between owners and consultants. The accuracy and reliability of the method can be evaluated according to relative scales from Saaty’s Fundamental 1 to 9 scale that measure the importance of every parameter (see Table 2). We identify the elements that influence trust according to a thorough literature review. Then, we group the elements into different clusters with common features and calculate the priorities among clusters and among elements of the same cluster. Finally, we obtain the unweighted supermatrix, the weighted supermatrix, and the limited supermatrix using Super Decisions® software.

Table 2. From 1 to 9 fundamental scale

Priority of importance	Definition
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extreme importance
The priorities of importance of 2, 4, 6, and 8 are between 1, 3, 5, 7, and 9.	

### 3. Case study

This case study has been implemented at a Sino-German eco-park in Qingdao city, Shandong province, China. The Sino-German eco-park is a joint project between the Chinese and German governments and applies German standards based on Chinese practice in the process of construction. Its construction period is from 2010 to 2020. The types of projects in the Sino-German eco-park include industrial projects, residential projects, roads, greening projects and infrastructure projects. Every project is overseen by a dedicated owner and consultant. To obtain sufficient and effective data in the study, we selected and invited 20 project managers who have conducted different projects to form an expert panel for the period from March–April 2017. Of the 20 respondents, 2 respondents had been working as owners for more than 20 years, 3 for 15–20 years, 4 for 10–15 years, and 1 for 5–10 years. One respondent had been working as a consultant for more than 20 years, 2 for 15–20 years, 4 for 10–15 years, and 3 for 5–10 years. Thus, the respondents have very rich practical and theoretical experience.

Our case study organized an in-depth interview with the expert panel that was conducted by the primary author. The interview included two parts. First, we identified the relationships between elements. Before we finished the work of identifying elements and clusters according to the

existing literature, the respondents determined these elements and their relationships with each other. If there was any inconsistency, the expert panel discussed it until the consensus score was approved by more than 70 percent of respondents. Second, we compared the priority of elements or clusters using Saaty’s Fundamental 1 to 9 Scale (see Table 2). If its average score was substantially different from the score of 70 percent of respondents, the score was discussed again; otherwise, the average score was used as the final score. The process lasted more than 3 hours, and the responses were recorded digitally and transcribed. Based on the results that we have achieved, the next steps of case study include: (1) Building a relationship matrix of all elements of the network; (2) Comparing the priorities between relevant elements; and (3) Determining the final priorities of the elements in the ANP model.

### 3.1. Building a relationship matrix with all of the network elements

A relationship matrix (zero-one dependence matrix) can reflect whether there is a direct relationship between elements. In the zero-one dependence matrix, the value of 0 or 1 in position  $r_{ij}$  represents whether one element is dependent on the other. If  $r_{ij} = 1$ , the element of row  $i$  has an influence on the element of column  $j$ . Otherwise, the element of row  $i$  does not have an influence on the element of column  $j$ . For example, the element of P1 impacts P2, P3, A3, B1, B2, B3, B4, I3, G1 and G2. Thus, the matrix represents the interdependence of factors influencing trust (see Table 3). Meanwhile, the interdependence of factors influencing trust is used in the ANP network model (see Figure 1).

### 3.2. Comparing the priorities between relevant elements

Based on the ANP network model, a questionnaire was designed to assess the impact of each element on other elements to which it is related. For this purpose, the respondents provided a pairwise comparison between elements required by the ANP model. A sample from the questionnaire is, “Comparing the elements (such as A1

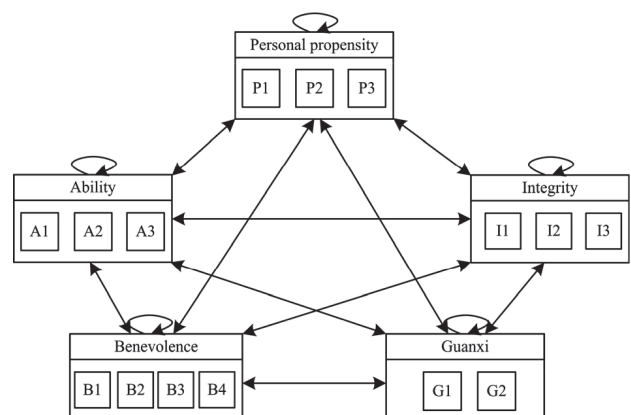


Figure 1. Interdependence of the elements in the ANP network model

Table 3. Relationship matrix of all elements of the network

	P1	P2	P3	A1	A2	A3	B1	B2	B3	B4	I1	I2	I3	G1	G2
P1	0	1	1	0	0	1	1	1	1	1	0	0	1	1	1
P2	0	0	1	0	0	1	1	1	1	1	0	0	1	1	1
P3	0	0	0	0	0	1	1	1	1	1	0	0	1	1	1
A1	0	0	1	0	1	1	1	1	1	1	0	1	0	1	1
A2	0	0	1	0	0	1	1	1	1	1	0	1	0	1	1
A3	0	0	1	0	1	0	1	1	1	1	0	1	0	1	1
B1	0	0	1	0	1	1	0	1	1	1	0	0	0	1	1
B2	0	0	1	0	1	1	1	0	1	1	0	0	0	1	1
B3	0	0	1	0	0	1	1	1	0	1	0	0	0	1	1
B4	0	0	1	0	0	1	1	1	1	0	0	0	0	1	1
I1	0	0	1	0	0	1	1	1	1	1	0	1	1	1	1
I2	0	0	1	0	0	1	1	1	1	1	0	0	1	1	1
I3	0	0	1	0	0	1	1	1	1	1	0	0	0	1	1
G1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
G2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0

Enterprise qualification, A2 Knowledge) in the cluster “Ability” based on their impact on the element P3 Cooperation expectation, which one has a greater influence and by how much?” consultants’ opinions showed that owners’ A1 Enterprise qualification has a stronger impact than A2 Knowledge on the element P3 Cooperation expectation during the stage of initial trust. The trust influencing factor and priority raw data were collected with a questionnaire.

### 3.3. Determining the final element priorities in the ANP model

All the raw data were inputted into Super Decisions® software, then the software output the individual results and the inconsistency index of each expert through a certain procedure. Meanwhile, we can obtain the unweighted supermatrix, the weighted supermatrix and the limited supermatrix to determine the element priorities in the ANP model. The final element priorities in the different stages are shown in Tables 5 and 6.

## 4. Results and discussion

The limited supermatrix was obtained via the repeated iteration of the weighted supermatrix until their outputs converged. Hence, the elements of each column of the limited supermatrix represent the final weights of the factors influencing trust. Based on these results, the purpose of this research was twofold. First, we investigated the priorities of factors influencing trust based on the case of the Sino-German eco-park. Second, we explored how these factors drive trust’s establishment and development from different perspectives in different stages.

### 4.1. The priorities of factors influencing initial trust for owners and consultants

The detailed results regarding the priorities of factors influencing initial trust for owners and consultants are displayed in Table 4. In the process of establishing trust, our research results reveal that the viewpoints of owners and consultants have certain differences regarding the priorities of factors influencing trust. Owners pay more attention to ability (its cluster weight is 0.415), while consultants focus more on integrity (its cluster weight is 0.402). The reasons include the need for more dependence and reliability for owners and greater attention to fairness and safeguards for consultants. These factors are related to each party safeguarding their self-interests. For owners, in the initial stage of building trust, integrity is the second most important cluster (its cluster weight is 0.175), especially contracts and legal provisions, whereas industry practice has low priority (their normalized clusters are 0.540, 0.375 and 0.085, respectively). From consultants’ perspective, contracts and legal provisions are almost equally important, and their importance far exceeds that of industry practice (their normalized clusters are 0.483, 0.463 and 0.053, respectively). Generally, owners select consultants through bidding and are responsible for the drafting of contractual agreements. Likewise, legal systems are the basis of contract implementations through which exchange partners can protect themselves from opportunism by appealing to the legal system (Joskow 1987; Zhou, Poppo 2010). There is an agency relationship between owners and consultants in which consultants have the ability to make up for owners’ needs. In the situation of extremely unequal professional knowledge, a stronger professional ability of the consultant will result in higher

Table 4. Final priorities of the factors that influence initial trust for owners and consultants

Influence factors	From the owners' perspective				From the consultants' perspective			
	Limit matrix	Weight of cluster	Normalized by cluster	Normalized	Limit matrix	Weight of cluster	Normalized by cluster	Normalized
A1	0.190	0.415	0.459	0.295	0.112	0.162	0.694	0.183
A2	0.136		0.328	0.211	0.014		0.086	0.023
A3	0.088		0.212	0.136	0.036		0.220	0.058
B1	0.010	0.023	0.443	0.015	0.003	0.016	0.167	0.004
B2	0.009		0.400	0.014	0.002		0.137	0.004
B3	0.002		0.105	0.004	0.007		0.436	0.012
B4	0.001		0.052	0.002	0.004		0.259	0.007
I1	0.066	0.175	0.375	0.101	0.186	0.402	0.463	0.304
I2	0.094		0.540	0.146	0.194		0.483	0.317
I3	0.015		0.085	0.023	0.021		0.053	0.035
P1	0.008	0.034	0.241	0.013	0.008	0.034	0.233	0.013
P2	0.013		0.371	0.020	0.012		0.368	0.020
P3	0.013		0.388	0.021	0.013		0.399	0.022

dependence and trust from the owner to the consultant. Owners are more concerned with knowledge than consultants (their normalized clusters are 0.328 and 0.086, respectively). Furthermore, owners and consultants know their partners' fiscal capacities, personal structures and communication mechanisms at the start. Therefore, both owners and consultants think highly of enterprise qualifications (their normalized clusters are 0.459 and 0.694, respectively). If these abilities meet the partners' requirements, both sides will make a good impression, facilitating the formation of initial trust. If they lack cooperative experience in unique project organization settings, they may depend more on their expectations and predictions (Gulati 1995). The cooperation expectation and reputation have higher weights in the cluster of personal propensity for owners and consultants (their normalized clusters are 0.388 and 0.371, respectively, from the perspective of

owners, and 0.399 and 0.368 respectively from the perspective of consultants). Once they have satisfactory prior experience, the inter-organizational relationship quality is deeply influenced by prior interactions among participating organizations since the prior experience determines their familiarity and trust development (Buvik, Rolfsen 2015). Due to the lack of in-depth communication and interaction between owners and consultants, affection-based trust may be formed by affection-based guanxi. To a certain extent, affection-based trust emphasizes certain social behaviors that are not positive and may harm the cultivation of social honesty and the credit system (Chen *et al.* 2013). Moreover, the results show that the influence of benevolence on initial trust is not prominent. The priorities of factors influencing initial trust for owners and consultants are shown in Figure 2 and Figure 3, respectively.

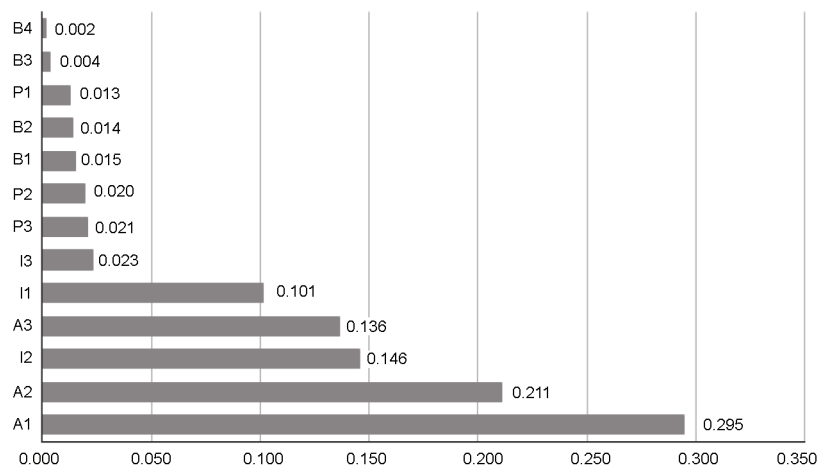


Figure 2. Priority of the factors influencing initial trust for owners

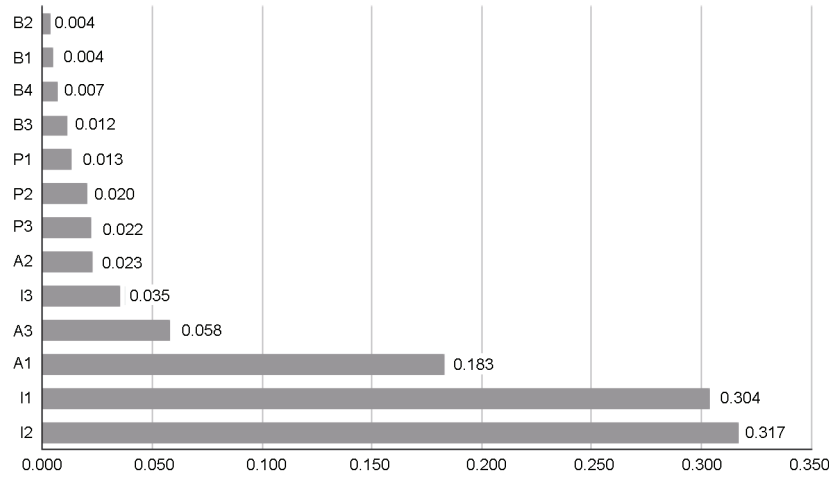


Figure 3. Priority of the factors influencing initial trust for consultants

**4.2. The priorities of factors influencing developing trust for owners and consultants**

Over time, the priorities of factors influencing trust have undergone great changes (see Table 5). Owners and consultants consistently assert that the prioritization of factors influencing trust is in the order ability, benevolence, personal propensity and integrity. As a relationship develops, each partner has enough time to repeatedly interact. Communication and trust create a strengthened circle, where open communications build trust, which further facilitates more open communications and more trust (Buvik, Rolfesen 2015). In conflict settings, particularly, the victim may choose to forgive their offender if the offender makes a sincere commitment to rectify their mistake through repeated and full communication. Thus, communication can dissolve conflict and increase mutual trust. Communica-

tion is the most important factor in the clusters of ability (its normalized cluster is 0.462 for owners and 0.543 for consultants). Owners are concerned with the knowledge ability of consultants at all times due to the information asymmetry (its normalized cluster is 0.41 in the process of developing trust). As the cooperation length increases, the partners have more interactions and accumulate experiences in dealing with each other, which may improve their understanding of each other (Mayer, Argyres 2004; Mesquita, Brush 2008; Dyer, Chu 2000). Moreover, these interactions and experiences, which is a cumulative processes through learning between owners and consultants, form the primary understructure for trust development and provide norms related to the moral character of the partners (Yuan et al. 2010; Cao, Lumineau 2015). Furthermore, partners may make specific investments in the

Table 5. Final priorities of the factors that influence the development of trust for owners and consultants

Influence factors	From the owners' perspective				From the consultants' perspective			
	Limit matrix	Weight of clusters	Normalized by cluster	Normalized	Limit matrix	Weight of clusters	Normalized by cluster	Normalized
A1	0.056	0.431	0.129	0.066	0.066	0.377	0.175	0.079
A2	0.177		0.410	0.209	0.106		0.281	0.127
A3	0.199		0.462	0.236	0.205		0.543	0.246
B1	0.072	0.262	0.274	0.085	0.044	0.260	0.168	0.052
B2	0.065		0.249	0.077	0.041		0.158	0.049
B3	0.062		0.236	0.073	0.086		0.333	0.104
B4	0.063		0.241	0.075	0.089		0.341	0.106
I1	0.004	0.023	0.187	0.005	0.004	0.026	0.168	0.005
I2	0.006		0.250	0.007	0.006		0.233	0.007
I3	0.013		0.563	0.015	0.016		0.599	0.019
P1	0.034	0.128	0.267	0.041	0.046	0.169	0.273	0.056
P2	0.027		0.209	0.032	0.034		0.203	0.041
P3	0.067		0.524	0.079	0.089		0.524	0.107



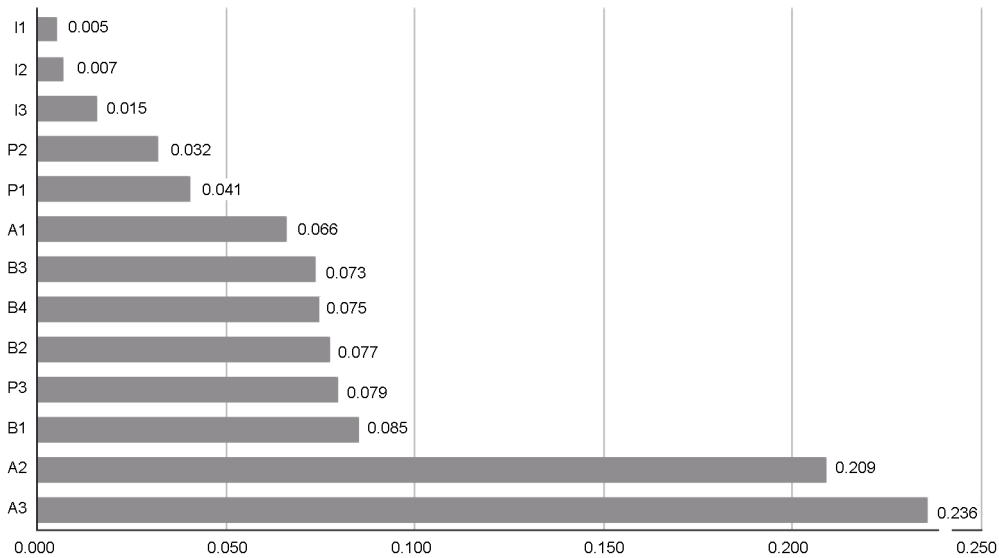


Figure 4. Priority of the factors influencing the development of trust for owners

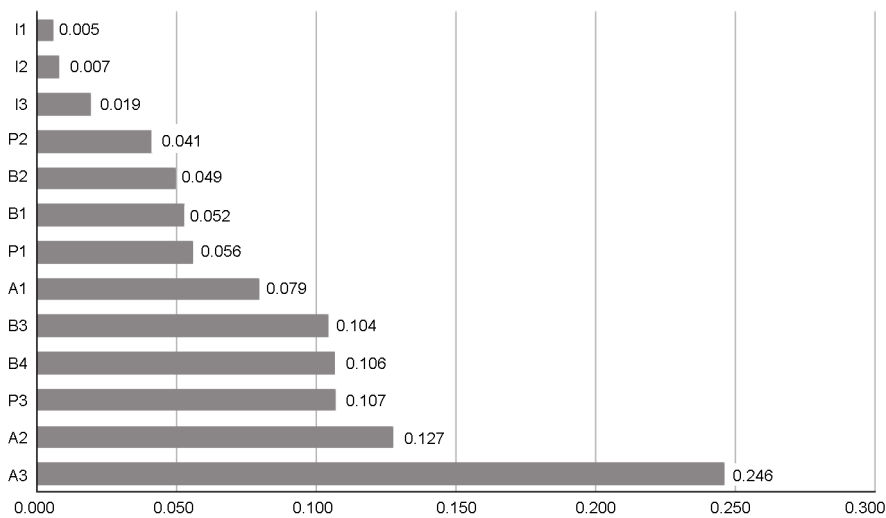


Figure 5. Priority of the factors influencing the development of trust for consultants

relationship (Wagner, Bode 2014), such as being thoughtful and emotional investment. There may be moral hazard and opportunism due to the information asymmetry between owners and consultants. Information availability and information quality somewhat reflect consultants' working attitudes and loyalty. For owners, the weights of information availability, information quality, being thoughtful and emotional investment have little difference (their normalized clusters are 0.274, 0.249, 0.236 and 0.241, respectively). However, consultants' give greater priority to being thoughtful and emotional investment than to information availability and information quality (their normalized clusters are 0.333, 0.341, 0.168 and 0.158, respectively). The partners are familiarized with each other, resulting in possible contingencies around their relationships due to the increased cooperation duration (Mayer,

Argyres 2004). The contractual terms may not contain adequate contingency clauses and may be ineffective in regulating partners' behaviors in the unpredictable environment due to the incomplete contract (Cavusgil *et al.* 2004; Cao, Lumineau 2015). Meanwhile, drafting a contract in a close and dense Chinese guanxi network may signal that a partner is untrustworthy (Yang *et al.* 2011; Lovett *et al.* 1999). In addition, legal provisions are guaranteed in the implemented contract, which are characterized by generality and universality. In contrast, industry practice can better facilitate interactions and understanding between partners through informal activities in the stage of developing trust. The final priorities of factors influencing the development of trust for owners and consultants are shown in Figure 4 and Figure 5, respectively.

Table 6. The changes in the guanxi elements

	Influence factors	From the owners' perspective		From the consultants' perspective			
		Limit matrix	Weight of clusters	Normalized by cluster	Limit matrix	Weight of clusters	Normalized by cluster
Initial trust stage	G1	0.261	0.354	0.736	0.275	0.386	0.711
	G2	0.093		0.264	0.112		0.289
Development trust stage	G1	0.090	0.155	0.579	0.091	0.168	0.539
	G2	0.065		0.421	0.077		0.461

### 4.3. The transformation of guanxi in different stages of the establishment and maintenance of trust

The transformation of guanxi is shown in Table 6. The results indicate that the viewpoints of owners and consultants are almost identical. With the accumulation of relationship duration, the weight of guanxi decreases from 0.354 to 0.155 for owners and from 0.386 to 0.168 for consultants. Meanwhile, the guanxi of inter-organizations is transformed from out-group to in-group. For example, from the perspective of owners, the weight of the inter-organizations of in-group (G1) decreases from 0.736 in the initial trust stage to 0.579 in the developing trust stage, while the out-group's (G2) weight increases from 0.264 to 0.421. A certain affinity relationship may already exist by nature, but guanxi also must be established or produced for or by a purpose (Fan 2002) in construction projects. Under the restrictions of the legal conditions, the family guanxi of direct blood, nepotism and in-laws is not allowed in the process of bidding. Thus, inter-organization relationships mainly include other affinity guanxi and business guanxi. The business guanxi is characterized as utilitarian, tactical and opportunistic (Fan 2002). If the partners do not know each other, unfamiliar organizations will be excluded unless they have positive prior experience, good reputation or high prestige. Leung *et al.* (2011) state that partners' problem-solving attitudes, mianzi and gift-giving build renqing in the new friend stage and the reciprocity of dynamics of renqing enable both partners to accumulate ganqing and become old friends. Thus, the guanxi of the out-group will transform into the in-group due to the increased cooperation duration and trust level. The gap of guanxi between the out-group and in-group will gradually decrease for owners and consultants.

### Conclusions

Our results reveal the priorities of factors influencing trust based on a Sino-German eco-park and explore how these factors influence trust at different stages from different perspectives. In the initial trust stage of the construction project, owners' perspectives show that the priority of factors influencing trust takes the following order: ability, integrity, personal propensity and benevolence. In addition, consultants state that integrity is more important than ability because they have little chance to change contractual agreements unless they are successfully rene-

gotiated. In the ability cluster, owners are more focused on consultants' enterprise qualifications and knowledge. However, consultants are more concerned about owners' enterprise qualifications. Due to information asymmetry, owners make up for their faults with the professional knowledge of consultants. Meanwhile, consultants will gain corresponding benefits from owners. Thus, the partners are interdependent. Previous findings suggest that prior experience has a vital influence on trust but ignore the fact that partners may lack cooperative experience in construction projects.

In the process of maintaining trust, the views of owners and consultants are almost identical. Their views suggest that the prioritization of factors influencing trust follows the order ability, benevolence, personal propensity and integrity. The owners evaluate consultants' trustworthiness mainly by their knowledge ability, information availability and information quality. These factors are also basic determinants of whether consultants are given the ability to exercise power on behalf of owners. Meanwhile, information availability and quality also represent consultants' loyalty and attitude in the process of accumulating trust. Owners measure consultants' knowledge first based on enterprise qualifications and later based on actions, such as communications, being thoughtful and emotional investment. In China, cultivating trust is a time-consuming task. Communication is a vital factor since a repeat interaction will increase understanding and emotions while simultaneously promoting the development of trust. Meanwhile, mutual understanding and emotions may restore a victim's trust in an offender because the victim may choose to forgive an offender if the offender makes promises and cooperation actions in the future. The proverb "Time will reveal a person's heart" means that a person needs a long time to estimate the trustworthiness of his/her partner based on factors such as being thoughtful and emotional investment. Comparatively speaking, personal propensity and integrity seem to be less important in developing trust. As a whole, the ordering of the factors influencing trust conforms to Akrouit and Diallo's (2017) findings that the development of trust will transform from calculative trust to cognitive and affective trust over time.

In contrast to the Western relationship context, Chinese guanxi networks are a self-defense mechanism among organizations of out-groups and institutional support mechanisms among organizations of in-groups. With

the increase of cooperation duration, mianzi and renqing are very special factors involved in the guanxi transformation. Maintaining mianzi and accumulating renqing can support harmonious cooperation, increase trust and improve project performance in a short time. Furthermore, these factors protect the enterprise's reputation and may increase the chances for future development. This is especially important in international projects that face greater uncertainties in inter-organizational relations caused by different cultures and institutions. Guanxi is one of the most prominent representatives of Chinese culture, and it affects Chinese social exchange. Partners, especially cross-border inter-organizational partners, should pay particular attention to the impact of Chinese culture on inter-organizational exchange.

This study contributes to understanding the establishment and maintenance of trust in different stages, but certain limitations require future research. First, while we obtained the relative priorities of the factors influencing trust based on pairwise comparisons, we did not explore the relationships among these factors. Further research must investigate how these factors impact each other. Second, our results only illustrated the transformation of guanxi for the process of developing trust but did not clarify clearly how trust and its influencing factors drive the transformation of guanxi. Third, our findings have regional limitations in that we only address a Sino-German eco-park project. This paper provides experiences and references for future practice.

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