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Risk Management Model of Electronic Commerce by the help of Decision support system

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ABSTRACT

This paper provides a good explanation of a model in a Decision System Support (DSS) for evaluation of risk in Electronic Commerce. There is a type of DSS concept which could be used for enabling project managers of Electronic Commerce in recognition all potential risk factors and also project risks of Electronic Commerce accordingly. Risk management model has been proposed by the use of DSS.

KEY WORDS: Risk Management, Electronic commerce, Decision Support System.

INTRODUCTION

Electronic Commerce (E-commerce) is a modern business method for meeting the needs of organizations, businessmen and consumers in reducing the costs and also betterment of quality of products and services and increasing the speed of servicing as well. Also there is another meaning for this word as using computer networks for searching and browsing information in supporting of companies & human decisions.

Although e-commerce provides different commercial opportunities, but it is facing with difference risks for which we need to have risks management. In fact, risk analysis is a critical duty in order to have a suitable management of e-commerce development. Increasing of knowledge and better understanding of managers of these risks are important steps in its development. There is a considerable time reduction for a risk analyst by the help of computer and benefiting from software systems. Risk analysis is possible by the use of probabilities theory and any consequences of the risks.

Fuzzy Decision Support System is suitable when there is vague and wrong information and also we have mental analysis. It is necessary to have a development of FDSS system by the help of the experts and for further risk evaluation of e-commerce.

This paper considers FDSS which may assist project managers of e-commerce in evaluation of risks. The real motivation of this job is lack of this system and facilitation of any risk level of company and also risk evaluation of business development.

Risk concepts related to E-commerce development

The real meaning of risk was presented in 1930 in economics. Then it was used in different theories of decision making, economy, business and science. Meriam Webster [1] explained it in his dictionary as “Possible lose or damages” and/or “Everything and/or any person which may create risks”. Right now there is not an agreement on a world description of risk in e-commerce. But one of the special aspects of risk in e-commerce is a wide range of information safety [2]. Mack Achern uses cyber risk for explaining any types of risks related to e-commerce including destruction & manipulation of non-authorized access to the web sites, internet infringement, and remote communications rubbery, breaking copy right rules and ignoring any access. On the other hand, Wildman [2] is focusing on risk management in e-commerce. He considers e-commerce as a negative effect probable in the organization when developing or performing e-commerce strategies. All related risks of e-commerce development are pointed out in this paper which may be resulted from direct and/or indirect loss of projects. It may point out that all projects include different steps including programming, analysis, designing and implementation on e-commerce system.

The importance of Fuzzy Risk analysis in e-commerce

Companies are able to make a connection with their commercial partners in their on-time production process & on-time delivery through which make better their competition at world level. Although e-commerce provides great opportunities, but certainly there are a lot of risks against e-commerce development as well. In this study we do not want to present e-commerce risks only but we mean relevant risks of e-commerce with traditional systems. Any establishment of e-commerce will provide various risks with different degrees. By the way, most companies could not evaluate and recognize relevant risks of e-commerce. There are a lot of common items in e-commerce creation and establishment of IT projects. Most of IT project and E-commerce developments could not be finished on timely and with estimated budget [3]. Suitable risk management is a necessary element in project success [3]. This is because with lack of a suitable risk management you will face with great loss in finding the goal of defending/ competitive investment. Risk analysis is one of the important procedures in risk management including of risk evaluation / recognition process [4]. A suitable risk evaluation will increase

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the probability of a successful implementation of project [4]. Mack Donald [5] and Stoehr [3] point out companies should make a risk analysis prior to involvement with e-commerce.

Fuzzy risk analysis research

Risk analysis techniques are powerful tools for enabling people to manage non-certain conditions. It is possible to supply a valuable support for making decision through estimation, evaluation and analysis. There are various risk analysis techniques which at present intend to evaluate and estimate the risks. According to the level of current information and required details, these techniques could be qualitative and quantitative as well [6]. Quantitative techniques are based upon statistical methods including Mont Carlo Simulation [7], Cause & Effect analysis tree [7], sensitivity analysis [7], annual lose estimation [8], disposing to risks [5], breaking & analysis of effects [7] and so on.

On the other hand, other qualitative techniques have more focuses on judgments instead of statistical calculations like scenario analysis [8], Fuzzy sets theory [8]. From among all these methods, it seems that FST is more suitable in risk analysis because this type of analysis is highly conceptual and more related to vague and uncertain information.

When FST was presented by Zadeh [9], it was applied for involving with different problems in which there are vague items for estimated reasoning. FST was effective in most fields because it is useful for obtaining useful information out of uncertain items.

Methodology of establishment a Fuzzy decision support system

The real purpose of this study is designing and development of FDSS for enabling project managers of e-commerce in recognition potential risk factors and risk evaluation related to e-commerce. There are five parts in designing and performing a FDSS based upon primary core of an information system [10] accompanied with fuzzy risk analysis method [11,12,13,13]. System development process includes 5 steps including description of primary concepts, fuzzy risk analysis model making, creation of system architecture, system designing & analysis, providing a prototype and system evaluation. Figure (1) shows a general schematic of these five steps of system development. Firstly we have fuzzy risk analysis model as the system core, secondly a system architecture, thirdly system analysis and designing, fourthly a prototype system for more acquisition with real concepts, framework and designing and finally sample system by specialists and potential users of e-commerce (Figure 1). Hereinafter there is a complete explanation of all mentioned steps.

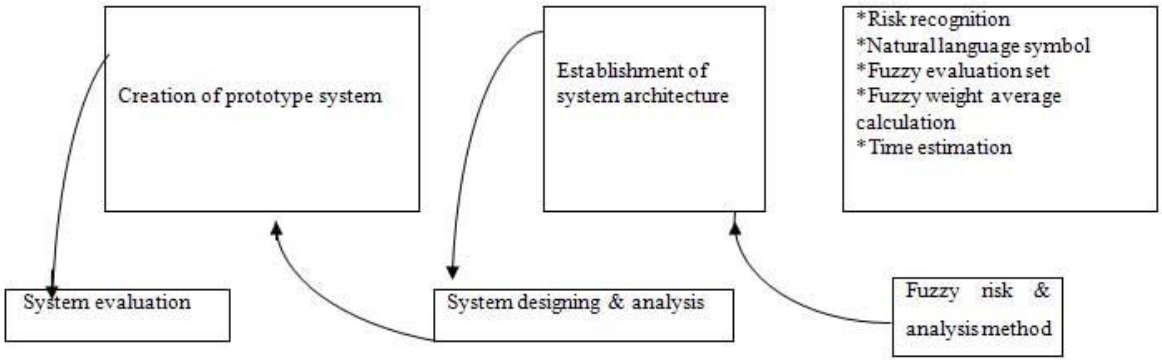

Figure 1

1st phase: Establishment a fuzzy risk analysis model

All current risk analysis models are based upon quantitative techniques like Mont Carlo simulation with annual loses waiting. Of course most obtaining information of uncertainty conditions are not numeric. FST is an estimated model for e-commerce risk evaluation model through a language attitude. There are five steps in fuzzy risk analysis process as mentioned in following resources [11,12,13,14]: Risk recognition, Natural Language representation, Fuzzy aggregation, risk net value calculation and linguistic estimation. Following parts are about relevant details of mentioned steps:

1-Risk recognition

The first step is risk recognition and preparing a list of most important factors of non-certainty and relevant explanations. Prior to fuzzy risk analysis, it is necessary to recognize all relevant risks in creation any e-commerce. Of course, quantitative experimental researches have been performed by focusing on recognition probable risk factors in e-commerce development.

Watt et al. [15], presented an attitude based upon classification of e-commerce development risks which may be divided into three major groups: Technical risks, Organizational risks and Environmental risks. Then they recognized 51 potential risks related to e-commerce (Refer to table 1). The mentioned risks were based upon previous studies and interviews with e-commerce persons in charge.

There was a study with 50 questions for further analysis. Data analysis show that 20 risks are related to development of e-commerce including: (1) risk of resources, (2) risk of necessities, (3), Risk of supplier's quality, (4) Client server, (5) Physical safety risk, (6) Human factor risk, (7) Natural factors risk, (8) Lack of supervision risk, (9) Supplier's specialty risk, (10) risk of new technology, (11) Risk of linguistic obstacles, (12) Lack of job force risk, (13) Managerial risk, (14) Lack of master management support risk, (15) Goals specification risk, (16) Landscape risk, (17) Legal risk, (18) Exteriority risk, (19) Cultural risk and (20) Re-engineering risk.

Table 1: Potential risks in E-commerce development

Unauthorized access of hacker	**Loosing main forces**
Lack of Firewall	Lack of master manager supports
Lack of coding	Weak project programming
Weak key management	Vague goals of project
Attacks of destructive codes	Non-specified project landscape
Disclosing of sensitive information	Lack of probable programs
Lack of continuous supervision	Re-designing of business process
Natural accidents which may destroy the equipment	Organizational Structural change
Human factor which may destroy the equipment	Lack of confident among your organization and merchant and/or customer
Threats of intentional destroys in internal network	Non-suitable media for product or services
Non-enough back up of systems	Lack of international legal standards
Hardware/software problems which may break the system	Rules, Regulations and new judicial decisions
Network/ Site over load and/or disconnection	Non-certain legal authorities
Maintenance method or coding and weak designing	Incomplete contractual terms
Incorrect development of functions and specifications	Hard situation for changing a decision or exterior supplier
Incorrect development of user interface	Lack of data control
Project complexity	Lack of control on supplier
Incorrect estimation of project size	Lack of control on IT
New technology	Hidden costs
Continuous change of system necessities	Lack of specialty and experience of supplier
Incorrect estimation of time schedule	Closed conditions
Hidden project time schedule	Skillful supplier with expired technology
Budget of project	Servicing supplier with weak quality
Non-enough monetary currency	Users with different cultures & business methods
Lack of job force (Personnel)	Linguistic obstacles
Lack of specialty and experience in e-ecommerce	

2-Natural Language Representation

Regarding the ideals of Karooski Wemital [16], traditional methods of risk evaluation may calculate risk grade by multiplying of the probabilities out of a probable accident out of risk. A simpler method presented by risk specialists is multiplying of risk occurrence severity in their probable rate of occurrence [17]. For example, the effect of risk means any probable of a non-certain result (probability) and losing effected groups out of this non-certainty [18]. As a result, both linguistic variant and severity items would be explained for calculation of general risk. Probability in FWA is the factor of degree (Ri) and Severity is the factor of weight (Wi) both related to factor i. Both linguistic variants have 5 words in themselves: Very little, Little, Average, High and very high. This study will specify all membership functions of linguistic words with triangular fuzzy numbers.

3-Total fuzzy evaluation

In this step, total fuzzy evaluation of different evaluations will be combined by the use of fuzzy average functions for this method. Fuzzy average functions are used for total method as "Triangle average formulation" [1] for specifying the average of the ideas of evaluators. Therefore, it is possible to obtain fuzzy average of all questions by the use of risk evaluation form. Following is the triangle average formula:

Assume n number of evaluators. Then we have $A_i = (a_1^{(i)}, a_M^{(i)}, a_2^{(i)})$ as fuzzy numbers when i=1,….,n. Then triangle average means:

$$A_{average} = A_1 + \cdots + A_n/n$$
$$= \left(a_1^{(1)}, a_m^{(1)}, a_2^{(1)}\right) + \cdots + (a_1^{(n)}, a_M^{(n)}, a_2^{(n)})/n$$

4-Calculation of Net value of the risk

We should calculate the average of all risk factors for further calculation of risk net value and/or final risk. It is a simple and confident method for general risk evaluation.

5-Linguistic estimation

Since the result of risk net value calculation is a fuzzy number, its translation into linguistic words is necessary for a simple interpretation.

The real purpose of linguistic estimation is to find a word with closest possible meaning into a fuzzy set. There are three methods in linguistic estimation: Best fit, continuous estimation and partial analysis. Chamker [11] studied any differences among these three techniques. In current study, the most suitable method has been applied because of its easy understanding and implementation on a computer [11].

2nd phase: System architecture

Good system architecture will provide a map for system establishment process. This process involved with combination of components in a landscape, specifying their characteristics and their interactions with each other. Web is the activity center in under-development decision supporting systems. While we have architecture of service receiver/servicing party in integration of applicable programs based upon the web. Any relation between service receiver architecture/server means distribution of duties between the server and those customers with an access to it. FDSS is architecture of service receiver/ server of customer with two columns architecture. Front part of system is customer side which is involved with web site applicants. It is established for receiving of customers' requests and obtaining the services and results. Servicer side is the rear part of the system for performing of fuzzy risk analysis and further access to data base for data management as well.

Furthermore, two columns architecture is a suitable type for non-live applicable programs with low transactions like DSS and/or department applications. Since FDSS is a service receiving/server system.

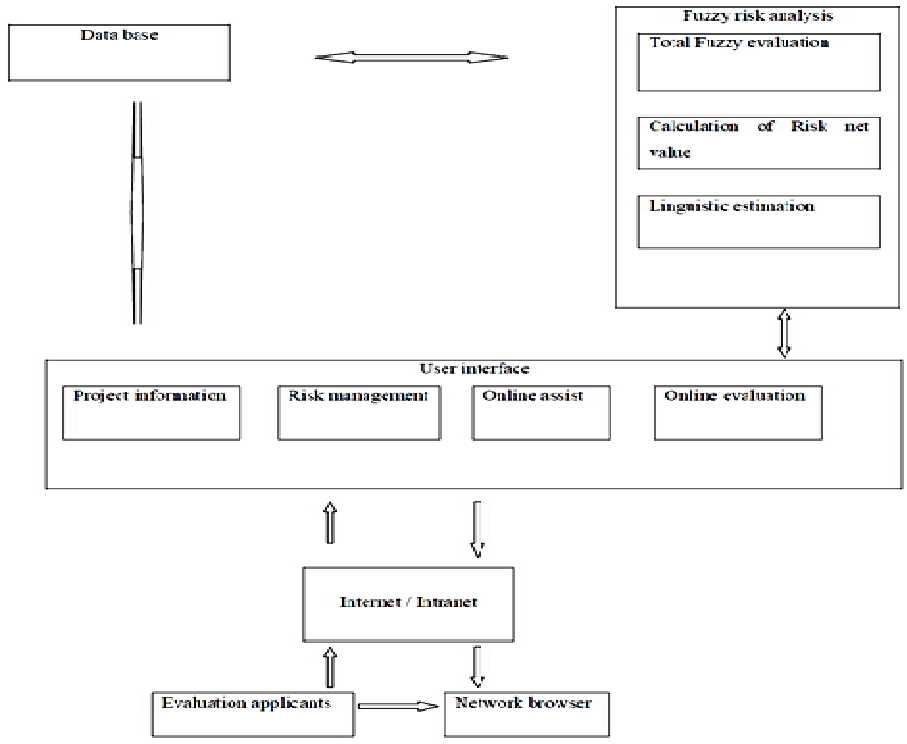

Figure 2

3rd phase: System designing & analysis

System analysis & design are important dimensions of a system establishment process. Designing include a studied scope of understanding, applying of different options and combination/evaluation of proposed solutions. Drawing of project specifications is applied for performance of a system as a map. We have specifying different parts of system and creation of primary plan through this phase. DSS design could be divided into three relevant parts including data base, main sub-system model and user interface. Partial specifications of these three parts are specified in following forms:

1-Data Base

Data Base system is responsible for data reserve and its management. This system may keep all required information about any project in e-commerce. Required information will be obtained through a foreign resource manually or through automatic processes and then FDSS is responsible for providing the results. Actives Data Object (ADO) could be used for data base in the relevant web. In order to be connected to data bases it is possible to use a relation through connecting protocol. Due to the high speed, easy application and low amount of memory full, ADO could be appointed as an access mechanism to data banks. Main data base is a program for supporting ODBC protocol. It is possible to use access Microsoft in proposed system.

2-Major sub-system model (COM part of Fuzzy Risk Analysis)

Model base has different activities for submission of analytical abilities for DSS. Users may write their own models and/or use standard models. Fuzzy risk analysis model as mentioned before is a sub-system model in FDSS. This model could be translated by programming codes and integrated as a COM factor. COM will explain double relation between objects. This character has a double cooperation facility.

Breaking of complex applicable programs and management of great codes for re-usage of them are most common ways for benefiting from this part. ASP script writing could be proposed mainly for implementation of FDSS. ASP script is able to contact with compatible parts of COM software. If there are any required functions out of ability of program writing, then ASP can used. ASP parts are: COM base, Maintenance of a special function which is called directly from an ASP page and/or indirectly from another ASP.

Fuzzy risk analysis is the real purpose of COM which is saved in DLL for further fuzzy risk analysis. When the applicants requests for calculation a general risk of e-commerce projects, the fuzzy risk analysis part of COM call for further access to the necessary information such as probability and severity of risk factor, for fuzzy average, calculation of fuzzy weight average and obtaining linguistic average.

3-User interface

Designing of user interface is a key factor in DSS facilities. DSS interface should provide an easy relation between the user and system as well. Web browser as a partial item of DSS user provides easy understanding and benefit of technology. Furthermore, FDSS is mainly includes different menus and graphics completed with natural language. The customer requests HTTP protocol for further connection to web site which may cause coding of server relation to customer station. Sliding menus should enable the users to specify their needs such as creation a new project and/or adding a new evaluation record.

4th phase: Creation a sample system

System implementation provides better reflection for designing and applying of considered specifications. Establishment a prototype system is one of the processes for finding problems and complexities of system through its development. FDSS is established by different commercial software packs and program writing techniques. Hereinafter there is a detailed explanation of FDSS structure by the use of these software packs and program writing skills.

5th Phase: System evaluation

Through system evaluation, it is possible to find any information about what the users like or dislike and what they should do or shouldn't do for removing their needs. Firstly the required tests and system evaluations should be performed. All modules of FDSS should be tested and considered for ensuring about complete exits. These tests will guarantee the completeness of system function and meeting the needs of users in risk management handling for providing electronic projects. Secondly upon creation of FDSS, there should be two steps of evaluation as: 1st Phase = Specialists evaluation scope & 2nd Phase= Evaluation of e-commerce users.

There are different DSS evaluation methods: One for evaluation of DSS and measuring the effectiveness of system. The other criterion of evaluation and measurement is user satisfaction. There could be an evaluation form with different parts. Part 1 could be for measuring the efficiency and applicable situation of system with 5 scores in Likert scope: 1= completely disagreed, 3=Indifference, 5=completely agreed.

It is possible to find system abilities for applying of the goals and /or assignment by measuring the system efficiency. There are different items for measuring any possibility for reflecting usefulness and easy apply of the system. Therefore we may evaluate user's satisfaction as an index of success evaluation.

Second part of evaluation form should includes different open questions like an interview in which we will provide a chance to all replies to present their ideas clearly about any problems and betterment ways. The final part should be for data set and personal evaluations.

FDSS advantages

FDSS is effectively applicable for relevant risk management and benefiting from e-commerce projects. It is boring to make relevant calculations in fuzzy risk analysis model manually. This is an easy job for reducing the time for a considerable reduction in risk analysis. FDSS based upon a web questionnaire may facilitate any automatic risk evaluation. Project managers of e-commerce specify a general risk for e-commerce. Followings are the advantages of this system:

1- It is possible to recognize all relevant risks of e-commerce development. These are relevant risks of e-commerce in technical, organizational and environmental dimensions. Project managers and/or e-commerce users may be informed about these dimensions and recognize relevant risks of e-commerce development.
2- Project managers of e-commerce are able to estimate general risks of project prior to start up and implementation. They should prepare a complete list of all potential problems.
3- System will provide an effective, regular and systematic fuzzy risk analysis model. Auditors will benefit from risks check lists and explain with qualitative language for further evaluation of risk level in e-commerce.
4- All risks could be classified in accordance with their importance [19]. There is a list of risk items with e-commerce development. As a result, it is possible to specify most serious conditions of risk as well.

Conclusion

E-commerce development is applicable in a complex and active environment with high level of risks and uncertainties. This study explained an evaluation method of relevant risks with e-commerce development by the use of FDSS. Then a fuzzy risk analysis model was proposed for enabling project managers of e-commerce and decision makers for integration of environmental risks evaluation. We presented the manner of systems evaluation in order to specify whether FDSS will be led to finding considered goal and satisfying results or not? There was little attention to risk management programming, problem solving and supervision on e-commerce establishment. It is necessary to perform more researches for such a risk management programming. Furthermore, we should have regular supervision on risks in order to follow up relevant conditions of recognized risks. Then FDSS may provide better and more confident risk management with such a viewpoint as well.

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