Evaluation of Emergency Response Capability for Large-Scale Construction Project Engineering Disaster Based on Metadata

Shengdeng Xu
Department of Management, Tianjin University, Tianjin 300072; China
E-mail: 604622610@qq.com

Abstract
In order to build a disaster emergency management capability assessment index system for large-scale construction project in construction phase, the emergency management of large-scale construction project is used as the research object of comprehensive modeling evaluation based on metadata, and take the overall emergency management as the guidance, to construct the evaluation index system, evaluation model, fuzzy comprehensive evaluation method with gray level extension analysis method for comprehensive evaluation, and it can constantly improve the ability of emergency management support system. The specific study of executive-level emergency management evaluation models and methods in the evaluation process should not only pay attention to the effect of the evaluation implementation, the research method is scientific and feasible, which can provide reference for strengthening the emergency management ability of large construction projects.

Key words: Extensible Matter-element Analysis, Index System, Emergency Management of Large Construction Projects, Metadata

1. INTRODUCTION
There are many uncertainties in the construction phase of large-scale projects, which induce all kinds of unexpected events. As to large-scale project emergency management, the focus is to identify the causes of unexpected events and to build emergency management mechanism for all disposal events.

Many scholars at home and abroad have carried out relevant research, foreign scholars study the response mode and disposal mechanism of project emergencies through empirical analysis. Based on the theory of practical psychology, Boin defines the subject behavior model after the emergency occurrence (Boin A, 2015). The survey results of Boin et al show the general characteristics of project organization in response to the unexpected events, and put forward some suggestions for the disposal of the unexpected events (Boin A, EKENGREN M, 2016). Boin A and others believe that temporary institutions should be set up to deal with unexpected events independently, so as to reduce the chain reaction and ensure the normal operation of the project (Boin A, 2016). Hsin-Min Lu and others believe that in addition to the establishment of temporary institutions, the existing project organization platform and resource capacity should also be utilized in dealing with emergencies (Hsin-Min Lu, Zeng, D. HsinChun Chen, 2015). The results of empirical research based on general projects provide support for the study of emergency management of Engineering projects.

In 2004, the US Department of Homeland Security (DHS) issued the "national emergency management system (NMS)" in the emergency management process, which is divided into "prevention, preparation, response, recovery and mitigation" (Jason K Levy, Kouichi Taji, 2017); revised by NMS in 2008, the related emergency response capability is summarized as "prevention, protection, response, mitigation and recovery" (Sang Tae Chung, Kwang II Kim, 2016) The National Fire Protection Association (NFPA) 2007 edition of the "NFPA 1600 disaster/emergency management and business continuity Standards Project", the emergency management process is extended from the 2004 edition of the preparation, response, recovery and mitigation" to "prevention, preparation, response, recovery and mitigation", increased the stage of "prevention" (John R. Harrald, 2016). In addition, more attention has been paid to the evaluation of emergency management capability of large-scale construction projects in foreign countries, and a lot of achievements have been achieved. Such as: Imperial Chemical Company proposed "Montevideo evaluation method", the Dow chemical company from United States proposed risk index assessment method (Dorota H. Lozowicka, 2016). In short, the research on safety management of large-scale construction projects in foreign countries is relatively rich and mature, but the theoretical summary of the literature is not enough. Jorien van der Peijl and others investigated 15 international engineering crisis events, analyzed the characteristics of large-scale project emergencies, and proposed the whole process of risk management and management strategy of double emergency response agencies (Jorien van der Peijl, Jan Klein, Christian Grass, Adinda Freudenthal, 2016). Loose More analyzed of the interests conflict of large-scale engineering construction part, and the factors hindering participants with collaborative engineering emergencies.

This thesis starts from the metadata acquisition and processing of emergency management modelling for
large-scale construction project based on historical experience, trying to give emergency warning response strategy, which has theoretical significance and great application value.

2 BASIC CONCEPTS

2.1 Metadata definition

Metadata is generally defined as "data about data", that is, information about the content, quality, status, and other features of data. The metadata application target is to realize data sharing; metadata description is the basic object of "data collection", which can be extended to set of elements and attributes in the data set and series data; metadata distribution, by a variety of digital resources information system provides tools for organic composition with a link to the integration, so the metadata is the core technology of data integration, which is also useful to system integration(Amit Singh, P. Mishra, Rajeev Jain, M. Khurana, 2014).

Metadata not only plays a great role of data description, data management and especially in data sharing, and resource discovery, knowledge management and more attention, with the increasing development of network technology and digital resources, its role is more and more obvious(Elmar Kutsch, Mark Hall, 2016). The current metadata has evolved from simple description or index to an important tool and means for managing data, discovering data and using data. All data leaving from metadata will not provide effective spirit of cooperation, retrieval and processing. Metadata is a standardized description of information resources. It is a set of feature elements which are extracted from information resources according to certain standards(S. C. Ward, 2016). This specification description must be accurate and complete of the characteristics of information resources, metadata standards formulation is the premise of metadata applications.

The development and application of metadata shows that it is difficult to have a unified metadata format to meet the needs of all the data description field, even in the same field but different purposes and needs(V. M. Rao Tumala, 2015). At the same time, the unified centralized planning metadata format is not suitable for the Internet environment, which is not conducive to make full use of all aspects of power. But in the same field, we should strive for "standardization", and properly solve the interoperability problems of different formats in different fields.

2.2 Definition of construction project disaster

Construction project refers to one-time task of construction under conditions of limited resources, to achieve the size and quality requirements of the standard within a predetermined period of time. The main purpose of construction project is to form fixed assets, which has a clear construction projects scale, quality standards and the use of the cycle with clear limits on human, financial, and material, usually constituted by the construction, equipment, industrial equipment, technological innovation activities, and related activities. Construction project has some common features include: a huge investment, long construction period, involving a wide surface; with fixity, one-time, multi-constraints and greater risk(E. Michael, 2016).

Research object that emergency management usually concerns is called emergencies; this study aims at the field of public security, the scope of its coverage beyond the scope of project management. Emergency management of construction projects aimed at unexpected events that occur during construction project implementation, the incident could threaten the successful implementation of the project, including social, natural emergencies, also includes improper management, human mistakes, lack of funds, technical disasters in project management process, so the project-level emergency is defined as "Project disaster", the object of emergency management research projects defined as "construction projects disaster", the main difference lies in the past, unexpected event represents limitation natural disasters, public health emergencies, war and other external disasters(Apeland, 2015). Construction project disasters include not only the scope of the project external environment disasters such as war, floods, etc., but also including other disaster scenarios for the proper implementation of the project disruption or destruction, especially catastrophic consequences of project management itself factors, project internal disasters are the main object of the study on the project of emergency management(Aven, 2016).

Based on the analysis to the concept above, author intends to give to meaning of "Project disaster", which means some interruption or delay in the in the normal process of construction project implementation due to external and internal reasons, including all serious incidents caused the construction project could not be properly implemented, and these events can be carried out by a certain method to control, prevent and eliminate, or even become a positive impact from the negative effects.

3. CONSTRUCTION OF DISASTER EMERGENCY RESPONSE CAPABILITY EVALUATION INDEX SYSTEM FOR LARGE-SCALE CONSTRUCTION PROJECT DURING CONSTRUCTION PHASE

3.1 Evaluation Index System of Emergency Management Capability
The improvement of Emergency Management System in large-scale construction projects includes exercise assessments and emergency management improvements. The exercise assessments improvement means assessment and improvement to evaluate the effectiveness and exercise plans of emergency exercise. The emergency management improvements mean emergency activities evaluation in the implementation process improvements. The essence improvement after emergency management is based on the evaluation of both before and during emergency management. The essence improved after emergency management is based on the evaluation of both the improvements made to the previous work. Furthermore, the project management level will affect the effectiveness of emergency management. The main factors influencing the emergency management process capability of large-scale projects could be divided into four areas of general predictable emergency management capabilities, unconventional and unpredictable emergency management, emergency management and resilience management, with the help of modern comprehensive evaluation on the basis of methods, such as expert inquiry method, accident tree analysis (ATA), combined with the actual establishment of the index system(Raz, 2014). Here is to explain how to build a large-scale construction project evaluation model of emergency management capacity, and to improve emergency management practices on this basis a project. Here we only build a three-level index system and the details are shown as below:

(1) Conventional predictable emergency management indicators

\[ U_1 = \{U_{11}, U_{12}, U_{13}, U_{14}, U_{15}, U_{16}, \ldots \}, \] the specific indicators refer to below table:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>( U_{11} )</th>
<th>( U_{12} )</th>
<th>( U_{13} )</th>
<th>( U_{14} )</th>
<th>( U_{15} )</th>
<th>( U_{16} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Plan</td>
<td>Exercise</td>
<td>identification</td>
<td>organization</td>
<td>resource</td>
<td>…</td>
</tr>
</tbody>
</table>

(2) Unconventional unpredictable emergency management indicators

\[ U_2 = \{U_{21}, U_{22}, U_{23}, U_{24}, U_{25}, \ldots \}, \] the specific indicators refer to below table:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>( U_{21} )</th>
<th>( U_{22} )</th>
<th>( U_{23} )</th>
<th>( U_{24} )</th>
<th>( U_{25} )</th>
<th>( U_{26} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Action velocity</td>
<td>Rescue</td>
<td>Refuge</td>
<td>Communication</td>
<td>Resource dispatch</td>
<td>…</td>
</tr>
</tbody>
</table>

(3) Emergency Management resilience indicators

\[ U_3 = \{U_{31}, U_{32}, U_{33}, U_{34}, U_{35}, \ldots \}, \] the specific indicators refer to below table:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>( U_{31} )</th>
<th>( U_{32} )</th>
<th>( U_{33} )</th>
<th>( U_{34} )</th>
<th>( U_{35} )</th>
<th>( U_{36} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Recovery</td>
<td>Material dispatch</td>
<td>Social influence</td>
<td>Risk investigation</td>
<td>Risk evaluation</td>
<td>…</td>
</tr>
</tbody>
</table>

(4) Integrated Management Capability Index

\[ U_4 = \{U_{41}, U_{42}, U_{43}, U_{44}, U_{45}, \ldots \}, \] the specific indicators refer to below table:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>( U_{41} )</th>
<th>( U_{42} )</th>
<th>( U_{43} )</th>
<th>( U_{44} )</th>
<th>( U_{45} )</th>
<th>( U_{46} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Principle</td>
<td>Capacity</td>
<td>Level</td>
<td>Implementation</td>
<td>Recovery ability</td>
<td>…</td>
</tr>
</tbody>
</table>

2.2 Index System Data Acquisition

The data acquisition of Emergency Management Index System for Large-scale construction projects is mainly according to the needs and the actual situation of the projects’ own emergency management decision. The external and internal factors of large construction projects in the construction phase of the project Disaster Emergency Management, which can be used as an important indicator data elements within the system, of course, with the occurrence of various projects and emergency situations, the index system is also in the constantly enriched and improved progress(Curt Finch, 2012).

(1) Metadata content

The Metadata of large construction projects Emergency Management in this study is descriptive metadata, object description is the data resource database, including data classification information, table information and field information. The metadata database management includes the following elements: Title, Code, Category, Tag, Description, Field Type, Primary key, Foreign key and Reference dictionary.

(2) Metadata table design

First, the following content describes the structure of metadata tables: where "O" indicates that the metadata is optional, "M" indicates that the metadata is mandatory:

<table>
<thead>
<tr>
<th>Metadata identifier(O)</th>
<th>Metadata name(M)</th>
<th>Metadata Character set(M)</th>
<th>Data set code(M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metadata language(M)</td>
<td>Data type(M)</td>
<td>Metadata restrictions(M)</td>
<td>Abstract(M)</td>
</tr>
<tr>
<td>Metadata Owner(M)</td>
<td>Time marking(M)</td>
<td>Construction section(M)</td>
<td>Device value(M)</td>
</tr>
<tr>
<td>Dataset name(M)</td>
<td>reference(O)</td>
<td>Construction human resource(O)</td>
<td>Keywords(M)</td>
</tr>
<tr>
<td>Project name(M)</td>
<td>Quality(M)</td>
<td>Metadata creation date(M)</td>
<td>Human name(M)</td>
</tr>
</tbody>
</table>
Based on the core metadata set table metadata described above and combined with emergency management information data of large-scale construction project studied in this paper, the establishment of a metadata table structure could be achieved in Table 2:

Table 2. metadata table structure

<table>
<thead>
<tr>
<th>Field name</th>
<th>Data type</th>
<th>illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>YSJBM</td>
<td>text</td>
<td>Metadata coding</td>
</tr>
<tr>
<td>YSJMC</td>
<td>text</td>
<td>Metadata name</td>
</tr>
<tr>
<td>YSJLB</td>
<td>text</td>
<td>Metadata type</td>
</tr>
<tr>
<td>SSJBS</td>
<td>text</td>
<td>Metadata expression</td>
</tr>
<tr>
<td>ZDLX</td>
<td>text</td>
<td>Field type</td>
</tr>
<tr>
<td>ZDCD</td>
<td>text</td>
<td>Field length</td>
</tr>
<tr>
<td>SFZJ</td>
<td>text</td>
<td>Primary key or not</td>
</tr>
<tr>
<td>NFWK</td>
<td>text</td>
<td>Empty or not</td>
</tr>
<tr>
<td>NFXG</td>
<td>text</td>
<td>Modify or not</td>
</tr>
<tr>
<td>XSMC</td>
<td>text</td>
<td>Name display</td>
</tr>
<tr>
<td>XSSJ</td>
<td>text</td>
<td>Data display</td>
</tr>
<tr>
<td>GFGS</td>
<td>text</td>
<td>Canonical form</td>
</tr>
<tr>
<td>KJLX</td>
<td>text</td>
<td>Space type</td>
</tr>
<tr>
<td>BZ</td>
<td>text</td>
<td>comment</td>
</tr>
<tr>
<td>SFXS</td>
<td>text</td>
<td>Display or not</td>
</tr>
</tbody>
</table>

Metadata encoding in the metadata table uses a hierarchical code, the data and each table elements in the table are divided according to the logic, some of the metadata as shown in Table 3:

Table 3. part metadata

<table>
<thead>
<tr>
<th>coding</th>
<th>name</th>
<th>type</th>
<th>expres</th>
<th>Primary key</th>
<th>Empty or not</th>
<th>Modifiable</th>
<th>weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Project emergency management</td>
<td>Core</td>
<td>GCYJ</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>undetermine d</td>
</tr>
<tr>
<td>0101</td>
<td>Influence factor</td>
<td>Core</td>
<td>YXYS</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>undetermine d</td>
</tr>
<tr>
<td>010101</td>
<td>External influence factor</td>
<td>Core</td>
<td>WBY</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>undetermine d</td>
</tr>
<tr>
<td>01010101</td>
<td>External supervision</td>
<td>Application</td>
<td>WBJG</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>undetermine d</td>
</tr>
<tr>
<td>0101010101</td>
<td>Owner supervision</td>
<td>Application</td>
<td>YZJG</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>undetermine d</td>
</tr>
<tr>
<td>......</td>
<td>......</td>
<td>......</td>
<td>......</td>
<td>......</td>
<td>......</td>
<td>......</td>
<td>......</td>
</tr>
</tbody>
</table>

Index System data listed in Table 3 is only part of the construction phase of large-scale construction projects throughout the emergency management modeling, with the change of the construction project there will be more factors need to be studied, table 3 is based solely on the foregoing analysis the part of the factors affecting research and analysis, as the weight of each factors currently set to "pending", which is due to the weight setting method of these factors is very complex, and different factors weight setting also have different effects for emergency management index system modeling. Taking chaotic sequence in the below example application and verification process to set different weighting factors in the next chapter, and with advanced software programming approach to solve the emergency management modeling of chaotic sequences under different result.

2.3 Index System Metadata Modeling

Emergency Management metadata standards of large-scale construction projects are developed based on prototype metadata classes, which are also the basic unit to create emergency management work of different forms of metadata content. So the metadata class creation is the core technology approach to above methods. The metadata class construction including the following content:

(1) Metadata class Extraction

Metadata class extraction is a shortcut to construct a standard prototype. Firstly, extract metadata classes
4.1 Method selection

4. EVALUATION OF EMERGENCY RESPONSE CAPABILITY BASED ON EXTENSION METHOD

4.1 Method selection
This paper studies the metadata of large-scale construction project emergency management evaluation index system based on the various advantages, not only can make full use of metadata, but also in-depth analysis of logical relationship among different indicators. On the basis of the analysis above, combined with the emergency management and risk assessment of large-scale construction project, through the factor extraction and metadata attribute among data classes, with the formation of emergency management evaluation of metadata ontology relationship can describe the concept of index system and attribute set \( R \):

- **Part-of relation**: representing the relation between the part and the whole of the concept, which is the semantic abstraction of the syntagmatic relation in the object oriented.

- **Kind-of relation**: representing the inheritance relationship between concepts, which is the semantic abstraction of the parent / child relation in the object oriented.

- **Instance-of relation**: representing the relation between the concept class and its specialized class, which is the semantic abstraction of the class and the instance in the object oriented.

- **Attribute-of relation**: representing the relation between the concept and its attribute, which is the semantic abstraction of the relation between the class and its attribute in the object oriented.

Before and After relations: representing temporal relationships between concepts or attributes.

- **SameAs relation**: representing a synonym relation between concepts or attributes, which is used to implement metadata interoperability, and the metadata items are explicitly defined between metadata standard families with the same semantics.

The content of the evaluation index system for large construction project construction stage is rich, but also very complex, a variety of the relationship exists among different indicators, such as inheritance, the part and the whole relationship, the relationship has synonymous relation etc.. For example, there is a succession, part and whole relationship between the first level index system and the second level index system, and there is a relationship between the different indicators in the first level index system.

### 4.2 Implementation of extension method based on Metadata

Extensics was founded in 1983, proposed by Chinese scholar Cai Wen, which applies formal language to express objects, relations and problems, establishes extension model, the expression of quantitative change and qualitative change process and the critical state, and it can describe the process of solving conflicts. Different from the natural language expression method in social science, extensics reflects the internal relationship of the research object by means of symbols, which is an abstract model. After more than 20 years of development, it has initially formed its own unique theoretical framework, and gradually developed to the application field.

- **The extension method is a basic method**, which provides all possible paths to solve contradiction problems, making people get rid of the habit of bound field, which is an important method to improve the processing problems and machine intelligence.

Extension method is based on matter element theory, and the extension set is used to express the degree of the object with certain nature. Among them, the basic concept of matter element extensics, which describes objects by three tuples. Name of object is defined as \( N \), character is defined as \( c \) and the characteristic value is \( v \), so the object element is defined as \( R = (N, c, v) \). If object \( N \) has more than one character and then we can define \( C = (c_1, c_2, \ldots, c_n) \) and value as \( V = (v_1, v_2, \ldots, v_n) \), \( R \) is the \( n \)-dimensional matter-element, \( C \) is the eigenvector, and \( V \) is the eigenvector value.

\[
R = (N, C, V) = \begin{bmatrix} R_1 \\ R_2 \\ \vdots \\ R_n \end{bmatrix} = \begin{bmatrix} N & c_1 & v_1 \\ c_2 & v_2 \\ \vdots & \vdots & \vdots \\ c_n & v_n \end{bmatrix}
\]

Extension set is a collection of objects that describe object that does not have a certain nature and transforms into something with a certain nature. It is expressed in the form of real numbers, positive numbers indicate the degree of the property, while the negative numbers do not have the degree of the property. The distance between the point \( x \) on the real axis and the interval \( X_0 = (a, b) \) is defined as:

\[
\rho(x, X_0) = \left| x - \frac{a + b}{2} \right| - \frac{1}{2} (b - a)
\]

The extension evaluation method is: firstly, according to the existing data (production data accumulated or successful test data) will be the evaluation object level, which is divided into several levels, each level is given by the expert database or data collection range, then the evaluation index into the object of each grade in the multi-index decision. The final evaluation results according to the size of the correlation degree and the level set are sorted, the bigger the degree of connection with the level set, the degree of compliance is better and the higher the score.
Based on the above idea, the object element comprehensive evaluation can be carried out according to the following four steps:

**Step 1:** determine the primitive domain, node domain and object to be formed by the object element.

\[ R_j = (N_j, C_i, V_{ji}) = \begin{bmatrix} \[ N_j \ c_1 \ v_{j1} \\
1 \ c_2 \ v_{j2} \\
\vdots \ \vdots \\
c_n \ v_{jn} \end{bmatrix} = \begin{bmatrix} \[ N_j \ c_1 \ (a_{j1}, b_{j1}) \\
1 \ c_2 \ (a_{j2}, b_{j2}) \\
\vdots \ \vdots \\
c_n \ (a_{jn}, b_{jn}) \end{bmatrix} \] (1)

Among them, \( N_j \) represents the \( j \) grades, and \( C_i \) is different. \( V \) is the classical domain (i.e., the range of features).

If \( P \) represents all the objects to be evaluated, then there are:

\[ P = (P, C_j, V_{pj}) = \begin{bmatrix} \[ P_0 \ c_1 \ v_{pi} \\
P_1 \ c_2 \ v_{p2} \\
\vdots \ \vdots \\
P_n \ v_{pn} \end{bmatrix} = \begin{bmatrix} \[ P_0 \ c_1 \ (a_{pi}, b_{pi}) \\
P_1 \ c_2 \ (a_{p2}, b_{p2}) \\
\vdots \ \vdots \\
P_n \ (a_{pn}, b_{pn}) \end{bmatrix} \] (2)

Among them, \( V \) is the range of characteristic, called node domain.

According to the specific data of the actual test, we can write the object element to be evaluated as follows:

\[ R_0 = \begin{bmatrix} \[ P_0 \ c_1 \ v_1 \\
P_2 \ c_2 \ v_2 \\
\vdots \ \vdots \\
P_n \ c_n \ v_n \end{bmatrix} \] (3)

**Step 2:** determine the weight coefficient of index.

In order to reduce the subjectivity of the evaluation results, according to the extenics related concepts, the weight coefficient of the evaluation index is determined according to the following methods:

For each evaluation index, the value of \( C_i \) is \( V_{ji} \), assumes that:

\[ d_{i,\max} = \max \left| V_i - a_{pi} \right| \left| b_{pi} - V_i \right| \]

\[ d_{i,\min} = \min \left| V_i - a_{pi} \right| \left| b_{pi} - V_i \right| \] (4)

It defines the weight of the evaluation index \( C_i \) as the weight of the evaluation index:

\[ \omega_i = \frac{e^{-\mu(d_{i,\max} - d_{i,\min})}}{\sum_{i=1}^{n} e^{-\mu(d_{i,\max} - d_{i,\min})}} \] (5)

Among them, the coefficient \( \mu \) is adjustable and \( \mu \geq 1 \).

**Step 3:** establish correlation function and calculate correlation function value.

The function of correlation function is to extend the qualitative description of "something of a nature" to the quantitative description of "the degree of some nature", the elementary correlation function is expressed as follows:

\[ K_j(v_i) = \begin{cases} 
-\rho(v_i, V_{ji}) & v_i \in V_{ji} \\
\rho(v_i, V_{ji}) & v_i \notin V_{ji} \ AND \ \rho(v_i, V_{ji}) \neq 0 \\
-\rho(v_i, V_{ji}) & v_i \notin V_{ji} \ AND \ \rho(v_i, V_{ji}) = 0 
\end{cases} \] (6)

Among them, \( v_{ji} \) can be obtained by normalizing the value of each classical domain and the matter-element to be evaluated on the basis of the original element extension method:
For a new matter-element to be evaluated, the distance between the new classical domain and its value range is obtained:

\[ D(v', V') = \sqrt{\frac{a + b}{2} - \frac{1}{2} (b - a)} \]  

(8)

The score of comprehensive correlation degree is:

\[ K_j(p_o) = 1 - \sum_{i=1}^{n} \omega_i D_i \]  

(9)

**Step 4 : Determining grade**

\[ K_j(p_o) = \max \{ K_j(p_o) \} \quad j = 1, 2, ..., m \]

\[ \bar{K}_j(p_o) = \frac{K_j(p_o) - \min K(p_o)}{\max K(p_o) - \min K(p_o)} \]

\[ j^* = \frac{\sum_{j=1}^{m} j \bar{K}_j(p_o)}{\sum_{j=1}^{m} \bar{K}_j(p_o)} \]

(10)

**5. CONCLUSION**

The research on emergency management in large-scale construction project has not been interrupted, but the degree of involvement is limited, and the theoretical research on the emergency management of large-scale construction project is less. Through deep research, combined with the characteristics of large-scale construction projects management, to clarify the concept and content of large-scale construction project emergency management mechanism, internal relations, with the application of metadata modeling advantages, and the integration of large-scale construction project emergency management mode characteristic, this thesis puts forward the emergency management mode of large-scale construction project based on metadata modeling and emergency management to construct the evaluation system to improve the modeling accuracy and reliability. In the aspect of model verification method, this thesis adopts the combination of qualitative and quantitative modeling of emergency management of large-scale construction projects using mechanism explanation, model deduction and so on, and the data processing using quantitative calculation, statistical analysis, which is much clearly to verify the application of quantitative value of the proposed model.

This study focuses on relevant theory of information resource metadata model and system implementation of large-scale construction projects, but some of the details and the theory mining depth is not enough, to solve these problems may need more knowledge of mathematical methods and computer technology, such as data warehouse technology, ontology, engineering knowledge, artificial intelligence etc.. The application environment with the integration of information resources in large-scale construction project based on IT support technology is rapidly changing from the research and practice of information resource integration, which should continue to absorb new development achievements, and gradually improve and solve the problems and contradictions arising in research. It is necessary to carry on a lot of work to improve and solve the above problems. We will continue to explore these problems in the future.

**REFERENCES**


