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# Virtual Enterprises Risk Management DSS under Electronic Commerce

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**ABSTRACT**

Risk management is important to the development of enterprise as well as social-economic prosperity. Virtual enterprise is the potential mode of future enterprise under electronic commerce environment and the risk management for it is a popular research area recently. Due to the complexity of its risk management a decision support system (DSS) with 3-bases-1-cell structure was designed. By coordinating data base, model base, algorithm base and dialogue cell, the functions of project management, risk identification, risk assessment, risk evaluation and risk programming was supported. The user-friendly system has such main characteristics as generality for verity virtual enterprise as well as different projects and the flexibility of model and algorithm, ensuring a standardized, scientific and informational risk management for virtual enterprises.

***Keywords***: virtual enterprise, risk management, decision support system, electronic commerce

## 1. INTRODUCTION

The subject of risk management has a history dating back to the 1950s. In the 70s it rapidly developed theoretically and practically and prevailed among developed countries [1-4]. With the formation of globalized market economy and emerging of electronic commerce, Virtual Enterprise (VE) has become a potential mode of enterprise development. Such a complicated environment requires effective production management as well as a complete and practical Decision Support System (DSS) for risk management to assist decision makers in making objective and correct decision.

Risk management is significant to the development of enterprise as well as social-economic prosperity. It is generally defined as an enterprise management which includes identification and assessment of every potential risk, as well as proper manipulation and solution, aiming at ensuring a safe enterprise operation with the lowest risk cost［5,6］. Trouble-free risk management relies on scientific strategies and its process consists of risk identification, risk assessment and risk evaluation sequentially and response-measure programming based on the first 3 steps so as to carry out effective risk manipulation and solution to unfavorable consequences. VEs are temporal virtual organizations for grasping some newly occurred opportunity [7,8]. It is always organized by project mode. The projects are different from each other for different VE. So, the risk management should be different accordingly. DSS of VE provides a functional support to risk identification, risk assessment, risk evaluation and risk programming for different projects in order to ensure a safe and effective operation for enterprises.

## 2. LOGICAL DESIGN FOR SYSTEMATIC STRUCTURE

Characteristically, project risk models differ when VEs are facing different opportunities, which require a flexible risk-describing function of the system. Similarly, the complexity of problems in a projects calls for flexible algorithmic solutions. Based on such requirements, a 3-base-1-cell logical structure [9] is established (see Figure 1), which consists a database, a model base, a algorithm base and a dialogue cell.

The logical structure of the system effectively carries out the 4 operational functions (risk identification, risk assessment, risk evaluation and risk programming) by constructing an operational environment of DSS for VE in the dialogue system on the informative basis of the 3 bases (database, model base and algorithm base) with the assistance of friendly man-machine interface and dialogues.

(1) Dialogue System

This is the component that users work with directly, the general frame of which is constructed according to the basic flow process of risk management. From a user's point of view, the frame presents itself as a master-control menu.

(2) Model Base

1) Requirements of VE DSS to model base

Risk evaluation model is a multi-level synthetic evaluation model with a dendritic structure (see Figure 2).

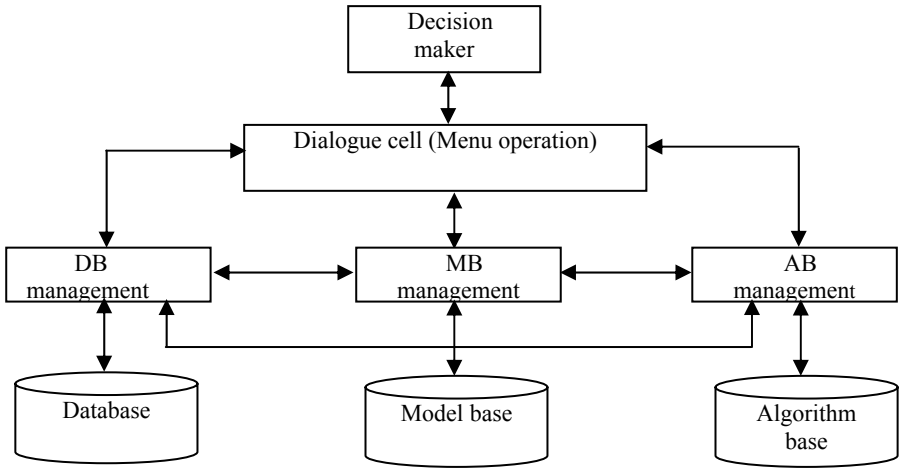


Figure1 The logic structure chart of the system

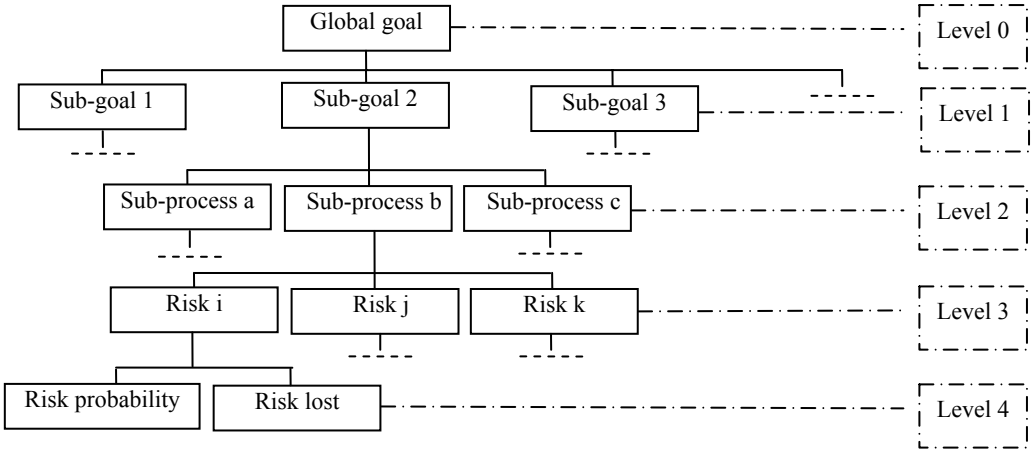


Figure 2 The hierarchic model for risk evaluation

When applied to risk management of different VE, the model has the same levels but different numbers of node. Consequently, managing system of model base should be able to establish a special model according to specific requirements of a project, which can be realized by achieving the followings:

① Separating model from algorithm
Model must be separated from algorithm; otherwise the source program has to be modified so as to make algorithm adaptive to a changed model, which is impossible for the operators to do by themselves.

② Automatic model generation
Unlike some DSS, system programmers cannot store some fixed models of DSS for VE in computers because the structure of the model is determined by a specific VE. Hence, it is necessary to build up a versatile system to assist users in establishing and storing a model structure according to his business.

③ Database structure with adaptability to all models
Such a database structure should be established so as to modify itself, complying with a changing model base and avoid the inconvenience of repetitive maintenances. Therefore a versatile structure of database is established according to the characteristics of the system.

2) Model base design

In this part, the core is how to store a model structure in computers. This research expresses the structure in a 3-level frame, which combines frame-knowledge and characteristics of database system and fully presents the external and internal features of the model, presenting a simple and straightforward visual illustration and proving the easiness of establishment.

In Frame level 1 store the model name, date of establishment and referential information etc., which are all external characteristics of the model.

Frame level 2 describes the internal characteristics of the model, mainly including the number of levels and nodes. Since 5 fixed levels are stored in the system, the number of nodes determines the main feature. The content consists of the name of model, level names, and the number of nodes in each level, etc.

Frame level 3 presents the physical mode of the model, which describes and stores the physical data of the model. Different model has different internal physical mode. Based on the characteristic that the synthetic evaluation reflects on each nodal point in this level, its content includes model name, level name, node name and the weight of the node etc.

(3) Database

Database is an important component of DSS. In this system, 9 tables are designed based on the data of risk evaluation and risk programming. The foreign-key reference relations are shown in Figure 3.

(4) Algorithm Base

This system provides the risk-programming model with two methods: genetic algorithm and Tabu search, which are stored in database system for users' options. Further the new algorithm can be added, and the exist algorithm can be deleted and modified by user according to practical needs, providing flexibility in algorithms.

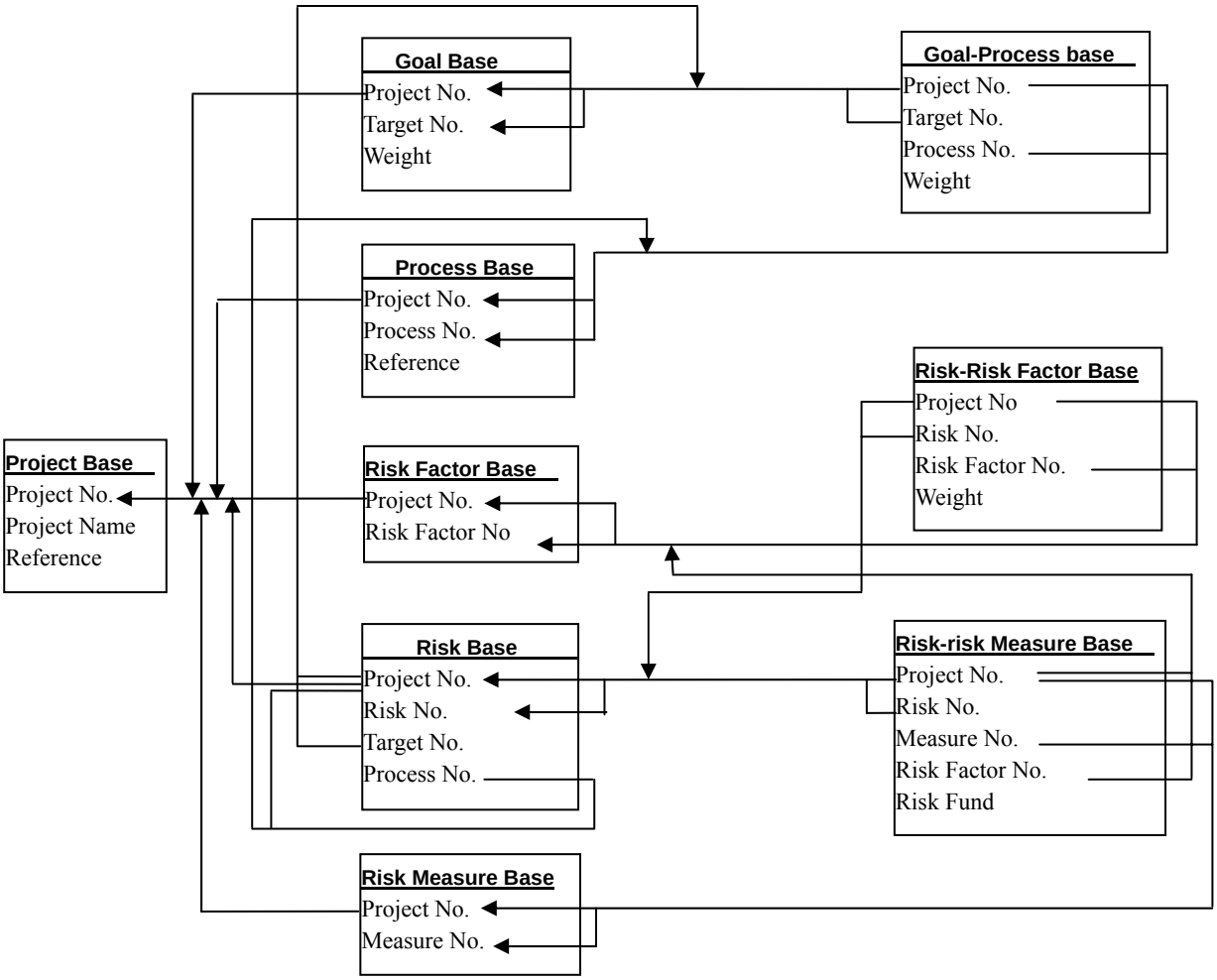


Figure 3 Relationship chart of foreign key

## 3. SYSTEM-FUNCTIONAL MODULES

In accordance with the demands of VE risk management, this decision support system can be functionally divided into 5 parts as follows:

(1) Project Management is an all-project-oriented management of VE, providing such projective functions as building, opening and deleting projects.

(2) Risk Identification is the first step of risk management. According to risk evaluation model, the managed content of this stage is the global goal, sub-goal, sub-processes, risks, risk localization, risk manipulation method etc. It also provides inputting, searching, sorting, inserting, modifying and saving functions for the data. This function corresponds with the establishment of frame level 1 and 2.

(3) Risk Assessment is a process in which the identified

risks are quantitatively estimated, including sub-goal weight assessment, sub-goal and sub-process relevant level assessment, relevant risk weight assessment, risk factor weight assessment and fuzzy description to pre-m manipulation and after-manipulation risk factors. The module also provides inputting, searching, sorting, modifying and saving functions for the data. This function corresponds with the establishment of frame level 3.

(4) Risk Evaluation calculates the general risk level according to risk evaluation model (Figure 2), where the risk evaluation is dealt from local (lowest level) to global system (level 0).

(5) Risk Programming provides the optimized risk-manipulating strategies according to programming model. Such function is especially applied to algorithm base management and algorithmic operation.

## 4. CONCLUSION

In this research, decision support system for VE under electronic commerce is designed. This user-friendly system has such main characteristics as generality for verity VE as well as different projects and the flexibility of model and algorithm. The system driven by general strategic goal of enterprise, assist the decision maker in establishing a standardized, scientific and informational risk management in an electronic commerce environment full of internal and external uncertainties.

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