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Recent Advances in Risk Management Using Business Intelligence

Swapnil Raj [1], and Mrinal Paliwal [2]

[1, 2] Assistant Professor, Department of Computer Science Engineering, Sanskriti University, Mathura, Uttar Pradesh

Correspondence should be addressed to Swapnil Raj; swapnil.cse@sanskriti.edu.in

ABSTRACT: Over the last several decades, risk supervision has been a hot subject in both academic world and practice. The complexity of the company and the environment in which it works determine operational risk. As the company or the environment becomes more dynamic, i.e., where change is a constant characteristic and a factor to consider into the management of the firm, such complexity grow. The important issue is how companies react to such changes today, and what measures can businesses take to anticipate and prepare for change as the nature of business and the environment becomes more dynamic. The majority of business intelligence (BI) programs or software have been utilized to improve risk supervision, and business intelligence methods have improved risk management solutions. This introductory paper offers an overview of current business intelligence research in risk management.

KEYWORDS: Business Intelligence, Risk Supervision, Operations Research.

I. INTRODUCTION

Risks occur in almost every single area of human being's lives, and although they may include various things to different individuals, they always have the potential to inflict significant harm and discomfort to the stakeholders. Recent catastrophe threats include terrorists poisoning the Japanese subway system, and the intimidations of the Spanish and British conveyance networks, in addition to the infection caused by SARS virus affecting public and commercial operations, especially in Asian countries. Further of late, H1N1 virus has raised worldwide consciousness of responding arrangement, & worldwide monetary predicament has give rise to recession across the board.

Figure.1: Illustrates Business Intelligence Cycle in Risk Supervision [1].

Over the last several decades, risk supervision has been a hot subject in both academic world and practical world. To manage the risks that a company faces, integrated methods are needed, and successful risk-taking techniques may include new business concepts such as enterprise risk management. The majority of business intelligence tools have been utilized to improve risk management, and business intelligence methods enhance risk management solutions. Artificial intelligence models like support vector machines and neural net, for example, have been extensively utilized to develop initial cautioning systems for observing a company's pecuniary condition [2]. In supply chain risk management, agent-based theories are used. By integrating market risks, credit risks, and operational risks into business intelligence models, financial risks may be hedged. Practitioners and academic academics alike will benefit from study into business intelligence tools in risk management.

II. LITRATURE REVIEW

Four papers on modeling risk supervision are included in this paper: two on fiscal risk supervision, one on security threat administration, and one on ERP project threat administration. The first set of papers on pecuniary peril administration covers a wide range of topics, including an innovative run of the mill exchange scheme based on Kansei evaluation and a self-organizing map model for

stock trading system improvement. Cristina et al. study the risks in ERP projects in their paper "Vibrant Hazards Modelling in ERP preservation schemes using FCM" [3]. They've created Fuzzy Cognitive Maps (FCMs) of ERP maintenance concerns in particular. FCM's primary benefit is its ability to simulate complicated phenomena based on expert views. This program simulates human thinking by modeling uncertainty and associated events. The suggested method is designed to simulate ERP conservation mission results and peril observations, on top of their unspoken interconnections. The authors demonstrate how simulations may be used to create forecasting exercises using FCMs. As a result, practitioners would evaluate the combined impact of ERP preservation perils on project results. The suggested solution would assist practitioners in more effectively and pro-actively managing ERP maintenance project risks.

Hai et al.'s paper "Hybrid Kansei-SOM Model Using Risk Management and Company Assessment for Stock Trading" describes a novel stock trading technique that combines Kansei assessment with a self-organizing map model for stock trading system enhancement [4]. By dealing with complicated circumstances in changing market settings, the suggested method seeks to aggregate numerous expert judgments, obtain the highest investment returns, and minimize losses. To measure trader sensitivities about stock trading, market circumstances, and stock market variables with unknown risks, Kansei assessment and fuzzy evaluation models are used. Group psychology and trader sensitivity are measured and expressed by fuzzy weights in Kansei assessment. SOM visualizes Kansei and stock-market data sets, as well as aggregate expert preferences, in order to identify prospective businesses, match trading methods at the appropriate moment, and exclude hazardous stocks. The authors put the suggested strategy to the test on the HOSE, HNX (Vietnam), NYSE, and NASDAQ (US) stock exchanges on a daily basis. The authors demonstrate that using Kansei assessment in a novel way improves share yields and decreases harming factors. The authors further demonstrate that the suggested technique outperforms other existing approaches in a variety of market situations. Fenget et al. develop a safety peril examination prototype to identify fundamental associations amid menace issues and evaluate the involvedness and ambiguity of susceptibility proliferation in their article "A Security Risk Analysis Model for Information Systems: Causal Relationships of Risk Factors and Vulnerability Propagation Analysis" [5]. As per information from witnessed instances, a Bayesian network (BN) is constructed in the proposed model to concurrently identify the risk variables and their causal connections. The authors do a security vulnerability propagation study to identify the route with the highest likelihood and the greatest risk exposure. SRAM use ant colony optimization to identify the BN structure and vulnerability propagation routes, as well as their occurrence probability. Organizations may use SRAM to create proactive security risk management strategies for their information systems.

Li et al. offer a adjustment technique for the agent-based incessant dual auction (IDA) financial market by means of scaling analysis in their paper "Standardization of Representative Grounded Incessant Dual Auction Stock Marketing Scale Analysis" [6]. The authors create an IDA stock market built on agents that utilizes the identical tradeoff process as the Chinese financial exchange. They conduct a scaling study of complete yields too in both artificial and actual money exchange markets, revealing fluctuation coefficients as energy regulations in all markets where the power-law exponent is not unique and all such exponent's exhibit multi-scale behavior.

III. DISCUSSION

A. Risks and Risk Management

Uncertainty and danger are inherent in all human activities. In the field of food production, research has achieved significant advances in genetic management. However, many operations involved have raised concerns, with differing viewpoints prevalent all over the world. Genetic management is often regarded in the United States as a method to get better and more productive food supplies in a more dependable manner. Nonetheless, bioengineered food is met with significant opposition in Europe and Asia. Natural illnesses have emerged, such as mad cow disease, which are very difficult to manage. It's sometimes debatable how much control was achieved. Even though Europe has strict bioengineering regulations, a pig breeding crisis involving dangerous feed stock and illegal medicines has occurred. In the food chain, bioengineering hazards are essential to address. When it comes to human resource management, genetic mapping provides great scientific advances, but it also poses political dangers. Even using information technology to help control healthcare delivery hazards comes with its own set of dangers. The use of computer control in airplanes has been tried, but it hasn't always succeeded. Risks may seem to be dangers, yet businesses exist to deal with them. Different fields define hazards in different ways. Jorion divided hazards into three categories to illustrate risk management lessons learned from the financial crisis: "identified known," "identified unknown," and "unidentified unknown." The following is a broad risk categorization we propose: There are two types of fields: field-based as the first field and property-based as the second field.

B. Field-based type

Financial hazards include a wide range of dangers in the financial industry as well as financial elements in other industries. These include marketplace menace, operative menace, operational risk, & liquescence menace, among others. Non-financial hazards are those that arise from sources other than money. Political risks, reputational risks, biotechnology risks, and catastrophe risks are all examples of this.

C. Property-based type

Uncertainty, dynamics, connectivity and dependency, and complexity are four characteristics that may be found in risks. The first two characteristics are well-known in behavioral choice and behavioral economics intertemporal models, whereas the final two traits are finely deliberated in investment castigations. To represent hazards, peril likelihood uses possibility model & different disseminations. The use of Bernoulli prototypes of dealings, as well as generic Pareto disseminations & overall great cost spreading to represent risky

occurrences, may be traced back to the 1700s. The application of stochastic process theory in risk management is central to risk dynamics. The development of Markov methods, Brownian movements, and Levy developments may be traced back to the 1930s. Risk interconnection and dependency is concerned with the relationship between risk aspects. Numerous copula tasks are constructed, as well as Fourier transformations. Risk complexity must be addressed further via the use of different complexity science-based models, such as agent-based modeling methods. The process of identifying, analyzing, and either accepting or mitigating uncertainty in investment decision-making is known as risk management. Risk management is the process of coping with the uncertainty that comes with a danger. Traditional risk management focuses on physical and legal hazards such as natural catastrophes like fires, accidents, fatalities, and litigation. Risks that can be controlled using traded financial instruments are dealt with in financial risk management. Enterprise risk management, the most current idea, is a tool for increasing the value of systems, both commercial and communal, from a systematic standpoint. When it comes to risk management, operations research (OR) is usually helpful.

D. Different Perspectives and Tools

Neural net, fuzzy logic and genetic set of rules, as well as gradual development of computing and most effective methods including linear programming, game theory, and multi-criteria decision analysis, have all made significant development in the past several decades. In several extents of weather predicting, enactment assessment, automated mechanism, and function estimate, optimization techniques have been extensively used in industry. This section includes a review of important topics as well as the methods that go with them.

E. Early-Warning Systems

The usefulness of early-warning systems as a risk-control tool has been discussed in a number of publications. Krstevska highlighted their usage in macroeconomic models, citing examples from Macedonia's economy [7]. Computer systems have been used to implement a variety of models. Flores used stochastic optimization to cope with early warning in insurance. Macroeconomic and financial monitoring methods were explored by Castell and Dacuycuy [8]. Hua looked examined the techniques utilized in real estate for early warning. Xie et al. developed a method for identifying logistical risks for small-to-medium businesses in industrial applications [9].
Risk Examination Depending on Neural Net:
Neural net are basically a kind of an artificial intelligence technologies that have shown to be very effective in detecting patterns in complicated data structures, particularly those with nonlinear connections. Schneidewing presented the findings of a study that used neural networks to evaluate software dependability with the aim of lowering the probability of project failure. Jin and Zhang presented another another example of the usefulness of artificial neural network models in projects, this time in the context of public–private partnerships. Banks, for example, are using artificial neural network models to evaluate credit card applications, enabling them to better manage risk after the financial crisis of 2008. In Groth and Muntermann, neural network models were coupled with test mining applications, and the model was applied to financial risk in day-trading.

F. Risk Dependent Choice Selection

Since the 1970s, the use of workstation utilities for menace-proof choice building has been extensively researched in the area of information systems called decision support systems. Warenski used artificial intelligence to demonstrate financial modeling in the paper and pulp sector, showing another use of loan-risk analysis. Otim et al. published a recent study that focused on assessing the value and risk of information technology investments [10]. Such investments include a diverse collection of stakeholders, necessitating the consideration of organizational politics. The role of political plurality in the development of commercial banks in India was investigated by Kozhikode and Li, who also took into account risk management. Industrial decision-making includes not only a large number of stakeholders, but also a large number of criteria, which is influenced in part by the fact that there are so many of them. For risk analysis in industrial safety, Silvestri et al. proposed a multiple criteria risk assessment method [11].

G. Game-Based Risk Analysis

By examining the function of competitive strategy, Nash produced many important mechanisms in the topic of game theory [12]. In industrial risk management, this well-studied subject is a significant emphasis. Zhao and Jianq looked at various developing hazards in a project management setting using a non-cooperative full information game model [13]. In the area of counterterrorism, the author expanded game theoretic models to incorporate probabilistic risk assessments. Containers were screened for radioactive elements as part of their application. Later, few researchers utilized game theory to analyze vertical differentiation in online advertising and discovered that a greater ad revenue rate may lead to reduced service costs. Gnyawali and Park have also used game theory to risk management in small and medium-sized businesses.

H. Credit Risk Decisions

The main objective of risk management in the financial sector is to determine the likelihood of default. Some of the researchers used linear discriminant analysis to develop a scoring model for US banks, while some presented yet another research focusing on financial risk reduction utilizing the Six Sigma DMAIC approach. Many of them showed how predictive scorecards have been utilized to control credit risk for major banks by developing a scoring model for small and medium-sized businesses looking for bank loans. Further, the efficacy of credit scoring is examined by government-sponsored enterprises, demonstrating how credit bureau grading influenced support for risk-averse and risk-averse investment strategies.

I. Enterprise Risk Supervision Based Data Excavation

Data excavation basically is one of the popular method for analyzing huge data sets using statistical and artificial intelligence techniques. DM techniques are used to commercial investment, comprising supervision swindle exposure, credit hazard valuation, & trade enactment

projection, among other applications to risk management. Some authors focused their data mining research on the risk of internal fraud, and found that data mining techniques outperformed univariate analyses. Workplace fraud is tackled by using text mining to aid fraud investigations. Data mining methods used in other sectors to better forecast power disruptions, particularly those caused by storms. Text mining applications are looked for supply chain risk management. Few research looked at the use of data excavation to decrease the risk of workplace accident.

J. Agent-Based Risk Management

AI is over and over again instigated via agent-based systems, in which computers act as human decision makers. This method can be used to look at risk management in supply chains, with a focus on peer partner business bankruptcy risk. Agent models can also be used to look at supply chain risk management, looking at the inherent hazards in both the demand for and supply of resources during economic downturns. Agents have also been deployed especially to simulation models, allowing simulation models to be used for the study of increasingly complicated issues. An optimum model may be proposed for financial markets in times of crisis that may combined simulation and game theory through agents. Particle swarm optimization is a similar technique that many authors used to control project risk and many used to develop more resilient supply chain architectures. This method was discovered to enable for the modeling of more complex scenarios. Few of them used agent-based modeling of supply chains to simulate the danger of participating businesses in self-emerging networks going bankrupt.

K. Technical Risk Examination Using Effective Tools

Engineering attempts to create better systems need the use of optimization techniques. Few of the necessary conventions for many effective models are violated by the presence of uncertainty. When there is risk, there is also uncertainty, which makes developing optimization models more challenging. However, models for optimizing engineering systems have been proposed. A group of researchers developed a model that took into account the increasing likelihood of mechanical system failure as a result of aging. Further, another group proposed a paradigm for dynamic strategic planning of engineering systems based on real choices analysis, showing that this method outperformed static design. Many used sophisticated optimization to improve risky maintenance systems.

L. Natural Disasters Risk Supervision

Knowledge organization is a wide field of research that includes data mining and business analytics, as well as decision support systems, expert systems, and artificial intelligence. Consider how tacit knowledge inside companies may be collected in desktops or laptops or wireless servers such as case-based reasoning as part of knowledge management. In the application of information organization to industrial risk management, there are a few articles. Few authors used data mining to evaluate and manage natural catastrophes such as landslides, earthquakes, floods, and wildfires using grid technologies in geoscience. Their method was designed to help in catastrophe preparedness and response. Many developed a Bayesian network to forecast natural catastrophes using domain knowledge and geographical data.

IV. CONCLUSION

This article has addressed the many components of BI and how they may be used to achieve a successful risk management implementation that is based on a continuous process of goal creation, monitoring, and optimization. We mostly followed the previously mentioned framework for enterprise risk management, which has become the de facto risk management implementation standard. The business performance framework is the initial component of BI, and it is responsible for creating organizational performance models, allowing for the assessment of business performance criteria, and allowing for what-if analysis and goal improvement. These tools enable company managers to see the status of their goals in real time and evaluate the impact of any measures they wish to take on performance. The same methods may be used to evaluate performance in the context of external and internal hazards, resulting in a holistic picture of performance and risk.

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