

Construction Risk Evolution System, Construction Method and Construction Risk Evaluation Method

TECHNICAL FIELD

- 5 The present disclosure relates to the technical field of construction risk evaluation, and particularly relates to a construction risk evolution system, a construction method and a construction risk evaluation method.

BACKGROUND

- 10 Construction risks are various risks existing in the process that construction enterprises organize and are engaged in production and operation activities. Risk management is an important means for the enterprises to avoid failures and obtain success, and risk management of the construction enterprises also has become an eternal topic.

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- One important step of risk management is evaluation on a construction risk. Currently, it is mostly adopted that workers carry out construction risk evaluation according to working experience. In the specific evaluation process, it is often started with a certain angle (e.g., a construction project design scheme) to evaluate the construction
- 20 risk. However, in practice, engineering construction is an extremely complicated process, relates to various categories of natural science, also relates to technical science, and has the multidisciplinary characteristic, resulting in that risk evolution evaluation carried out only from one single angle cannot meet the complex overall risk evaluation demand of engineering.

SUMMARY

In order to solve the above-mentioned technical problems or at least partially solve the above-mentioned technical problems, the present disclosure provides a construction risk evolution system, a construction method and a construction risk evaluation method.

In a first aspect, the present disclosure provides a construction risk evolution system, including: an engineering self subsystem, an environment subsystem and an organization management subsystem;

the engineering self subsystem is used for evaluating a construction project per se on the basis of engineering self category risk source data, and outputting an evaluation result to the organization management subsystem;

the environment subsystem is used for calculating a risk event probability of the construction project on the basis of environment category risk source data, and outputting a calculation result to the organization management subsystem; and

the organization management subsystem is used for: establishing a construction risk factor index system on the basis of organization management category risk source data, and calculating a weight of each organization management risk factor on the basis of an analytic hierarchy process; analyzing a causal relationship among all the organization management risk factors, and establishing a causal relationship diagram; determining a level rate and variable set on the basis of the evaluation result, the calculation result and the organization management category risk source data and a weight thereof; drawing a system flow diagram on the basis of the causal relationship

diagram and the level rate and variable set, and forming a system dynamics model matched with the construction project; and determining a change relationship of a risk level of the construction project over time on the basis of the system dynamics model matched with the construction project. Further, the engineering self subsystem is specifically used for evaluating the construction project per se by utilizing a catastrophe progression method, and outputting the evaluation result to the organization management subsystem.

Further, the environment subsystem is specifically used for:

establishing a mixture probabilistic risk evaluation model for construction surroundings on the basis of the environment category risk source data by utilizing a fault tree/event tree, a fuzzy theory and a Bayesian network method; and calculating the risk event probability of the construction project on the basis of the mixture probabilistic risk evaluation model, and outputting the calculation result to the organization management subsystem.

Further, the mixture probabilistic risk evaluation model is provided with a reserved data interface, and the reserved data interface is used for carrying out environment category risk source data supplementation.

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Further, the construction risk evolution system further includes a first adjustment unit, used for:

acquiring the change relationship, output by the organization management subsystem, of the risk level of the construction project over time; and

adjusting the engineering self category risk source data on the basis of the change

relationship of the risk level of the construction project over time, and outputting an adjustment result to the engineering self subsystem.

Further, the construction risk evolution system further includes a second adjustment unit, used for:

acquiring the change relationship, output by the organization management subsystem, of the risk level of the construction project over time; and

adjusting the environment category risk source data on the basis of the change relationship of the risk level of the construction project over time, and outputting an adjustment result to the environment subsystem.

In the second aspect, the present disclosure further provides a construction method of a construction risk evolution system, including:

acquiring risk source data of construction, the risk source data of construction including engineering self category risk source data, environment category risk source data and organization management category risk source data;

constructing an engineering self subsystem, the engineering self subsystem being used for evaluating a construction project per se on the basis of the engineering self category risk source data, and outputting an evaluation result to an organization management subsystem;

constructing an environment subsystem, the environment subsystem being used for calculating a risk event probability of the construction project on the basis of the environment category risk source data, and outputting a calculation result to the organization management subsystem; and

constructing the organization management subsystem, the organization management

subsystem being used for: establishing a construction risk factor index system on the basis of the organization management category risk source data, and calculating a weight of each organization management risk factor on the basis of an analytic hierarchy process; analyzing a causal relationship among all the organization management risk factors, and establishing a causal relationship diagram; determining a level rate and variable set on the basis of the evaluation result, the calculation result and the organization management category risk source data and a weight thereof; drawing a system flow diagram on the basis of the causal relationship diagram and the level rate and variable set, and forming a system dynamics model matched with the construction project; and determining a change relationship of a risk level of the construction project over time on the basis of the system dynamics model matched with the construction project.

In the third aspect, the present disclosure further provides a construction risk evaluation method, including:

acquiring initial risk source data of a to-be-evaluated construction project; inputting the initial risk source data into any one of construction risk evolution systems provided by the embodiments of the present disclosure; and acquiring a change relationship, output by the construction risk evolution system, of a risk level of the construction project over time.

Compared to the prior art, the technical solution provided by the embodiments of the present disclosure has the following advantages:

three subsystems in the construction risk evolution system provided by the embodiments of the present disclosure partially intersect and interact with each other,

and related factors are correlated and influenced mutually, thereby implementing fusion and adjustment of system data. A monitoring index is added into risk indexes and the index data interface is reserved, so that dynamic adjustment of the risk level along with the construction process is implemented.

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The construction risk evolution system provided by the embodiments of the present disclosure adopts three subsystem models for analyzing the risk factors, sufficiently plays the advantages of various risk evaluation methods, improves sensitivity of the risk factors, implements traceback of a risk evolution accident, and may implement

10 real-time feedback of the system.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings herein are merged into the specification and constitute one part of the specification. Embodiments in conformity with the present disclosure

15 are shown, and used for explaining the principle of the present disclosure together with the specification.

In order to describe the technical solutions in the embodiments of the present disclosure or in the prior art more clearly, a simple introduction on the accompanying

20 drawings which are needed in the description of the embodiments or the prior art is given below. Apparently, those of ordinary skill in the art also can obtain other accompanying drawings according to these accompanying drawings without any creative effort.

Fig. 1 is a structural schematic diagram of a construction risk evolution system provided by an embodiment of the present disclosure;

Fig. 2 is a schematic diagram of a mixture probabilistic risk evaluation model for construction surroundings provided by an embodiment of the present disclosure;

5 Fig. 3 is a flow chart of a construction method of a construction risk evolution system provided by an embodiment of the present disclosure; and

Fig. 4 is a flow chart of a construction risk evaluation method provided by an embodiment of the present disclosure.

10 DETAILED DESCRIPTION

To understand the objectives, characteristics and advantages of the present disclosure more clearly, the solutions of the present disclosure will be further described below. It should be illustrated that in case of no conflict, the embodiments of the present disclosure and the characteristics in the embodiments can be combined mutually.

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Many specific details are explained in the following description so as to facilitate sufficiently understanding the present disclosure, but the present disclosure also can be implemented in other modes different from that described herein; and it is obvious that the embodiments in the specification are just a part but not all of the
20 embodiments of the present disclosure.

As mentioned in the background art, according to an existing engineering construction risk evaluation method, it is mostly adopted that workers carry out construction risk evaluation according to working experience. In the specific evaluation process, it is

often started with a certain angle (e.g., a construction project design scheme) to carry out evaluation, but engineering construction is an extremely complicated process, not only relates to social science of organization management and natural science of the geological environment, but also relates to technical science of design, construction and the like, and meanwhile, has the typical multidisciplinary characteristic, resulting in that risk evolution evaluation carried out only from one single angle cannot meet the complex overall risk evaluation demand of engineering.

In view of this, the present disclosure provides a construction risk evolution system. Fig. 1 is a structural schematic diagram of a construction risk evolution system provided by an embodiment of the present disclosure. With reference to Fig. 1, the construction risk evolution system includes: an engineering self subsystem 1, an environment subsystem 2 and an organization management subsystem 3. The engineering self subsystem 1 is used for evaluating a construction project per se on the basis of engineering self category risk source data, and outputting an evaluation result to the organization management subsystem 3. The environment subsystem 2 is used for calculating a risk event probability of the construction project on the basis of environment category risk source data, and outputting a calculation result to the organization management subsystem 3. The organization management subsystem 3 is used for: establishing a construction risk factor index system on the basis of organization management category risk source data, and calculating a weight of each organization management risk factor on the basis of an analytic hierarchy process; analyzing a causal relationship among all the organization management risk factors, and establishing a causal relationship diagram; determining a level rate and variable set on the basis of the evaluation result, the calculation result and the organization

management category risk source data and a weight thereof; drawing a system flow diagram on the basis of the causal relationship diagram and the level rate and variable set, and forming a system dynamics model matched with the construction project; and determining a change relationship of a risk level of the construction project over time

5 on the basis of the system dynamics model matched with the construction project.

Specifically, the risk source data refers to a value of a factor influencing a safety accident (hereinafter referred to as a risk factor). Exemplarily, risk factors may include, but be not limited to, a construction method, a construction process, stratum

10 water content, frozen soil, a stratum porosity ratio, a technical level of a constructor, a health condition of the constructor and the like. The “value” should be understood as a result obtained after the risk factor is quantized. In practice, for the risk factors (e.g., the stratum porosity ratio and the stratum water content) which may be directly monitored, monitoring results may be directly used as the values of the risk factors,

15 i.e., the risk source data. For the risk factors (e.g., the construction method and the construction process) which cannot be directly monitored, in a mode of scoring by specialists, score results may be used as the values of the risk factors, i.e., the risk source data.

20 The engineering self category risk source data refers to a value of an engineering self risk factor. Engineering self risk factors refer to risk factors capable of reflecting engineering self characteristics, e.g., the construction method, the construction process and the like.

25 The environment category risk source data refers to a value of an environment risk

factor. Environment risk factors refer to risk factors capable of reflecting a construction environment, e.g., the stratum water content, the frozen soil, the stratum porosity ratio and the like.

- 5 The organization management category risk source data refers to a value of an organization management risk factor. Organization management risk factors refer to risk factors capable of reflecting the organization management condition of the construction project, e.g., the technical level of the constructor, the health condition of the constructor and the like.

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When the construction risk evolution system is constructed, the risk factors need to be determined according to the characteristics of engineering. Exemplarily, the risk factors may be determined according to the working experience of workers. Optionally, construction accident sample data also may be obtained; and on the basis

15 of the construction accident sample data, the risk factors of construction are acquired. Exemplarily, engineering construction accident cases happened over the years are subjected to statistics in modes of literature consultation, internet search and the like and are classified and summarized according to different accident types, main construction risks are analyzed in the aspects of engineering self structure, design,

20 construction, management, geology, environment and the like, and the risk factors are determined. Optionally, the engineering self risk factors, the environment risk factors and the organization management risk factors also may be identified by a Bayesian method.

- 25 It should be illustrated that different construction projects may be related to different

risk factors. Therefore, when the construction accident sample data is acquired, construction accident data similar with the construction project which needs to be evaluated should be acquired as the construction accident sample data. Exemplarily, if the construction project is an underground space construction project, underground
5 space construction accident cases happened over the last ten years may be selected as the construction accident sample data.

In practice, importance, i.e., a weight, of each risk factor (including the engineering self risk factors, the environment risk factors and the organization management risk
10 factors) also may be further determined. Such setting may facilitate subsequently processing the risk source data by each subsystem (e.g., the engineering self subsystem 1, the environment subsystem 2 and the organization management subsystem 3), and can improve accuracy of risk evolution analysis.

15 Further, a proportion of an accident caused by each risk factor to total accidents may be analyzed on the basis of the construction accident sample data, so that the importance of the risk factor is determined according to the proportion.

The essence of the above-mentioned technical solution is that according to different
20 action mechanisms of risk sources on safety risks, different subsystems are utilized, and different risk evolution methods are selected to solve the problem that risk evolution evaluation carried out only from one single angle cannot meet the complex overall risk evaluation demand of engineering, so that accuracy and sensitivity of risk evaluation can be improved, and traceback of a risk evolution accident is
25 implemented.

It should be illustrated that if an engineering self category, an environment category and an organization management category are regarded as three risk factor categories, and in practice, one risk factor may be subordinate to one risk factor category, or may
5 be subordinate to a plurality of risk factor categories. That is because there is no obvious boundary among the three risk factor categories. Therefore, there is a case in which a same risk factor is simultaneously subordinate to the engineering self category and the environment category, and in this case, the corresponding value of the risk factor will be simultaneously input into the engineering self subsystem 1 and
10 the environment subsystem 2. Similarly, if the same risk factor is simultaneously subordinate to the environment category and the organization management category, in this case, the corresponding value of the risk factor will be simultaneously input into the environment subsystem 2 and the organization management subsystem 3. If the same risk factor is simultaneously subordinate to the engineering self category and
15 the organization management category, in this case, the corresponding value of the risk factor will be simultaneously input into the engineering self subsystem 1 and the organization management subsystem 3. If the same risk factor is simultaneously subordinate to the engineering self category, the environment category and the organization management category, in this case, the corresponding value of the risk
20 factor will be simultaneously input into the engineering self subsystem 1, the environment subsystem 2 and the organization management subsystem 3.

In the above-mentioned technical solution, optionally, the engineering self subsystem 1 is specifically used for evaluating the construction project per se by utilizing a
25 catastrophe progression method, and outputting the evaluation result to the

organization management subsystem 3.

Exemplarily, the engineering self subsystem is specifically used for: firstly, sorting risk factors which correspond to engineering self category risk source data and are
5 input into the engineering self subsystem according to weights so as to construct an evaluation index system. Exemplarily, the evaluation index system may be set to include at least two levels of indexes, and level setting is to comb each risk factor input into the engineering self subsystem; secondly, a catastrophe type is selected according to the number of each level of indexes, then normalization operation
10 evaluation is carried out on the basis of the engineering self category risk source data, and operation is carried out upwards level by level from bottom layer indexes to obtain a total subordinate function value of the system; and the total subordinate function value is used as the evaluation result of evaluating the construction project per se.

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The essence of such setting is that modeling analysis is carried out for self factors of design, construction, geology, engineering structural scale and the like and characteristics of dynamic, nonlinear and irreversible evolution thereof by applying the catastrophe progression method, analysis is carried out according to the risk factor
20 faced by the self factors of construction, and finally, the objective of evaluating the construction projection per se is achieved.

The environment subsystem is specifically used for: establishing a mixture probabilistic risk evaluation model for construction surroundings on the basis of the
25 environment category risk source data by utilizing a fault tree/event tree, a fuzzy

theory and a Bayesian network method; and calculating the risk event probability of the construction project on the basis of the mixture probabilistic risk evaluation model, and outputting the calculation result to the organization management subsystem.

5 Arrangement of the environment subsystem is mainly to solve the problem how to quantize influence degrees and damage degrees of construction for the surroundings. It should be noted that the surroundings of different construction projects include different contents, and the present disclosure does not make any limit to it. Exemplarily, if the construction project is an underground construction project, the
10 surroundings of the construction project mainly include surrounding buildings, pavements, pipelines and the like, and at the moment, arrangement of the environment subsystem 2 is mainly to solve the problem how to quantize influence degrees and damage degrees of construction for the surrounding buildings, the pipelines, the pavements and the like.

15 Safety risk analysis on construction not only should be based on historical objective data, but also should be combined with subjective adjustment by experts, and thus, how to utilize the two types of data is the key of establishing the mixture probabilistic risk evaluation model for the construction surroundings. In the above-mentioned
20 solution, “establishing the mixture probabilistic risk evaluation model for the construction surroundings on the basis of the environment category risk source data by utilizing the fault tree/event tree, the fuzzy theory and the Bayesian network method” specifically refers to a case that on the basis of the environment category risk source data, a structure of a Bayesian network is established by utilizing fault
25 tree/event tree analysis, expert adjustment is quantized by utilizing the fuzzy theory

and used as a conditional probability table of the Bayesian network, and the final risk evaluation result is reasoned by utilizing the Bayesian network, i.e., the mixture probabilistic risk evaluation model for the construction surroundings is formed.

- 5 Fig. 2 is a schematic diagram of the mixture probabilistic risk evaluation model for the construction surroundings provided by an embodiment of the present disclosure. In Fig. 2, X1 to X17 and M1 to M5 represent risk factors. Exemplarily, in Fig. 2, the mixture probabilistic risk evaluation model is provided with reserved data interfaces (i.e., other 1, other 2 and other 3 in Fig. 2), and the reserved data interfaces are used
- 10 for carrying out environment category risk source data supplementation. In practice, construction risk evaluation runs through the process of the whole construction project. As the construction project constantly advances, the risk factors which need to be considered in different time periods are also slightly different, and due to arrangement of the reserved data interfaces, added environment category risk source
- 15 data only needs to be supplemented by the reserved data interfaces without reconstructing the mixture probabilistic risk evaluation model, so that the difficulty of the whole construction risk evaluation may be simplified, and timeliness of the construction risk evaluation is ensured.
- 20 Optionally, continuously with reference to Fig. 1, in the above-mentioned technical solution, the construction risk evolution system further includes a first adjustment unit 4, used for: acquiring the change relationship, output by the organization management subsystem 3, of the risk level of the construction project over time; and adjusting the engineering self category risk source data on the basis of the change relationship of
- 25 the risk level of the construction project over time, and outputting an adjustment result

to the engineering self subsystem 1. The essence of such setting is that feedback adjustment on the engineering self category risk source data is implemented, and an optimal solution of the engineering self category risk source data is obtained so as to ensure risk controllability of the whole construction project.

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It should be noted that adjustment on the engineering self category risk source data mainly refers to adjustment on values of some original engineering self category risk factors.

10 Similarly, continuously with reference to Fig. 1, in the above-mentioned technical solution, the construction risk evolution system further includes a second adjustment unit 5, used for: acquiring the change relationship, output by the organization management subsystem 3, of the risk level of the construction project over time; and
15 adjusting the environment category risk source data on the basis of the change relationship of the risk level of the construction project over time, and outputting an adjustment result to the environment subsystem 2. The essence of such setting is that feedback adjustment on the environment category risk source data is implemented, and an optimal solution of the environment category risk source data is obtained so as to ensure risk controllability of the whole construction project.

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It should be noted that adjustment on the environment category risk source data mainly refers to a case that remediation or prevention measures are determined according to the change relationship of the risk level of the construction project over time, and values of some original environment category risk factors are adjusted on
25 the basis of the remediation or prevention measures; or categories of the environment

category risk factors input into the environment subsystem are adjusted (e.g., increased, deleted and the like).

According to the above-mentioned technical solution, three subsystem models may be integrated, and a construction safety risk dynamic evolution model is constructed. Analysis results of the engineering self subsystem and the environment subsystem are unified into the management subsystem and are used as part of initial value variables in a simulation analysis model to be fused into the integral system, and subsystem associated factors are extracted and used as system feedback factors so as to form a feedback mechanism.

Compared to the prior art, the construction risk evolution system provided by the present disclosure has the following advantages that:

1. The evaluation result formed by the environment self subsystem and the calculation result formed by the environment subsystem are input into the organization management subsystem. Moreover, in practice, it often occurs that a same risk factor is subordinate to a plurality of risk factor categories, so that the risk factor is input into different subsystems; or there is a causal relationship among several different risk factors, and those different risk factors are input into different subsystems. Under the combined action of these cases, three subsystems are entangled together and partially intersect and interact with each other, and the related factors are correlated and influenced mutually. The construction risk evolution system implements fusion and adjustment of system data. A monitoring index is added into risk indexes and the index data interface is reserved, so that dynamic adjustment of the risk level along with the construction process is implemented.

2. The construction risk evolution system adopts three subsystem models for analyzing the risk factors, sufficiently plays the advantages of various risk evaluation methods, improves sensitivity of the risk factors, implements traceback of a risk evolution accident, and may implement real-time feedback of the system.

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It should be noted that in practice, for underground space engineering construction, due to the specificity of construction, in the risk evaluation process, massive risk factors need to be considered, and the technical solutions provided by the present disclosure are particularly suitable for the case of the underground engineering construction.

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Based on the same inventive concept, the present disclosure further provides a construction method of a construction risk evolution system. Fig. 3 is a flow chart of a construction method of a construction risk evolution system provided by an embodiment of the present disclosure. With reference to Fig. 3, the construction method of the construction risk evolution system includes:

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S110: risk source data of construction is acquired, the risk source data of construction including engineering self category risk source data, environment category risk source data and organization management category risk source data;

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S120: an engineering self subsystem is constructed, the engineering self subsystem being used for evaluating a construction project per se on the basis of the engineering self category risk source data, and outputting an evaluation result to an organization management subsystem;

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S130: an environment subsystem is constructed, the environment subsystem being used for calculating a risk event probability of the construction project on the basis of

environment category risk source data, and outputting a calculation result to the organization management subsystem; and

S140: the organization management subsystem is constructed, the organization management subsystem being used for: establishing a construction risk factor index system on the basis of the organization management category risk source data, and calculating a weight of each organization management risk factor on the basis of an analytic hierarchy process; analyzing a causal relationship among all the organization management risk factors, and establishing a causal relationship diagram; determining a level rate and variable set on the basis of the evaluation result, the calculation result and the organization management category risk source data and a weight thereof; drawing a system flow diagram on the basis of the causal relationship diagram and the level rate and variable set, and forming a system dynamics model matched with the construction project; and determining a change relationship of a risk level of the construction project over time on the basis of the system dynamics model matched with the construction project.

The construction method of the construction risk evolution system, which is provided by the embodiment of the present disclosure, is used for constructing any one of the construction risk evolution systems provided by the embodiments of the present disclosure, and thus has the same or corresponding beneficial effects of a model constructed by the construction method, which are not repeated herein.

Optionally, step S110 includes: construction accident sample data is acquired; and risk source data of construction is acquired on the basis of the construction accident sample data.

Based on the same inventive concept, the present disclosure further provides a construction risk evaluation method. Fig. 4 is a flow chart of a construction risk evaluation method provided by an embodiment of the present disclosure. With reference to Fig. 4, the construction risk evaluation method includes:

S210: initial risk source data of a to-be-evaluated construction project is acquired;

S220: the initial risk source data is input into any one of the construction risk evolution systems provided by the embodiments of the present disclosure; and

S230: a change relationship, output by the construction risk evolution system, of a risk level of the construction project over time is acquired.

The construction risk evaluation method provided by the embodiment of the present disclosure carries out evaluation on the basis of any one of the construction risk evolution systems provided by the embodiments of the present disclosure, and has the same or corresponding beneficial effects of a model used by the construction risk evaluation method, which are not repeated herein.

It should be noted that in this specification, the relational terms such as “first”, “second” and the like are merely used for distinguishing one entity or operation from another entity or operation, but do not necessarily request or denote any practical relationship or order between these entities or operations. Moreover, terms such as “include” and “comprise” or any other variants thereof are intended to cover non-exclusive inclusion, so that a process, method, object or equipment including a series of elements not only includes those elements, but also includes other elements which are not definitely listed, or also includes inherent elements of the process,

method, object or equipment. In case of no more limitations, an element defined by the statement “including a...” is not exclusive of existence of additional same element in the process, method, object or equipment including the element.

- 5 The foregoing embodiments merely are specific embodiments of the present disclosure, so that those skilled in the art can understand or implement the present disclosure. Various modifications to these embodiments are obvious for those skilled in the art, and the general principle defined in this specification can be implemented in other embodiments without departure from the spirit or scope of the present
- 10 disclosure. Therefore, the present disclosure will not be limited to these embodiments described in this specification, but should be in conformity with the widest scope consistent with the principle and novel characteristics disclosed in this specification.

CLAIMS

1. A construction risk evolution system, characterized by comprising: an engineering self subsystem, an environment subsystem and an organization management
5 subsystem;

the engineering self subsystem being used for evaluating a construction project per se on the basis of engineering self category risk source data, and outputting an evaluation result to the organization management subsystem;

the environment subsystem being used for calculating a risk event probability
10 of the construction project on the basis of environment category risk source data, and outputting a calculation result to the organization management subsystem; and

the organization management subsystem being used for: establishing a construction risk factor index system on the basis of organization management category risk source data, and calculating a weight of each organization management
15 risk factor on the basis of an analytic hierarchy process; analyzing a causal relationship among all the organization management risk factors, and establishing a causal relationship diagram; determining a level rate and variable set on the basis of the evaluation result, the calculation result and the organization management category risk source data and a weight thereof; drawing a system flow diagram on the basis of
20 the causal relationship diagram and the level rate and variable set, and forming a system dynamics model matched with the construction project; and determining a change relationship of a risk level of the construction project over time on the basis of the system dynamics model matched with the construction project.

2. The construction risk evolution system of claim 1, characterized in that the engineering self subsystem is specifically used for evaluating the construction project per se by utilizing a catastrophe progression method, and outputting the evaluation result to the organization management subsystem.

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3. The construction risk evolution system of claim 1, characterized in that the environment subsystem is specifically used for:

establishing a mixture probabilistic risk evaluation model for construction surroundings on the basis of the environment category risk source data by utilizing a

10 fault tree/event tree, a fuzzy theory and a Bayesian network method; and

calculating the risk event probability of the construction project on the basis of the mixture probabilistic risk evaluation model, and outputting the calculation result to the organization management subsystem.

15 4. The construction risk evolution system of claim 3, characterized in that the mixture probabilistic risk evaluation model is provided with a reserved data interface, and the reserved data interface is used for carrying out environment category risk source data supplementation.

20 5. The construction risk evolution system of claim 1, characterized by further comprising a first adjustment unit, used for:

acquiring the change relationship, output by the organization management subsystem, of the risk level of the construction project over time; and

25 adjusting the engineering self category risk source data on the basis of the change relationship of the risk level of the construction project over time, and

outputting an adjustment result to the engineering self subsystem.

6. The construction risk evolution system of claim 1, characterized by further comprising a second adjustment unit, used for:

5 acquiring the change relationship, output by the organization management subsystem, of the risk level of the construction project over time; and

 adjusting the environment category risk source data on the basis of the change relationship of the risk level of the construction project over time, and outputting an adjustment result to the environment subsystem.

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7. A construction method of a construction risk evolution system, characterized by comprising:

 acquiring risk source data of construction, the risk source data of construction comprising engineering self category risk source data, environment category risk
15 source data and organization management category risk source data;

 constructing an engineering self subsystem, the engineering self subsystem being used for evaluating a construction project per se on the basis of the engineering self category risk source data, and outputting an evaluation result to an organization management subsystem;

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 constructing an environment subsystem, the environment subsystem being used for calculating a risk event probability of the construction project on the basis of the environment category risk source data, and outputting a calculation result to the organization management subsystem; and

 constructing the organization management subsystem, the organization
25 management subsystem being used for: establishing a construction risk factor index

system on the basis of the organization management category risk source data, and calculating a weight of each organization management risk factor on the basis of an analytic hierarchy process; analyzing a causal relationship among all the organization management risk factors, and establishing a causal relationship diagram; determining
5 a level rate and variable set on the basis of the evaluation result, the calculation result and the organization management category risk source data and a weight thereof; drawing a system flow diagram on the basis of the causal relationship diagram and the level rate and variable set, and forming a system dynamics model matched with the construction project; and determining a change relationship of a risk level of the
10 construction project over time on the basis of the system dynamics model matched with the construction project.

8. The construction method of the construction risk evolution system of claim 7, characterized in that
15 the acquiring the risk source data of construction comprises:
acquiring construction accident sample data; and
acquiring the risk source data of construction on the basis of the construction accident sample data.

20 9. A construction risk evaluation method, characterized by comprising:
acquiring initial risk source data of a to-be-evaluated construction project;
inputting the initial risk source data into the construction risk evolution system of any one of claims 1 to 6; and
acquiring a change relationship, output by the construction risk evolution
25 system, of a risk level of the construction project over time.