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Assessment of the Impact of Risk Aggregation on S/w Development Cost Using Soft Computing Techniques

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Abstract

Risk is one of the major factors to decide the software cost, reliability and the software dead lines. As the software proposal is presented along with this risk analysis also begin. With each step of software development some risk factor is added with software cost. Other then this some other factors like availability of resources, software duration also effect the software risk. In this proposed work we will evaluate the software aggregative risk based on some of these factors. The proposed work is about to evaluate the software risk aggregation based on some weight-age. The work will be carried out using soft computing techniques. Here the risk is divided in different categorize based on the risk impact and then an risk aggregation based computation is implemented to find actual risk in the software system.

Keywords: *Risk Design, Risk Management Cycle.*

1. INTRODUCTION

Risk is the traditional manner of expressing uncertainty in the systems life cycle. Risk assessment is a common first step and also the most important step in a risk management process. Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat. In a quantitative sense, it is the probability at such a given point in a system's life cycle that predicted goals can not be achieved with the available resources. Due to the complexity of risk factors and the compounding uncertainty associated with future sources of risk, risk is normally not treated with mathematical rigor during the early life cycle phases. Risks result in project problems such as schedule and cost overrun, so risk minimization is a very important project management activity. Up to now, there are many papers investigating risk identification, risk analysis, risk priority, and risk management planning. We have classified the risk factors into six attributes, divided each attribute into some risk items, and built up the hierarchical structured model of aggregative risk and the evaluating procedure of structured model, ranged the grade of risk for each risk item into eleven ranks, and proposed the procedure to evaluate the rate of aggregative risk using two stages fuzzy assessment method. Chen ranged the grade of risk for each risk item into thirteen ranks, and defuzzified the trapezoid or triangular fuzzy numbers by the median. Based on, Lee et al. presented a new algorithm to tackle the rate of aggregative risk. Lin and Lee presented a new fuzzy assessment form and synthetic analysis for the rate of aggregative risk. Based on, we propose the compositional rule of inferences to tackle the fuzzy presumptive rate of aggregative risk in this paper. The computed presumptive rate is close to the human thinking.

2. ASSESSMENT FORM FOR RISK

The criteria ratings of risk are linguistic variables with linguistic values 1 V, 2 V… 7 V, where 1 V = extra low,
2 V = very low, 3 V = low, 4 V = middle, 5 V = high, 6 V = very high, 7 V = extra high. These linguistic values are treated as triangular fuzzy numbers as follows:

$V_1 = (0,0,1/6)$,

$V_K = (k\text{-}2/6, k\text{-}1/6, k/6)$, for $k=2,3,\ldots\ldots,6$ (1)

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V_7= (5/6,1,1)

The assignment of a real value to a fuzzy number is called defuzzification. It can take many forms, but the most standard defuzzification is through computing the centroid. This is defined, effectively, as the center of gravity of the curve describing a given fuzzy quantity. Now, we Defuzzify v_1, v_2,……v_7 by the centroid method.

In previous studies, the evaluator only chooses one grade from grade of risk for each risk item, it ignores the evaluator's incomplete and uncertain thinking. Therefore, if we use fuzzy numbers of assessment in fuzzy sense to express the degree of evaluator's feelings based on his own concepts, the computing results will be closer to the evaluator's real thought. The assessment for each risk item with fuzzy number can reduce the degree of subjectivity of the evaluator, express the degree of evaluator's feelings based on his own concepts. The results will be closer to the evaluator's real thought. Based on the structured model of aggregative risk proposed by Lee, Lin and Lee proposed the new assessment form of the structured model and proposed an algorithm to tackle the rate of aggregative risk in software development.

3. FUZZY GROUP DECISION MAKING USING FUZZY SET THEORY

Lee uses linguistic values for ranking the grades of risk of the risk items and uses linguistic values (i.e., De_nitely low, Extra low, Very low, Low, Slightly low, Middle, Slightly high, High, Very high, Extra high, and De_nitely high) for ranking the grades of importance of the risk items, where the linguistic values are represented by triangular fuzzy numbers. Furthermore, Lee also allows the decision makers to use _ve linguistic values (i.e., VL, L, M, H, and VH) represented by triangular fuzzy numbers for assessing the grades of importance of the risk items. The decision makers can use either the importance set W = fVL; L; M; H; VHg with the appropriateness grade set S = fDe_nitely low, Extra low, Very low, Low, Slightly low, Middle, Slightly high, High, Very High, Extra high, De_nitely highg or their own preference directly rating by normal triangular fuzzy numbers for assessing the weights of the attributes, the weights of risk items, and the grades of risk and grades of importance of risk items. Lee presented a hierarchical structure model of aggregative risk in software development under the fuzzy group decision making environment as shown in Fig. 1.

Assume that there is a group of n decision makers (D1; D2; : : : ; Dn) to assess the rate of aggregative risk for a project in software development. Let the symbol W 2(j;m) denote the relative importance weight given by the decision maker Dj to the attribute Xm, and let W 1(j; h; k); r(j; h; k), and i(j; h; k) denote the weight, the grade of risk, and the grade of importance given to the risk item Xhk for decision maker Dj's assessment data (j=1; 2; : : : ; n; h=1; 2; : : : ; 6; k =1; 2; : : : ; n(h)), where n(h) is the number of risk items for attribute Xh). For example, Table 1 shows an example of the contents of the hierarchial structure model for decision maker Dj (j=1; 2; : : : ; n), where

W2(j; h) =(a2(j; h); b2(j; h); c2(j; h)); (1)

W1(j; h; k) =(a1(j; h; k); b1(j; h; k); c1(j; h; k)); (2)

r(j; h; k) =(a3(j; h; k); b3(j; h; k); c3(j; h; k)); (3)

i(j; h; k) =(a4(j; h; k); b4(j; h; k); c4(j; h; k)): (4)

Lee presented two algorithms for group decision making to evaluate the rate of aggregative risk in software development by fuzzy set theory. These two algorithms are very similar, where the first algorithm averages each parameter individually and then aggregates to produce the final rate of aggregative risk, and the second algorithm averages the rate individually and then averages the results to produce the final rate of aggregative risk.

Lee's presented in for fuzzy group decision making to evaluate the rate of aggregative risk in software development is very similar to the algorithm described above. It aggregates the rate individually and then averages the results to produce the final rate of aggregative risk.
It is obvious that Lee's algorithms for evaluating the rating of aggregative risk in software development under the fuzzy group decision making environment are not efficient enough due to the fact that

(1) They take a large amount of time to form the fuzzy assessment matrices for attributes. Especially, when the number of attributes is very large, it will take a large amount of time to form the fuzzy assessment matrices for attributes.

(2) The arithmetic operations for calculating the matrices of the first-stage aggregative assessment risk and the matrices of the second-stage aggregative risk for attributes will take a large amount of time.

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(3) Using the centroid defuzzify method to obtain the final rate of aggregative risk RIK is very inefficient. Therefore, it is necessary to develop a more efficient algorithm for evaluating the rate of aggregative risk in software development under the fuzzy group decision making environment to overcome the drawbacks of Lee's algorithms.

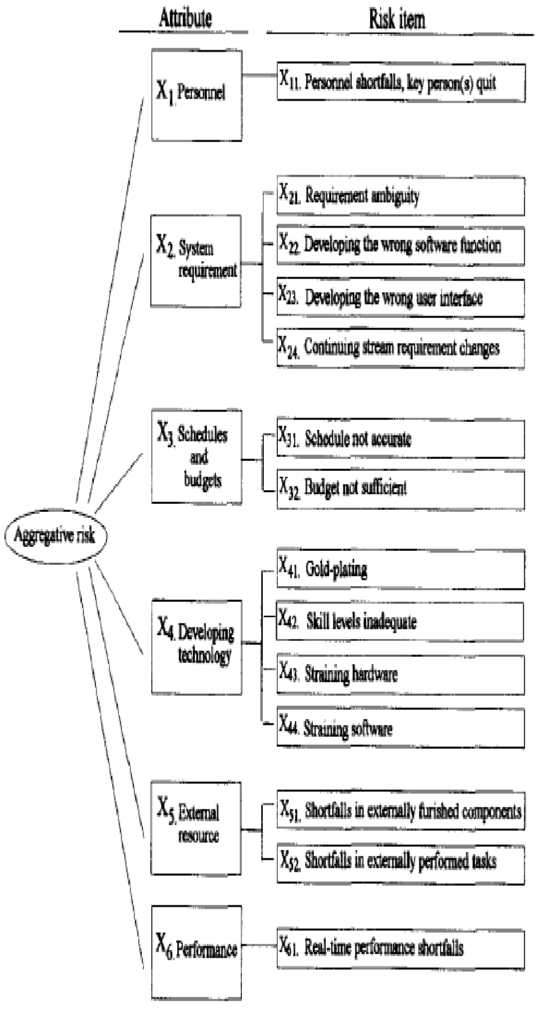

Fig 1 Hierarchical Structure Model For Aggregative Risks

4. A NEW ALGORITHM TO EVALUATE THE RATE OF AGGREGATIVE RISK IN SOFTWARE DEVELPOMENT

In this section, we present a new algorithm to evaluate the rate of aggregative risk in software development under the fuzzy group decision making environment. Firstly, we introduce a defuzzification method of trapezoidal fuzzy numbers. Let M be a trapezoidal fuzzy number parametrized by a quadruple (a; b; c; d) . Then, the defuzzified value of the trapezoidal fuzzy number M is e where

$$(e-b)(1)+1/2(b-a)(1)=(c-e)(1)+1/2(d-c)(1)$$

$$(e-b)+1/2(b-a)=(c-e)+1/2(d-c)$$

$$(e-b)-(c-e)=1/2(d-c)-1/2(b-a)$$

$$2e=(d-c)-(b-a)/2+b+c$$

$$2e=a+b+c+d/2$$

$$e=a+b+c+d/4$$

It is obvious that a triangular fuzzy number M parametrized by a triple (a; b; c) is a special case of trapezoidal fuzzy numbers. In this case, the triangular fuzzy number (a; b; c) also can be represented by a quadruple (a; b; b; c). Thus, based on formula, the defuzzified value D(M) of the triangular fuzzy number M parametrized by (a; b; c) is as follows:

$$D(M)=a+b+b+c/4$$

Assume that there are two decision makers (i.e., D_1 and D_2) to assess the rate of aggregative risk for a project in software development. Let the symbol $W_{2(j;h)}$ denote the relative importance weight given by the decision maker D_j to the attribute X_h, and let $W_{1(j;h;k)}$; $r_{(j;h;k)}$, and $i_{(j;h;k)}$ denote the weight, the grade of risk, and the grade of importance given to the risk item X_{hk} for decision maker D_j's assessment data, respectively (j=1; 2; h=1; 2; : : : ; 6; k =1; 2; : : : ; n(h)), where n(h) is the number of risk items for attribute X_h).

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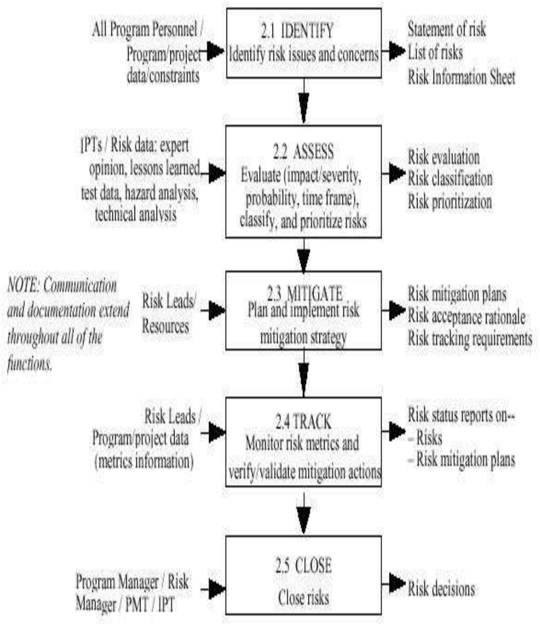
5. RISK MANAGEMENT CYCLE



6. Research Design

Define Different Kind of Risk over to software Life Cycle

↓

Define different parameters that can influence the risk

↓

Select the parameters and risk types on which research will performed

↓

Analyze the impact of these risks based on these parameters from existing study

↓

Assign weightage to these risks respective to selected parameters

↓

Define the soft computing rules based to perform the risk

↓

Estimate the software risk based on designed rule set

↓

Analysis of results

7. CONCLUSIONS

In this paper, we have presented a new algorithm to evaluate the rate of aggregative risk in software development under the fuzzy group decision making environment. We also use an example to illustrate the rate of aggregative risk evaluation process. The proposed algorithm has the following advantages:

(1) It does not need to form fuzzy assessment matrices for attributes to evaluate the first-stage aggregative assessment vectors for attributes.

(2) It does not need to perform the complicated defuzzication operations of fuzzy numbers using the centroid method.

Because the proposed algorithm uses simple arithmetic operations rather than the complicated arithmetic
operations presented in, it can be executed much faster than the ones presented in. The proposed algorithm is more efficient and faster in evaluating the rate of aggregative risk under the fuzzy group decision making environment.

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