# CULTURAL RISK ASSESSMENT IN CONSTRUCTION PROJECTS

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## ABSTRACT

Construction projects are subject to diverse risk factors which may influence project participants' performance and eventually quality of the constructed projects. One of the significant risk factors is cultural risk that stems from the characteristics of a multi-cultural project environment. Therefore, it is essential to analyze causes and consequences of cultural risk when a construction organization decides to perform projects where different cultures of project parties may cause conflicts in the working environment. The aim of this study is to define cultural risk, identify its sources and build a model for the assessment of cultural risk related to construction projects performed in multi-cultural environments. Based on the opinions of construction professionals, an Analytic Network Process (ANP) model, which may be used as a decision support tool for cultural risk assessment will be developed. With the help of ANP interdependence relationships between factors can be modeled. The findings of the prioritization process conducted by ANP will be discussed to identify the most significant contributors of cultural risk.

**Keywords:** Analytic Network Process, Cultural Risk, International Construction, Multi-Cultural Environment.

## 1. INTRODUCTION

Construction projects are subject to an assortment of risk factors which are the outcomes of the involvement of diverse parties in different stages throughout their life cycle. Moreover, since the trend towards international construction is increased due to the new opportunities offered by developing countries which are in need for infrastructure and buildings, new sources of risk emerge together with the original causes (Gunhan and Arditi, 2005). One of the significant risk factors is cultural risk that stems from the characteristics of a multi-cultural project environment. Although both local and international construction projects may have multi-cultural environments, nonetheless, the risk of working with different cultures increases in global markets.

Construction organizations are enthusiastic to explore new opportunities abroad. Globalization of construction markets now allows local construction companies to compete internationally (Han and Diekmann, 2001). Mahalingam and Levitt (2005) argue that as globalization proceeds at an ever-increasing rate, the amount of international or cross-national construction activity is increasing dramatically. Large domestic and multinational companies are setting up overseas subsidiaries. Simultaneously many governments, particularly in developing countries, are soliciting

international aid in terms of financing, technology and know-how, in order to speed up their development. However, it is essential to analyze causes and consequences of cultural risk when a construction organization decides to perform projects where different cultures of project parties may cause conflicts in the working environment. Moreover, to analyze risk from a project point of view, it is essential to identify how the project is likely to be impacted by the country factors and the specific market conditions (Hastak and Shaked, 2000).

Because of the significance of the risks associated with working in international markets, several studies were conducted to analyze risk related to international construction. There exist three different approaches for assessing country risks which are: (1) the political risk assessment approach; (2) the macro- sociopolitical approach; and (3) the exchange instability approach (Hastak and Shaked, 2000). The political risk assessment models mainly consider economic, financial, political, legal, and social condition in addition to policy and foreign exchange systems of the host country (Hastak and Shaked, 2000). Moreover, most of the studies focus on the political risk assessment on the expense of the cultural risk coupled with working in a multi-cultural environment. The available studies in literature usually handled cultural risk in two ways. The first approach considers the overall effect of social, cultural, and religious differences as part of the country risk; while the other takes into account the effect of cultural difference on the working environment (business and project specific conflicts). Yet, there is no integrated study which combines both approaches together and conducts a detailed assessment of cultural risk factors. On the other hand, there are some attempts to provide comprehensive models for assessing international construction risk. One of the comprehensive models is ICRAM-1 (International Construction Risk Assessment Model-1) which was developed by Hastak and Shaked (2000). The model analyzes risk of working in international markets in three levels: (1) Macro (country) level, (2) Market level, and (3) Project level. Although the model may be considered as a comprehensive model, Analytic Hierarchy Process (AHP) is used to calculate the risk impacts, thus the interrelations between the risk factors at the same level are ignored. Moreover, the overall impact of cultural differences may not be assessed reliably. Another study was conducted by Dikmen and Birgonul (2006) which aimed at the assessment of risks and opportunities in international construction projects. The study also uses AHP and considers cultural differences as a risk factor without elaborating the sources of cultural differences. There are some studies which analyzed cultural conflicts in some detail, an example of which is Baba (1996). In his study, he categorized cultural difference into: traditional organization structure; managerial differences; and differences in fundamental concept and philosophy. Moreover, Baba considered cross cultural differences from risk management perspective; he recognized that the risk factors associated with international construction can be classified into: political situation; economic and financial situation; and social environment, where he proposed that social environment risks are mostly expected to be the outcome of cultural differences. Further, he stated that these risk factors are beyond the control of the construction organizations, yet they can be managed, and are relatively predictable and measurable by adequate statistics.

The major shortcoming of the existing research studies is related to the absence of detailed assessment of the foremost sources of cultural risk. A crucial research question is “What are the sources of cultural risk?” Measuring the level of cultural risk in a project is the next step. There may be strong dependencies between the sources of

cultural risk. Thus, another research question is “How can the level of cultural risk be measured by considering the complex relations between the risk sources?” Major shortcoming of the existing models that use AHP is the assumption of independence among the identified factors. Moreover, the conducted studies mainly analyze cultural risk at the country level and do not consider the impact of cultural risk on either market or project level indicators (Hastak and Shaked, 2000). Therefore, the aim of this study is to develop a comprehensive model for the assessment of cultural risk related to construction projects which are performed in multi-cultural environments. For this purpose, initially, cultural risk will be defined and sources of cultural risk will be identified. Further, a model will be developed using Analytic Network Process (ANP).

## 2. DEFINITION OF CULTURE AND CULTURAL RISK

According to the definition of Edward B. Taylor "Culture, taken in its wide ethnographic sense, is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society" . The United Nations agency UNESCO defines culture as the "set of distinctive spiritual, material, intellectual and emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyle, ways of living together, value systems, traditions and beliefs". Kroeber and Kluckhohn (1952) compiled a list of more than 200 different definitions of culture in their book.

In this study, the term “culture” is used to reflect the beliefs, customs, habits and the ways of conducting business in a society that will have an impact on how a construction project is conducted and managed. Risk is defined as any event or factor that involves either uncertainty or vagueness that may have an impact on project objectives. It is assumed that some problems may be encountered in a multi-cultural project environment due to cultural difference between the project participants and these problems may have an adverse effect on the predetermined project success criteria such as cost, time and quality. The reasons of these problems associated with cultural differences are defined as cultural risk factors.

## 3. METHODOLOGY

The study was carried out through the following main steps: (1) Risk identification: Identification of cultural risk factors associated with international construction through literature review and experience; (2) Development of the conceptual model: Developing a network structure that includes the risk factors and interrelations between them (3) Utilization of ANP: Conducting brainstorming sessions and using ANP to calculate the contribution of each risk factor to the overall cultural risk. The detailed discussions for the above mentioned steps are given below.

**Step 1: Identification of Cultural Risk Factors**

While identifying the risk factors, it is of vital importance to avoid inconsistency of defining risk. Risk may be seen as source, consequence or probability of occurrence of a negative event. Inconsistency results from mixing the different perspectives of risk (Dikmen and Birgonul, 2006). For this research, as mentioned earlier, all of the factors

that may have an impact on project success criteria and resulted from cultural differences are defined as cultural risk factors; thus, risk is considered as a source rather than a consequence. However, the consequences of each defined source will be discussed briefly.

The literature related to international construction was reviewed to identify the potential sources of cultural risk. Individual sources of cultural risk cited in different research studies (e.g. Pheng and Yuquan, 2002; Han and Diekmann, 2001; Baba, 1996; Hastak and Shaked, 2000) were tried to be integrated into a comprehensive model. The experience of the authors of this paper was also utilized to improve the model with additional sources. Identified risk factors were grouped into two main categories where the first category included the risk factors associated with host country and the other one with the project environment.

**Step 2: Development of the Conceptual Model**

In this step, a conceptual model is developed in the form of a network. For this purpose, criteria, sub-criteria and interrelations between them have been defined. The model is depicted in Figure 1.

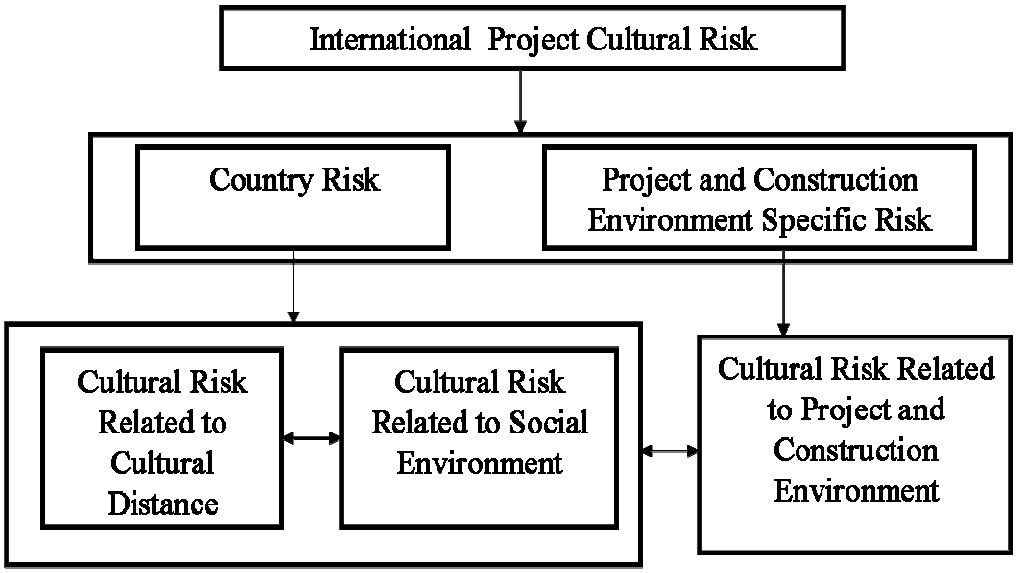


**Fig. 1 International Project Cultural Risk**

The study identified a total of 13 cultural risk factors, which include both country and project specific factors. Table 1 describes these factors in detail.

**Table 1. Cultural Risk Factors**

| Criteria | Sub-Criteria | Risk Factors | Description |
|---|---|---|---|
| Country Risk | Cultural Risk Related to Cultural Distance | Individualism | Opposite to collectivism which is the degree to which individuals are integrated into groups. It is about the degree the society reinforces individual or collective achievement and interpersonal relationships. |
| | | Power Distance | The nature of human relationships in term of hierarchy. It is about the degree of equality, or inequality, between people in the country's society. |
| | | Long Term Orientation | It focuses on the degree the society embraces, or does not embrace long-term devotion to traditional, forward thinking values. |
| | | Uncertainty Avoidance | It is concerned with how cultures adopts to changes and cope with uncertainty. It is about the level of tolerance for uncertainty and ambiguity within the society. |
| | | Masculinity | It considered the extent that society stresses achievement or nurture. It is about the degree the society reinforces, or does not reinforce, the traditional masculine work role model of male achievement, control, and power. |
| | Cultural Risk Related to Socio Environmental factors | Traditions | Tradition is a mode of thought or behavior followed by a people continuously from generation to generation. This factor considers the risk of working where different traditions may exist. |
| | | Language | Language barrier is the risk related to the language(s) of the host country and the degree of familiarity of the contractor and his employees to these language(s). |
| | | Legislation | This factor is related to the risk associated with the traditional methods used for solving disputes and the ruling law in case of conflicts. |
| | | Religion | Risks due to religious differences between the contractor and the host country. |
| Project and construction environment specific risk | Cultural Risk Related to Project and Construction Environment | Collaboration and Communication | Barriers to collaboration and communication due to working in multi-cultural environment. When the parties of projects coming from different cultures, high communication barriers may be faced and poor communication and collaboration within project environment could jeopardize the success of project. |
| | | Contract Language | In international projects, the contract is usually written in more than one language, therefore, the ruling language for the execution of the contract and in case of dispute represents a source of risk for contractors. |
| | | Construction Methods and Resources | Culture plays an important role in the determination of the methods and approaches used for construction and the utilized technologies. Working in different cultures may lead to inability to make use of the previous experience of the contractor which is risk related to construction methods and resources. |
| | | Requirements | Unclear safety and quality requirements are sources of risk which may cause accidents and poor quality work. This may be due to the adoption of different standards or unclear regulations. |

The term "Cultural Distance" that is mentioned in Table 1, adopts the national cultural framework proposed by Hofstede who specifically examined the role of national culture in work-related values and information system design. Hofstede constructed his framework on a review of sociological and anthropological theories and work (Harvey and Francis, 1997). The initial four dimensions of national culture which are considered in the framework are:

- **Uncertainty avoidance**: the extent to which future possibilities are defended against or accepted. This dimension focuses on how cultures adapt to changes and cope with uncertainty. Emphasis is on the extent to which a culture feels threatened or is anxious about ambiguity.
- **Power distance**: the degree of inequality of power between a person at a higher level and a person at a lower level, this dimension focuses on the nature of human relationship in terms of hierarchy.
- **Individualism**: the relative importance of individual goals compared with group or collective goals, this dimension focuses on relationship between the individual and the group.
- **Masculinity**: the extent to which the goals of men dominate those of women, this dimension focuses on how extent to which a society stress achievement or nurture.

Later, a fifth dimension was added by Hofstede after conducting an additional international study with a survey instrument developed with Chinese employees and managers. This dimension is "Long Term Orientation" which focuses on the degree the society embraces a long term devotion to traditional forward thinking values or not. Cultural distance was considered due to the role that those factors play on the stabilization of the working environment. The influence they have on the potential project specific risk factors is also included in the model. According to Hofstede, countries with high uncertainty avoidance tend to minimize risk which leads to resistance to change. In an effort to minimize or reduce this level of uncertainty; strict rules, laws, policies, and regulations are adopted and implemented. Hofstede argues that the ultimate goal of these populations is to control everything in order to eliminate or avoid the unexpected. As a result of this high "uncertainty avoidance" characteristic, the society does not readily accept change and is very risk adverse. Moreover, when a country have both high "uncertainty avoidance" and "power distance" this would create society that is highly rule-oriented with laws, rules, regulations, and controls to reduce the amount of uncertainty, while inequalities of power and wealth have been allowed to grow within the society. Further, such culture is more likely to follow a caste system that does not allow significant upward mobility of its citizens (http://www.geert-hofstede.com).

**Socio Environmental Factors**

These are the factors related to the social environment of the country. Four factors where considered under this category: (1) Difference in Traditions; (2) Language Barriers; (3) Legislations; and (4) Religious Inconsistency. Detailed description of these factors is listed in Table 1. The factors considered are the potential sources of risk associated with the differences that are due to different social practices between two countries. Language(s) of the host country are usually decided to be the ruling language in case of disputes; therefore the familiarity of the language(s) used in the host country become an essential advantage for the contractor while poor knowledge

of the language(s) may lead to misinterpretation of contract clauses or requirements which may end up to conflicts within the project environment. Moreover, these factors are highly related with the cultural distance factors discussed earlier. It is assumed that there are bi-directional relations between these factors.

**Cultural Risk Related to Project and Construction Environment**
These are risk factors related specifically to the project in a specific country (Hastak and Shaked, 2000). The influence of the country risk (both Cultural Distance and Social Environment) on the identified project risk factors is also included in the model.

The conceptual model that consists of 3 levels is shown in Figure 1. In the network, "an influence" is represented by an external two directional arrow between the two risk categories (country, and project specific) whereas a "relation" is represented by a two directional arrow within country risk sub-criteria. Boxes surrounding each sub-criterion represent the internal relations among elements of sub-criteria.

**Step 3: ANP model**
It is anticipated that systematic cultural risk assessment may help managers to estimate the level of cultural risk quantitatively, develop effective response strategies to minimize its impacts and determine reliable risk premiums while conducting construction projects in a multi-cultural environment. Thus, in this study, based on the conceptual model, an ANP model is developed as a decision support tool for cultural risk assessment. As defined by Saaty (2005), ANP is a general theory of relative measurement used to derive composite priority ratio scales from individual ratio scales that represent relative measurements of the influence of elements that interact with respect to control criteria. This step aims to perform pair-wise comparisons among the risk factors. In ANP, pair-wise comparisons of the elements in each level are conducted with respect to their relative importance towards their control criterion. Saaty (2005) has suggested a scale of 1 to 9 while comparing two components. A score of 1 indicates that the two options have equal importance where a score of 9 indicates overwhelming dominance of the component under consideration (row component) over the comparison component (column component). Once the pair-wise comparisons are completed for the whole network, the vectors corresponding to the maximum eigenvalues of the constructed matrices are computed and a priority vector is obtained. The priority value of the concerned element is found by normalizing this vector. In the assessment process, a problem may occur in the consistency of the pair-wise comparisons. The consistency ratio provides a numerical assessment of how inconsistent these evaluations might be. If the calculated ratio is less than 0.10, consistency is considered to be satisfactory.

In this step of the research, the conceptual model is imported to the ANP software; SuperDecisions (developed by Adams, W. J., and Saaty, R. W.), and the pair-wise comparison matrices have been prepared and solved using this software. The aim of constructing pair-wise matrices is to find out the relative importance weights of the identified risk factors. The importance weight of a risk factor reveals the contribution of that factor to the overall cultural risk in general. Pair-wise comparisons between parameters are performed considering the inter-related ones based on brainstorming sessions of an expert team.
The procedures carried out in this step are outlined below:

i. The conceptual model depicted in Fig. 1 and the factors listed in Table 1 were used to develop the logical groupings of ANP network; the categories in the conceptual model were used as clusters (Aim, Criteria, Sub-criteria) while the elements under each category in Table 1 were created as nodes.

ii. An Expert team which was composed of three experts experienced in international construction has established links between the parent nodes (either influence or influenced by) and all its children nodes in each cluster. The comparison matrices between nodes were created this way.

iii. The comparisons were conducted in three ways: (1) when comparing the sub-criteria with the main criteria the importance of each sub-criterion with respect to the parent criterion was considered; the question asked was "e.g. Given country risk which sub-criterion under country risk is more important (have greater influence on country risk)?"; (2) when comparing sub-criteria under cultural risk related to the project and construction environment with the sub-criteria under country risk the comparison considered the influence of country risk on the project specific risk (e.g. Given sub-criterion under country risk and comparing two sub-criteria under project and construction environment which one is more influenced by the parent criterion?); and (3) when the interrelation between the two sub-criteria clusters under country risk was considered, the comparison was made between the criteria according to the strength of the relation "e.g. Given a parent which of the two elements is more related to the parent?". Finally, feedbacks (inner relations) between elements in all sub-criteria clusters were also examined. An essential assumption was made during the assessment and comparison: the comparison was bicultural that is when assigning the ratings, it was assumed that the contractor is conducting the job abroad and the other multinational contractors were ignored. The total number of comparison matrices evaluated by the experts was 43. The inconsistency indices for all the matrices were below 0.10 therefore the judgments were assumed to be consistent. Table 2 shows an example of comparison matrix.

Table 2. Comparisons with respect to "Country Risk" node in "Sub-Criteria Social Environment Factors" Cluster (Inconsistency index = 0.0887 < 0.1)

| | Language | Legislations | Religion |
|---|---|---|---|
| Traditions | 1/5 | 1/7 | 4 |
| Language | | 1/2 | 5 |
| Legislations | | | 8 |

iv. There are three super-matrices associated with the network: the un-weighted super-matrix, the weighted super-matrix and the limit super-matrix. The un-weighted super-matrix contains the local priorities derived from the pair-wise comparisons throughout the network. The weighted super-matrix is obtained by multiplying all the elements in a component of the un-weighted super-matrix by the corresponding cluster weight (derived from Cluster comparisons). Finally, the limit super-matrix is derived by raising the weighted super-matrix to its powers and multiplication process is discontinued when the numbers become the same for all columns. Super-matrices are constructed for the resolution of the effects of the interdependences that exist between the factors. In this study, all calculations were performed by Super Decisions

Software. “Computations Priorities command” was used to determine the priorities of all the nodes in the network. The final weights (limiting priorities) obtained as a result of these calculations are given in Table 3.

**Table 3. Importance Weights of Cultural Risk Factors as obtained from ANP**

| Risk Factor | Weights |
|---|---|
| Collaboration and Communication | 0.113816 |
| Traditions | 0.108597 |
| Legislation | 0.087291 |
| Individualism | 0.086981 |
| Power Distance | 0.078804 |
| Contract Language | 0.077077 |
| Requirements | 0.075543 |
| Language | 0.074367 |
| Masculinity | 0.071053 |
| Construction Methods and Resources | 0.066898 |
| Religion | 0.063079 |
| Uncertainty Avoidance | 0.050763 |
| Long-Term Orientation | 0.045733 |

## 4. DISCUSSION OF FINDINGS

The obtained weights indicate that the most critical risk factors related to cultural differences are: potential barriers to collaboration and communication, traditions, and legislations; while the least significant factors were to be long term orientation, and uncertainty avoidance. The fact that construction projects experience the involvement of dispersed parties with diverse contributions to the successful achievement of predefined project objectives; implementation of an adequate communication and collaboration system within the project is indispensable to provide a solid ground for achieving the success of the project. However, when the contractor conducts project abroad, it entails working in multi-cultural environment where the probability of the existence of collaboration and communications obstacles raises. Traditions and legislations are risk factors related to the behavior of people and legal practices in the host country. The high rating of these factors reflect the significant influence they have on the project. Traditions reflected by the stream of behaviors within people in certain environment have a noteworthy influence on the project and conflicts due to different traditions lead to increasing possibilities of facing other risks within the project environment. Moreover, complexity of construction projects, especially the ones constructed abroad; increases the risk of disputes and methods used to solve disputes represent a major source of risk for international projects. Although importance weights slightly differ between the factors within the range of (0.06-0.09), long term orientation is ranked the last with a very low weight (0.046), followed by uncertainty avoidance (0.051). These results indicate that the factors which are directly related to the working environment are considered more important than the other factors that do not have a direct influence on the project specific environment. Moreover, the social environmental factors have slightly more influence on the working environment than the cultural distance factors.

## 5. CONCLUSIONS

In this study, a comprehensive conceptual model was developed to identify the cultural risk sources and an application of ANP was demonstrated as a cultural risk assessment tool in international construction projects. According to the subjective assessments of the expert team, the most important risk factors associated with multi-cultural environments were found as barriers to collaboration and communication, traditions and legislations. However, it should be noted that, the obtained weights reflect the subjective judgments of three experts and are subject to change with respect to different expert assessments. Thus, the aim of this paper is not to report universally accepted views on major reasons of cultural risk, but to propose a framework for cultural risk assessment. Using the conceptual model and outlined procedure, companies may develop their own tools by referring to their own judgments on the level of different risk factors. Alternatively, the proposed model can be used by professionals as a decision-support tool, where he/she can utilize the suggested weights for the specified risk factors. For a given project in a given country, by using a subjective scale, he/she can assign a rating to each risk factor. The specific country conditions should be taken into account while assigning ratings to the identified risk factors. Cultural risk rating may be found by multiplying weights with ratings and summing them up. The output is an indicator of magnitude of problems that may be experienced in an international project due to difficulties of working in a multi-cultural project environment in a specific country. Finally, cultural risk rating may help decision-makers to identify appropriate markup while bidding for international projects.

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