

RISK MANAGEMENT IN SUPPLY CHAIN MANAGEMENT

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ABSTRACT

Now a days, global speedy transformations have forced on organizations to investigate on risk management in supply chain in order to overcome to their around insecure conditions. Suppliers should produce materials and parts with the best quality and less costs. Identifying and ranking of the effective risks in supply chain is necessary in order to achieve it. In this essay, in addition to explanation of non-determinant concept in supply chain, and also the identification of risks supply chain and determining the intensity of their effects, risk management in supply chain has been explained as one of the main managers functions. In addition, we have recognized the most important supply chain risks on the basis of suggestive model from us and also have designed the questionnaire which has not only measured the severity of risks relating to each other and finally have analyzed the results by DEMATEL technique in order to clarify the most important supply chain risks regarding to their priorities. For example: environmental, financial, strategic, informative and communicative technology.

Keywords: Risk Management, Supply Chain Management, Risk in Supply Chain, Decision Making

1- INTRODUCTION

Nowadays, the management's challenges are increasingly formed from a complex network of suppliers that can do threaten the business and the creation of new opportunities for agency management. To understand the supply chain risks which the companies are faced to makes possibility for agencies managers to make more power to realize and challenge against unexpected happenings. In the unsecure and unstable terms of competitive environment, recognizing of above mentioned risks cause the adaptation and act as a strategic lever in the organizations competitive process.

Supply chain risk appraisal process can help to make strategic decisions and operational plans to reduce the quantity of supply chain defects (Zurich Insurance Company, 2010). The process of advancement in this regard is described in the way that, at first, organizations were trying to produce the products with better quality and the least costs by standardization and improving their own internal processes in order to increase their competitive power. In the past, the dominant thinking was that the powerful engineering and designing and also harmonious and consistent production operations are the leading factor to access market demands and, as a result, to get more market share and, therefore, the organizations do their best to increase efficiency. In later years, with increasing of diversification in customer's expected patterns, the organizations were concerned with increasing elasticity in production lines and development of new products for customer's satisfaction. In later time, by improving of production processes and using further engineering models, most of the industrial managers found that to continue their presence in the market, it's not enough to have improvement in internal processes and flexibility in companies abilities. But parts and materials producers should produce the materials with the best quality and least costs and also products distributors must have a close relation with policies of market

development of producers. By such a view point, the supply chain approaches and its management were born (Mentzer.etal).

Most of the companies take different actions like contracting to manufacture diversified productions to have cost advantage and market share. These actions may be efficient due to the stable conditions. But these actions by itself can effect on supply chain by different kinds of risks.

The risks like unsecure economic cycles, customer's uncertain demands and human and natural events. So, in regard to more increasing of these actions, the need to study of different methods and strategies for supply chain risk management in the superior companies has also been put to agenda more than before (Sharafati,2009). In this research, besides explanation of the concepts of supply chain, supply chain management, risk and non determination in supply chain, we talk about the existing risks in supply chain and finally, after inquiry of risk models in supply chain, we examine one of the them and the questionnaire which has been extracted from the best selected model, is analyzed by DEMATEL method.

2- A REVIEW ON RESEARCH RESOURCES AND LITERATURE STUDY

2-1 Supply chain

A supply chain is including all stages which directly or indirectly handle customer's demands. Supply chain consists of all cases relevant logistics network which is including suppliers, manufacturing centers, stores, distribution centers, retailers' s market, raw materials, processing stocks and current final products. In literature study, there is many description of supply chain like: company's establishment so that to prepare the products or services for the market (Douglas and partners,1998). It is including of all stages which are active to make the customer desires directly or indirectly be met and not only consist of producers and suppliers, but also including transports, stores, retailers, and customers themselves (Chopra.et al,2001). The network of facilities and distributors which prepare the materials, changing them to semi - manufactured and final productions and distribution of them between customers (Goneshan. et al,1995).

On the basis of a given definition from Logistic Management Association, logistic means: planning process, effective execution and control of flow and saving raw materials, materials in production process, finished goods and all information regarding to inventory from place of production till using point in order to supply consumer's needs. In another definition, logistic is a part of supply chain process which plans, performs and controls the effective and efficient flow of goods storage, services and data relating to them from start point to consumption point, for meeting customer's needs (Erich Nickel,2004).

2-2 Supply chain management

Supply chain management is a synthesis from art and science which improve the method of finding company's needed raw materials for production or services. Five main parts of supply chain management are as follows:

2-2-1 Program: program is a strategic part of supply chain management.

You need strategy for management of all resources which use to supply customers requests. The most important part of planning is development of collections of parameters for efficiency control, decreasing costs and delivery with high quality of supply chain.

2-2-2- Finding selected supplier

Choosing of suppliers who deliver your goods and services which you need for manufacturing of products or offering the services. Pricing processes development, delivery and payment and also using some parameters to control and improve of suppliers' relationship and finally using these processes in inventory management and taking services from suppliers like taking cargos and checking them are necessary.

2-2-3 Fabrication

In this part, some activities are done which are necessary to produce, test, packaging and setting up for delivery.

2-2-4 Delivery

This part is including of coordinating customers orders receiving, network development of stores and to set up invoice systems for payments.

2-2-5 Rejected

The difficult part of supply chain. To sets up network to receive the faults and returns products from customers and supporting those customer who have problem with product (Koch,2008).

2-2-6 Model score

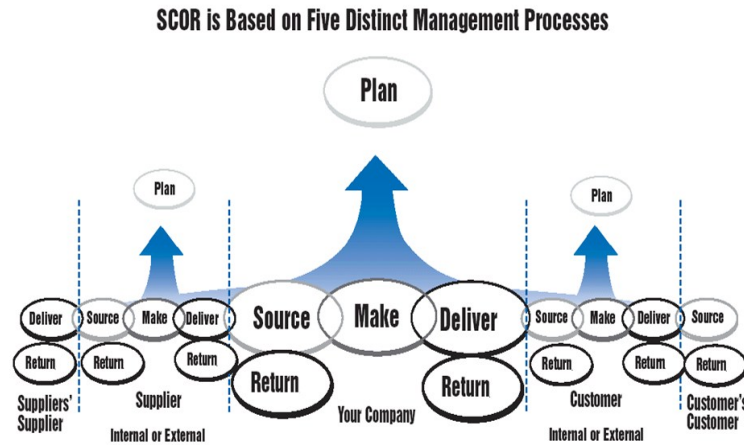


Fig.1 SCOR Model

2-3 Risk

Risk and its probability, remarkably returns to the beginning of written human history. Nowadays not only there is too many dangerous situations, but also the development of modern technology has brought about an exact knowledge of probability risk in these risky cases. The new risks which have been relevant with advancement of this trend. The key parameter in this trend is regarded as a fact which improves relating knowledge. At the present, we have more information about physics world as to 19th century and more than 20th century. Altogether, mechanization of the most part of daily life has caused human being enter to newer dangerous world.

At the same time, the available technology makes us familiar with the instruments which estimate and control probable risks and avoids over all from them in all times. Our understanding about the priority of human being in behavioral psychology and economical sciences help us to recognize the methods in which, people can understand the probable risks and control them in their life. With increasingly modernized life, still the different ways are necessary to divide the role and share of risks between different organizations (Michael, 2003).

2-3-1 Risk management

Risk management means recognition, analysis and economical control of risks or probability of risks which can threat properties and economical incomes of companies. On the other hand, risk management is the same system which is planned to order the confronting operations against indetermination and probable deviation (Fathi.et al, 2004).

2-4 Indetermination and risk in supply chain

Indetermination and risk in supply chain have important effect on its shape, plan and operation. In the other words, business and trade get meaning due to the presence of indetermination and risk, because in case of the absence of risk and danger in any activity, there will not be any economical value added value (Simchilevi.et al).

Indetermination and distrusts are present in two tactical (short terms) and strategic (long terms) levels. Regarding to short terms indetermination, we can point to items like demand for a commodity or a collection of goods. But, indetermination in long terms includes cases such as market expansion or production line development. The risks relating tactical level (short terms) are much different than long terms plans. Tactical level risk consequence and imposed charges can be calculated and are predictable, while the risks in long terms plans level, due to the presence of indetermination phenomenon, there will be much more different forms of diverse views (Tavakoli.et al,2007).

In the other side, risk and indetermination are different from share holders, management and employees view point and they all have also very different views from society which means distributors and consumers (Koch,2008). For share holders of big economical companies, success or defeat of supply chain planning circle are considered only as a statistical inquiry, but risk of defeat for a manager may be regarded like a catastrophe, which causes him to become more conservative in his tactics when he implies the plan. So, these approaches show that long terms planning is surrounded by different sides of

indetermination. There are some kinds of risks in supply chain planning for employees depending to their responsibility. Also, for products distributor or service provider relating to this plan, there are market and purchase non-acceptance risk, and there are also some distrust for consumers to accept products or services because of quality. We can call this inquiry as a kind of indetermination from actors viewpoints (Tavakoli et al, 2007).

Supply chain risk evaluation can protect business resources and trade mark of organization against basic and important meaning of supply chain defeat. The evaluation instruments should upgrade with combination of supply chain and professional business risk in every some years. Here we can come to the conclusion that business has some different levels of growth and perfection in supply chain risk management (Zurich Insurance Company, 2010).

In addition, with regards to review of available resources in risk management and supply chain area, the main risks factors which are identified are as follows:

2-5 Supply chain risks

2-5-1 Financial risk

It is a kind of risk which indicates that the organization has no enough money to face to its financial consequences. If the organization uses from a loan or credits, should be able to pay it back in due time, otherwise it will face to financial risk (Shenkir, 2007).

2-5-2 Strategic risk

Strategic risk means the profit at the present and in the future of organization. This kind of risk is subject to companies' strategic targets. When the business strategies advance and fix resources are against them, strategic risk will appear (Brannan, 2007).

2-5-3 Operational risk

Nowadays, organizations are trying to upgrade the techniques for measurement, monitoring and decreasing of operational risks. For example: the results getting from unsuccessful processes or a few equipment, inefficient employees and systems in external accidents, damages are brought about from processes, improper personnel and defective systems or accidents due to the companies outside factors are those to be mentioned. (Litov et al, 2005).

2-5-4 Human resources risk

There are two kinds of human resources risks: 1- The absence of trained persons in order to apply management programs. 2- The important necessary strategy section to connect with risks is the intelligence of those who have to deal with unexpected accidents (Erven, 2007).

2-5-5 Technological risk

Informational systems and organizational activities, automation, projects rebate, misunderstanding of share holder's role and technology's position are parts of technological risks. These risks should be recognized earlier, and a set of activities to avoid the serious problems proceeding from them be considered later on (Adams et al, 2005).

2-5-6 Fame risk

Fame risk has been described as a current or future risk for earning and increasing capital from different view points of financial firms and commercial beneficiaries. The duty of all employees is to keep organization fame (Fiorino, 1989).

2-5-7 Laws risk

At any environment which is changeable, these controlling laws can give confidence regarding the fact that identification, management and control of any kind of controlling risks, now and in the future will be done. Control teams on laws are including controlling experiences and especial risks management. Not only they know laws, but have also trained for contrasting, executing and accessing to risks (Brannan, 2007).

There are some different kinds of models in supply chain in order to manage the risks which can point to some of them, like FM Global models, Marine Swanson and partners, Nick Edwards and partners, and our suggestive model.

2-6 Risk models in supply chain

2-6-1 FM Global model

In this model, risk factors divide to four branches for reflecting different risks which may arising from confusion in supply chain.

2-6-1-1 Environmental: This kind of risk especially concerns to economical, social, governmental and climate factors. Recently, in spite of no lack in above mentioned items, some societies were faced to earthquakes, terrorist attacks and tsunamis.

2-6-1-2 Market effects: Is your supplier's reflex in pressure terms?

If not, the disorders between products supply and your supply chain can have destruction effect on your final line. And what kind of information your suppliers have from their suppliers about market reflex?

Their presentation can be your presentation.

2-6-1-3 Business activities: Financial and managerial stability of suppliers should be attended more than internal processes and governmental organizations experiences for their representing risk.

For example:

2-6-1-3-1: In case of breaking of internal operations by suppliers, if the defect has not been removed on time, there will be problem in organization very easily.

2-6-1-3-2: If there is no attention to changes in key personnel, management and business process with organization suppliers, it will have a negative effect on organization.

2-6-1-4 Physical installation: Losing dimensions is as much important for organization suppliers as organization personnel. The difference is that organization does not control suppliers' facilities. Some points likenatural risks, structural materials, automatic sprinkler keeper and popular attraction in losing protection indicator are usually ignored. However, these may be the most important probable factors relating to defeated scenario (FM Global factory, 2006).

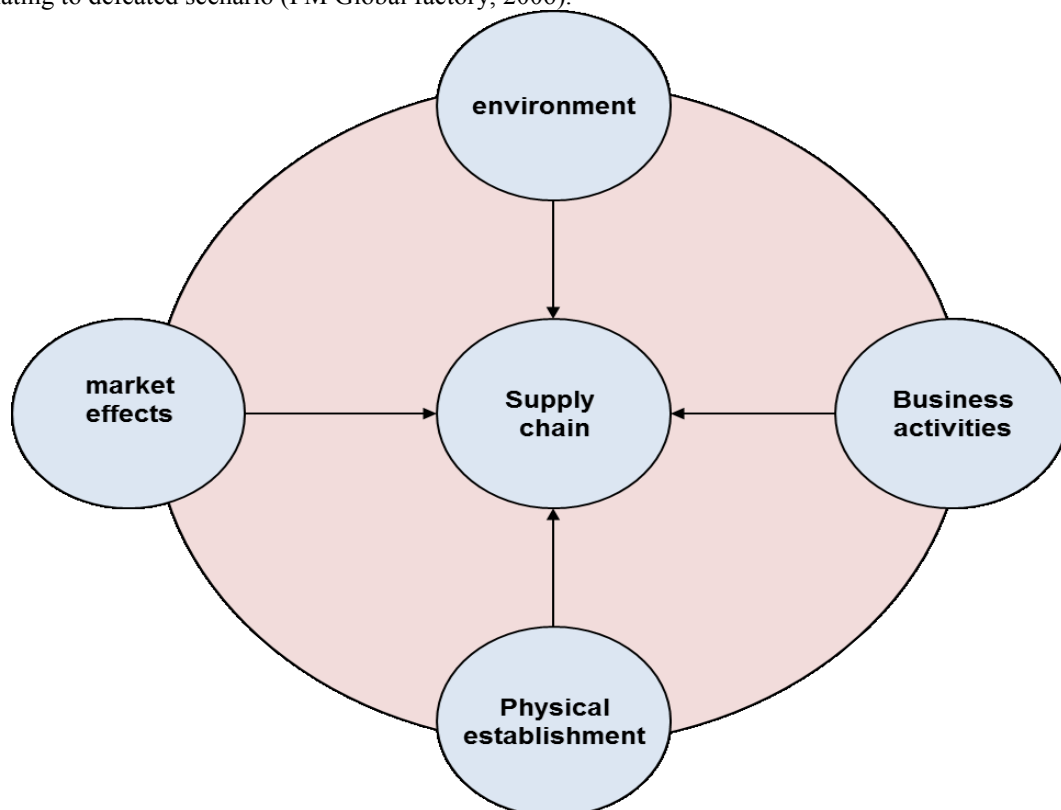


Fig.2 Fm Global Factory Model

2-6-2- Marianne Swanson Model

In this model, the conditions to set up an agency is explained which is used to establish operational team in order to achieve supply chain risks and risks computation by means of programmed techniques and synthetic technology.

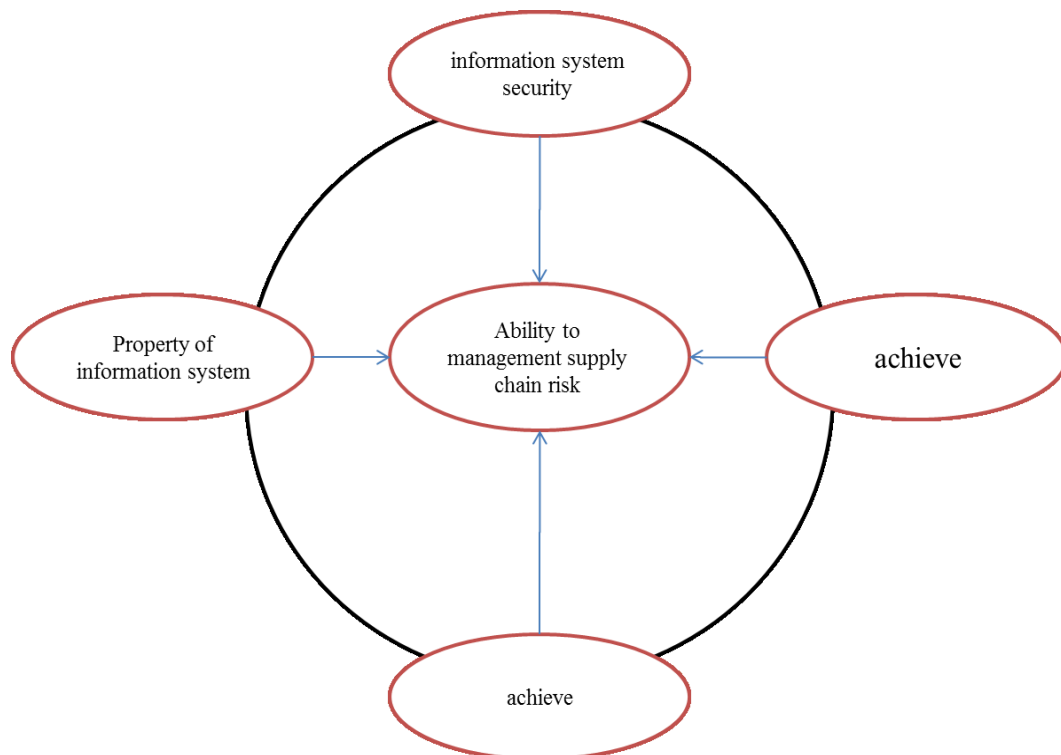


Fig.3 - Marianne Swanson Model

2-6-3 Nick Edwards Model

There is available information in this model for recognizing of risks relevant with suppliers or products group which are important for organization later decision.

This group of risks is against those standards which have to be reviewed.

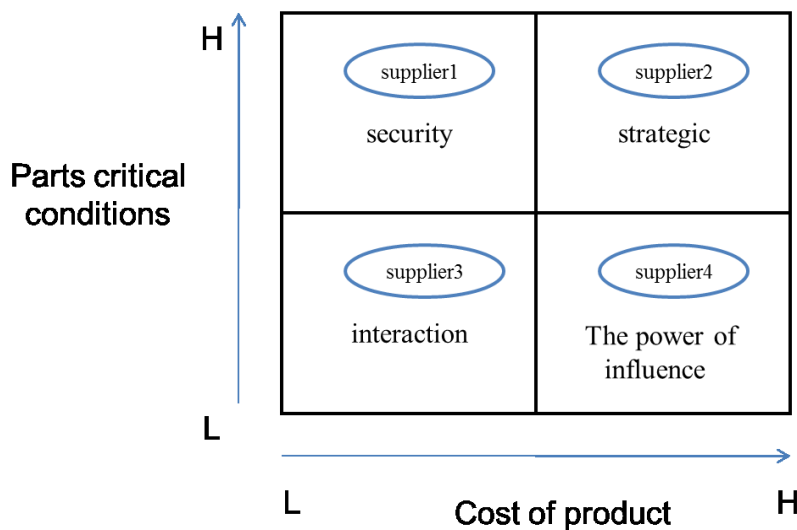


Fig 4. Nick Edwards Model

2-6-4 Conceptual Model:

This model is showing the new idea for supply chain risk management and after study the different kinds of models we suggest this model. It is complete model.

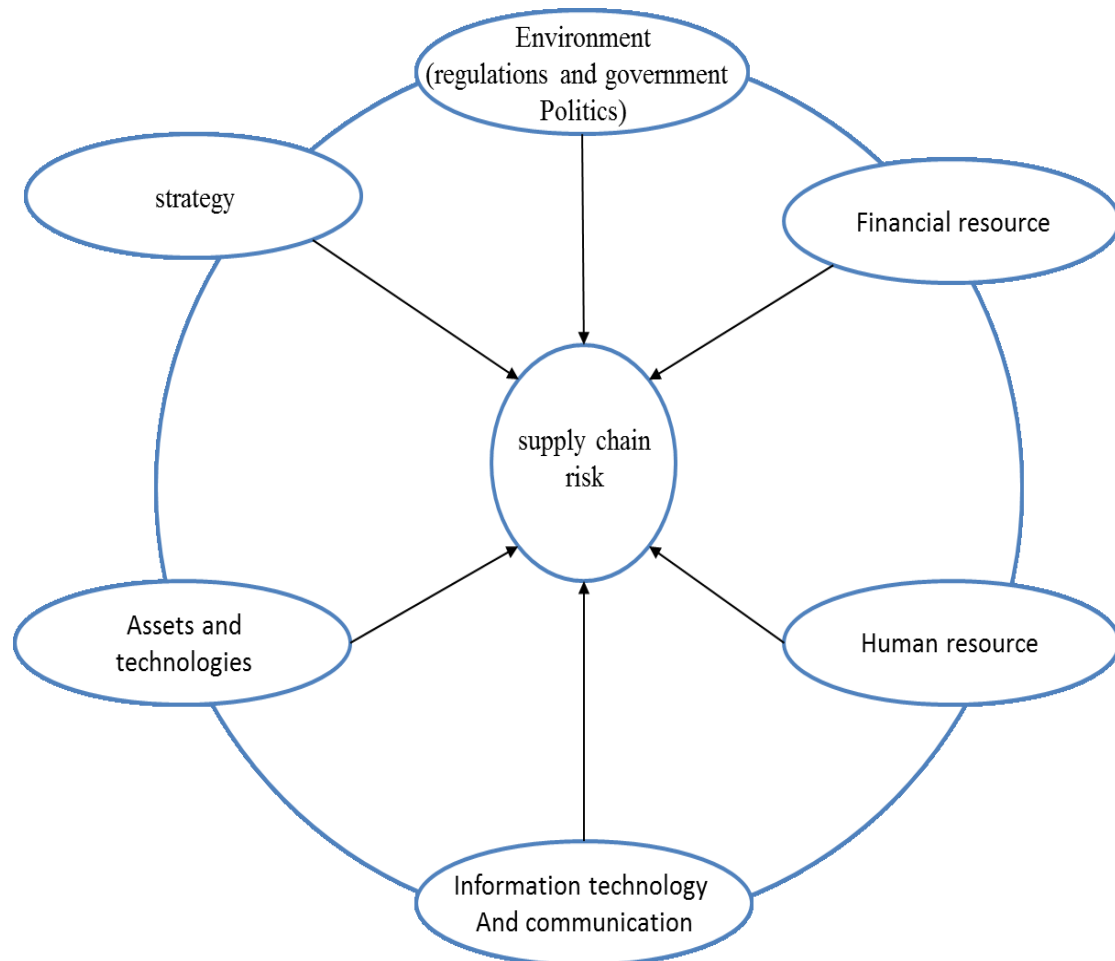


Fig5. Conceptual Model

With regarding to controlled models, where as the most identified risks in supply chain can be placed in our suggestive model, so this model, selected as a basic model.

Now we are going to plan a questionnaire for inquiry of these risks and their effects intensity and then will analyze this questionnaire by DEMATEL model.

3- RESEARCH METHOD

In this part, the stages of work performance is explained shortly.

After knowing effective risks in supply chain, the most important identified risks were replaced in the set of our suggestive model. On the basis of this model, a questionnaire was planned to evaluate the extent of general risks effect. As we mentioned before, suggestive model was chosen because of its comprehensive of main factors.

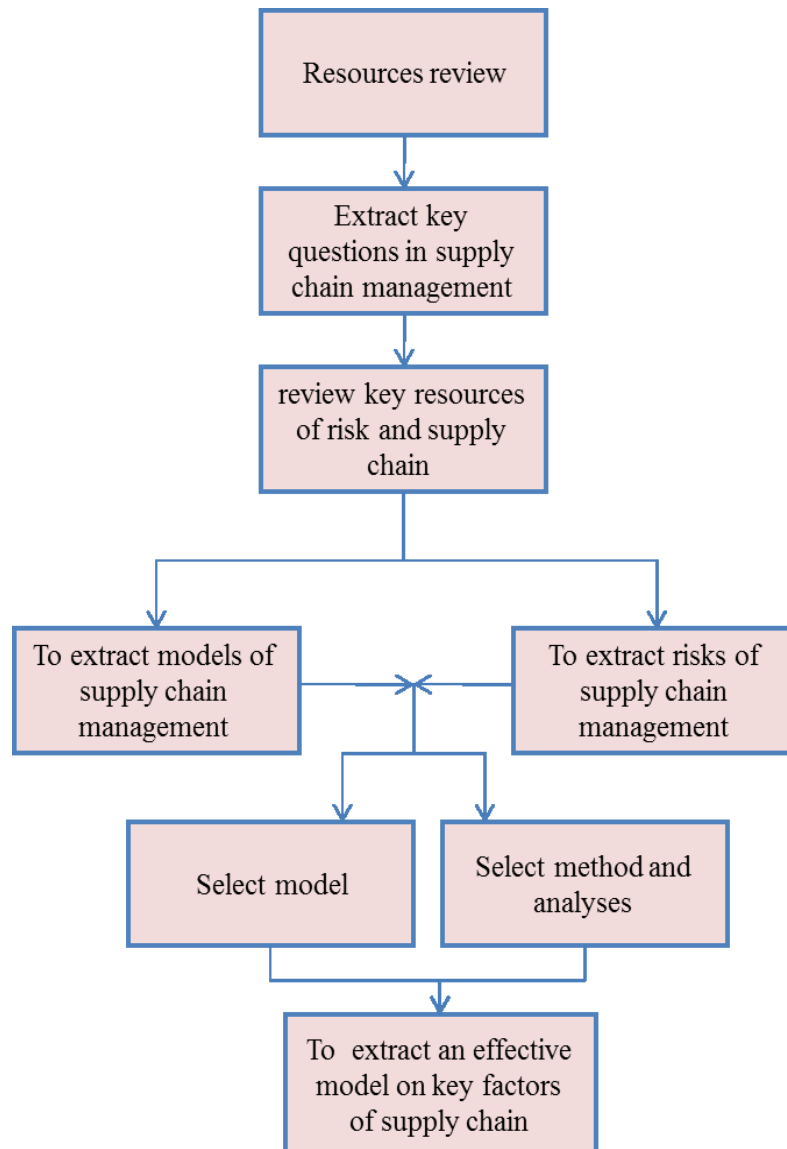


Fig6. Research method

5- STATISTICS POPULATION

Considering that a few experts are active in risk management area in Iran, and from this list, even less than that are working in supply chain risk management subject, therefore, in this research, we have used methods concerning experts judgment and multi standard decision making. Among methods of multi standard decision making, in order to estimate the extent of factors effect, the DEMATEL 24 method has been used.

6- INFORMATION ANALYSIS

The data extracted from experts views have been analyzed by using steps and stages DEMATEL algorithm.

7- RESEARCH FINDINGS

In this part, after completing questionnaires by experts and collecting data by using geometric mean, the factors which were identified as effective factors by half plus one experts were selected and calculated. Analytical and calculative schedules are as follows:

Table 1
geometric average of Questionnaire's elements

Risk factor	Environment (regulations and government Politics)	Financial resource	Human resource	Information technology And communication	Assets and technologies	strategy	supply chain risk
Environment (regulations and government Politics)		7.483	7	4	6	7.937	8.485
Financial resource			6	8	7.483	6	8
Human resource						4.472	5
Information technology And communication			4.472		6	4	8
Assets and technologies			5	5.292		4.472	6
strategy		5	6.481	8	8		5.477
supply chain risk							

Above table is a result of geometric average of all experts' views.

Table 2 severity of system relations

Risk factor	Environment (regulations and government Politics)	Financial resource	Human resource	Information technology And communication	Assets and technologies	strategy	supply chain risk
Environment (regulations and government Politics)	0.0000	0.183	0.171	0.098	0.147	0.194	0.207
Financial resource	0.0000	0	0.147	0.196	0.183	0.147	0.196
Human resource	0.0000	0	0	0	0	0.109	0.122
Information technology And communication	0.0000	0	0.109	0	0.147	0.098	0.196
Assets and technologies	0.0000	0	0.122	0.129	0	0.109	0.147
strategy	0.0000	0.122	0.158	0.196	0.196	0	0.134
supply chain risk	0.0000	0	0	0	0	0	0

In above table, the severity of present relations in the system is shown

Table 3
severity of direct relations

Risk factor	Environment (regulations and government Politics)	Financial resource	Human resource	Information technology And communication	Assets and technologies	strategy	supply chain risk a
Environment (regulations and government Politics)	0.00	0.02	0.09	0.09	0.09	0.07	0.12
Financial resource	0.00	0.02	0.07	0.05	0.06	0.06	0.10
Human resource	0.00	0.01	0.02	0.02	0.02	0.00	0.01
Information technology And communication	0.00	0.01	0.03	0.04	0.02	0.03	0.05
Assets and technologies	0.00	0.01	0.03	0.02	0.04	0.03	0.05
strategy	0.00	0.00	0.06	0.05	0.05	0.08	0.11
supply chain risk	0.00	0.00	0.00	0.00	0.00	0.00	0.00

In above table the severity of direct relations is shown.

Table 4
severity of indirect relations

Risk factor	Environment (regulations and government Politics)	Financial resource	Human resource	Information technology And communication	Assets and technologies	strategy	supply chain risk a
Environment (regulations and government Politics)	0.00	0.04	0.14	0.14	0.14	0.12	0.21
Financial resource	0.00	0.03	0.11	0.09	0.09	0.09	0.16
Human resource	0.00	0.01	0.03	0.03	0.03	0.01	0.03
Information technology And communication	0.00	0.02	0.05	0.06	0.04	0.05	0.08
Assets and technologies	0.00	0.02	0.03	0.04	0.06	0.05	0.09
strategy	0.00	0.01	0.10	0.08	0.09	0.11	0.17
supply chain risk	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5
relative severity of direct and indirect relations

	R		J		R+J	R-J
Environment (regulations and government Politics)	1.44	Environment (regulations and government Politics)	0.00	Environment (regulations and government Politics)	1.79	1.79
Financial resource	0.38	Financial resource	0.44	Financial resource	1.88	1.00
Human resource	0.84	Human resource	1.20	Human resource	1.58	-0.82
Information technology And communication	0.81	Information technology And communication	1.06	Information technology And communication	1.90	-0.22
Assets and technologies	1.37	Assets and technologies	1.12	Assets and technologies	1.93	-0.31
strategy		strategy	1.08	strategy	2.45	0.29
supply chain risk	1.79	supply chain risk	1.75	supply chain risk	1.75	-1.75

Above table shows the severity of the effective and affective factors. Negative factors are affective, and positive factors are effective. The numbers show the severity of factor's effect. The most important factor is environmental, and the less important factor is supply chain risk: the severity of the factor effect is shown by numbers from table to indicate the priority of the factors on the basis of effective severity.

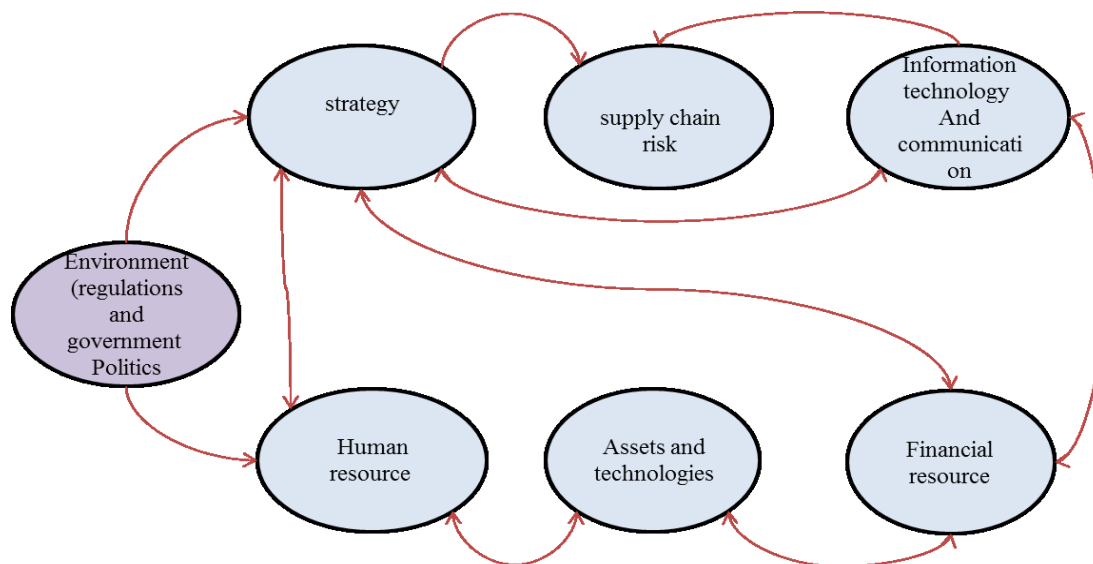


Fig 7.relative severity of direct and indirect relations algorithm

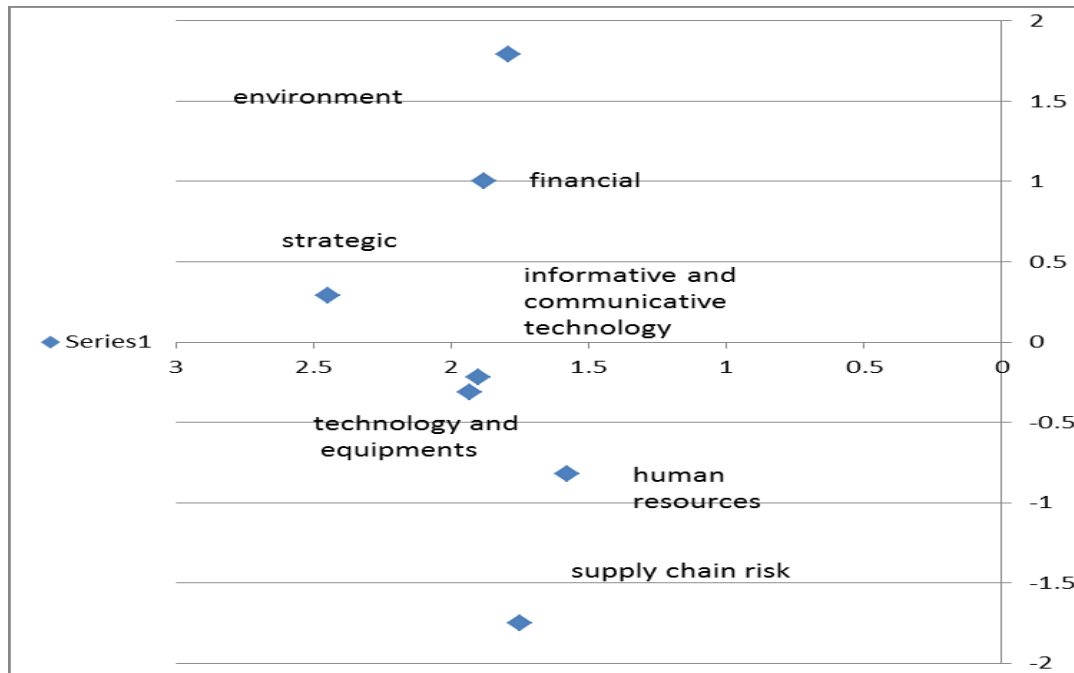


Fig 8. the priority of the factors on the basis of effective severity

in above table which has drawn by Excel software extraction from Table5 data and arranged the factors on the basis of severity of effect with environmental factor as the most important, and supply chain risk as the less important.

7- CONCLUSION

Nowadays, decreasing of probability in risk happening and frequency can keep away the organization from the tensions resulting of internal and environmental processes and prepare conditions for formulating proper and operational strategies which can secure the continuation of organization in global markets. In this research, at first, supply chain and its management are introduced. Then, the necessity of supply chain risks identifying is explained. Afterwards, available risks in different models were described and the best model has been chosen. For analyzing, classification and indicating the severity of risk effects, a questionnaire has designed on the basis of identified risks in our suggestive model. Finally, the results of questionnaires were analyzed on the basis of DEMATEL technique and the risks were ordered by their priority. The risks have been specified regarding their orderly priorities which are considered as followed: environmental, financial, strategic, informative and communicative technology, technology and equipments, human resources and supply chain risks. Due to the policies implemented by government and her ratified regulations, the most influential and important risk is regarded as environmental risk. Environmental insecure and competition severity of organizations and managers have confronted them with several challenges which in this regard has placed the environmental risk in the first priority. The second risk, from the view point of importance is recognized as financial risk. Instable financial policies, exchange rate fluctuation, rate of inflation, global market changes, all have increased the importance of financial risk. The third risk is strategic risk which indicates the special importance of the organization strategy. The strategic risks can danger the strategy of a trade organization or even the organization itself. These risks are not only including the trade risks such as decision to imply an important investment strategy, marketing, or even producing new product, but, thy also relate to an important accident taking place in organization, environmental pollution and even industrial spying. By the way, it determines the duty of managers during these incidents and indicates the necessary standards such as different types of Iso and final strategic framework for management risk. Managerial teams in their main task are not conceived without access to Internet and compiled information and supported collected data for gaining more profit by units, which are also considered as high level manager business priorities. Unknown equipments and technologies or imported equipments are effected by difficulty, in case of sanction or exchange rate fluctuation or market instability. Human resources inefficiency, insufficient information or

sufficient motivation which cause difficulty for organization and reduce profitability of it are finally regarded as less important in supply chain risk. It is generally evaluated during production process from the beginning to the end and includes all stages and indicates the fact that organizations are not valued solely for their activities, but their securing measures and their participants are also including such an evaluation. Therefore, the supply chain risk relates to all stages of the process.

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