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[Master in Management Program]

RISK MANAGEMENT IN TRANSPORTATION COMPANIES: RUSSIAN AND FINNISH PRACTICES

Master's Thesis by the 2nd year student

Concentration — Master in Management

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ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

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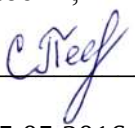

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I, Stanislav N. Pachin, (second) year master student, program «Management», state that my master thesis on the topic

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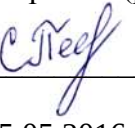

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Описание цели, задач и основных результатов	Развитие практик управления рисками стало существенной частью стратегии компаний. Эволюция от управления страхованием до концепции управления рисками организации привела к развитию инструментов и методов управления рисками. Целью данной диссертации является разработка методики по оценке практик риск менеджмента национальных транспортных компаний. Эмпирическое исследование сделано на примере российских и финских транспортных компаний. Необходимые данные были получены с помощью опроса. Результатом диссертации является разработанная методика по оценке практик управления рисками, которая позволяет сравнить практики разных стран и организаций с разными характеристиками. Диссертация имеет как теоретическую, так и практическую значимость. Была создана методика, основанная на реализации метода АПИС. Более того, практическая ценность заключается в том, что менеджеры могут использовать методику для сравнения практик разных стран, разных организаций и даже разных подразделений внутри самой компании.
Ключевые слова:	управление рисками, транспортные компании, практики управления рисками, ОСППР АПИС, агрегированный показатель, сравнение практик управления рисками

ABSTRACT

Master Student's Name	Stanislav Pachin
Master Thesis Title	Risk Management in Transportation Companies: Russian and Finnish Practices
Faculty	Graduate School of Management (St.-P. State University) School of Business (LUT)
Main field of study	Master in Management (MIM) Strategy, Innovation and Sustainability (MSIS)
Year	2016
Academic Advisor's Name	Associate Professor Nikolay A. Zenkevich (GSOM) Professor Jukka Hallikas (LUT)
Description of the goal, tasks and main results	Development of risk management practices became significant part of transportation companies' strategy. Evolution from insurance management into enterprise risk management (ERM) led to development of risk management tools and methods. The purpose of this thesis is to design technique for evaluation of risk management practices of national transportation companies. The empirical research is made on the example of Russian and Finnish transportation companies. The required data was conducted with a help of survey. The result of the thesis is designed technique for risk management practices evaluation that allows to compare practices of different countries and organizations with different characteristics. The Master thesis has novelty in theoretical and practical contribution. It was designed new technique based on realization of the method of APIS. Moreover, it has practical implication as managers can utilize this method for comparison of practices between different countries, different organization and even different units within particular organization.
Keywords	risk management, transportation company, risk management practices, DSS APIS, aggregated index, comparison of risk management practices

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Introduction

Background and actuality of the study. Companies put an effort to collect all essential quantitative and qualitative information concerning possible negative events from different involved parties for further analysis. However, companies cannot focus only on a few risks and use tools only to avoid particular list of them.

Lam (2001) emphasizes that reports of the companies with established enterprise risk management (ERM) system show much better results in the form of lower losses caused by disruptions and higher value on the market in comparison to companies with traditional approach. Within ERM approach, managers consider organization as integral system with established risk management best practices and enhanced communication tools between all parts. Enterprise risk management process is not unified for everyone approach (Knutson, 2013). Managers need to adjust it for particular needs and organizational structure. In this way, it will be possible to create relevant framework that includes all steps of risk management processes.

Aabo, Fraser and Simkins (2005) as well provide the idea that there is no universal set of practices for enterprise risk management. Therefore, organizations should combine different approaches. One of the ways that can be effective solution is to follow best practices on the market.

The topic of paper has important managerial application. Risks that appear during transportation of materials and goods and in information flows can affect company overall. Hendricks (2005) investigates the interrelation changes in transportation process have influence on long-term values in stock prices and equity risk of the organization. This statement has empirical confirmation with results that average transportation disruptions lead to a fall by:

- 7% per year in Sales;
- 42% in Operating profit;
- 35% in Return on assets.

Transportation companies' activities are affected by the range of risks significantly. That is why it is especially necessary to be able to manage risks at any stage of occurrence. Transportation companies provide clients with solutions of delivery goods and are aimed to make decisions with adjustments on potential risks.

The objectives and research methodology. The following topic pays attention to quite sophisticated problem of companies risk management tools evaluation. In the paper different methods of evaluation will be analyzed and the most appropriate one will be used for design of technique that allows to estimate own facilities and be able to adjust current tools in positive way.

The subject of the research is risk management practices, which can be described as tools and methods that companies utilize during risk assessment and control. Whereas the object of the research is transportation companies. The goal of the thesis is to design technique for evaluation of risk management practices of national transportation companies.

The presented goal requires achievement of the following objectives:

- Description of current risk management practices based on provided literature review;
- Selection of methods for transportation risk management practices evaluation and for design of technique;
- Quantitative modelling of Russian and Finnish risk management practices evaluation and comparative analysis.

The thesis' method includes usage of primary and secondary data. It requires collection of primary data – attributes' estimation and alternatives' preferences – directly from the companies. The secondary data is analysis of literature for building risk management practices framework. The data will be provided as responses of experts received with a help of designed survey, and further will be processed in decision support system (DSS).

Outline of the study. The thesis has consistent structure, which is divided into three chapters. The first chapter is introduction into topic and reveals main concepts concerning related to companies risks and risk management. Chapter 1 is literature review that helps to understand the nature of the problem. It expands knowledge about various typed of transportation modes and their advantages and disadvantages, reviews concepts of risk and risk management. Moreover, it represents time pace of risk management system evolution that came from simple tools of insurance to complex approach of enterprise risk management that interconnected to the development of corporate strategy. Consequently, Chapter 1 is finalized with representation of current risk management methods and tools that are utilized in risk management process. Described in the chapter practices will be base for creation of risk management practices' hierarchy model.

The Chapter 2 raises purpose for risk management practices estimation and various methodologies for it. Evaluation of methods and tools can be made with utilization of different approaches. However, transportation companies likely do not prefer to disclose information about internal processes and, especially, quantitative data, which considered as commercial secret. This leads to the fact that it is quite hard to estimate methods and tool with common approaches like statistical instruments and comparative analysis. Even case study requires close relationship and

high level on insight knowledge, which is generally closed from outsiders. Consequently, this problem requires utilization of conceptually different tool that can give estimations in conditions of high uncertainty and can calculate them even with heterogeneous types of data. DSS APIS is considered as the suitable tool for solution of this problem. As a result of Chapter 2, technique of risk management practices evaluation will be provided on the base of APIS method.

The Chapter 3 is aimed to utilized technique that was designed in previous chapter on the example of Russian and Finnish transportation companies' risk management practices. Methodology of the paper is based on principals of decision-making in conditions of uncertainty and lack of quantitative data. Therefore, the data collection process was design for utilization of data in DSS APIS for further calculation. Each step of empirical part is discussed and shows significant issues. As a final part of Chapter 3 there are included the main results of research. It gives clear understanding of outcomes from the points of comparison Russian and Finnish practices as well as comparison tools and methods within group of particular country. The final chapter highlights value of technique's utilization for adjusting or correction risk management methods in order to be more agile in risk minimization processes.

CHAPTER 1. RISK MANAGEMENT PRACTICES

1.1. Transportation modes and companies

Transportation company is a company that provides services of transport of goods in direction from the shipper to the end client. Generally, transportation companies are divided by transportation of persons and cargoes. However, this paper is considered only cargo transportation companies. One of the main reasons of transportation companies' appearance was realization of economies of scale. Producers and manufacturers have often own facilities to fulfil the all parts of supply chain. Nevertheless, transportation requires additional investments in vehicles and related expenses that in some cases it is cheaper to outsource this function by delegation it to special organization.

Transportation costs take up one-third part of overall supply chain process' costs (Tseng et al 2005). Therefore, some companies prefer to use services of transportation companies that are able to decrease these costs with economies of scale. Cargo delivery in such companies is a process with high frequency. Moreover, it allows to gain sufficient expertise and to improve performance by developing services and reducing losses and damage.

There are two basic elements of transportation: infrastructure and vehicles. Transport infrastructure is fixed means that are aimed to serve and provide conditions for transportation. According to Abkowitz (2002), infrastructure that is aimed for transportation of cargos as well as passengers includes several facilities:

- Roadways;
- Railroads;
- "Infrastructure hot spots" that create bottlenecks (e.g. bridges);
- Navigable waterways;
- Airports with supporting facilities;
- Storage facilities as intermediate part of transportation;
- Pipelines.

Quality of infrastructure influences value of transportation. It determines effectiveness of operations in different regions of the world (PwC 2015). Infrastructure varies highly in different countries. It depends on particular features of geographical and economic conditions. For example, air and railroad transportation dominate in countries where distances between cities are significant.

Vehicle is another basic element that is movable means of transportation. It is aimed to transport passengers and cargoes. The main feature of vehicles is necessity of person who is

obligatory to control (or to drive) vehicle. Even fully automated means require operators of processes. Driver is responsible for safety and timely delivery of passengers or cargoes.

For the last decades, transportation became source of competitive advantage for some companies (Li et al 2006). Internationalization and changes in global economies were impulse for transportation development. Organizations had to adjust all process including transportation because of changes in regional revision of specializations, increased volumes of production, increased competition caused by globalization (Rodrigue 2013, Chapter 7).

Specialization revision of different regions is connected to allocation of resources and labor that led to possibilities for the companies to find the most appropriate solutions. Enterprises are able to select optimal factors of production combination. Consequently, organizations develop competitive advantages by extracting value from areas with developed expertise in particular specialization and supply it to customers.

Increased volume of production was caused also by globalization that is characterized by opportunity to access different markets. There are different market entry strategies. Transportation is possible alternative for it. However, mass production should be effective to be able to utilize competitive advantages. Thus, companies developed various concepts like "just-in-time". It makes transportation as more valuable part of supply chain because companies should adjust their facilities to transportation requirements. Even product design is changing for the purpose of transportation, because companies tend to adjust packages in order to utilize space of vehicles more effectively (Kye et al 2013).

Because of increased competition, companies began to gain completive advantages on any step of production and delivery processes. Customers have opportunity to choose among big range of goods. That is why it is important to be able to provide customers with goods that have acceptable price and are delivered in time. This can be achieved by reducing costs on transportation with selection of the best alternative.

As it was stated previously, different modes of transportation exist (Rodrigue 2013, Chapter 3):

- Road transportation.
- Rail transportation.
- Pipelines.
- Maritime transportation.
- Air transportation.

- Intermodal transportation.
- Telecommunications.

Road, rail, maritime and air transportations are the most common and will be described in this paper. Intermodal (or multimodal) transportation is mode that interconnects several types and present the highest level of operations' complexity.

Road transportation is the largest mode because road infrastructure is rather developed and countries put efforts to improve road networks. Generally, it is connected with relatively easy technology of roads' construction. Exceptions are connected with construction of special infrastructure to avoid natural constraints concerning topography: construction of tunnels, crossings through the rivers, etc.

In comparison to other modes, road transportation is flexible for adjustments. For the company scheduling road vehicles routes is easier because infrastructure allows its utilization almost all the time without restrictions. Transport can deliver various types of cargoes and, consequently, vehicles can complete different shipments. Nevertheless, road transportation is generally associated with such manufacturers as producers of fast moving consumer goods (FMCG). The main reason of this is physical constraints of possible delivered volume of the products. FMCG companies requires exactly frequent deliveries of small parcels to numerous customers, which will more expensive with other modes.

Rail transportation is delivery of the cargoes from one location to another by railways. It creates the first restrictions on movement by the definition. However, railroads were developing since 19th century and majority of countries have advanced railroad networks, especially, in Europe as countries' areas are relatively small and they are located close to each other.

Traditionally, this transportation mode can be associated with heavy industries that require transporting raw materials and massive products. Nonetheless, development of transportation in containers allows to deliver big volumes of customers' goods over long distances. Another restriction of this mode is concerned types of wagons. Particular goods require special type of wagons. As it was already mentioned, for products of FMCG industries organizations can utilize containers. For liquid and petrochemical products tanker wagons are commonly used, whereas raw material (like wood) and bulky equipment and mechanisms require transportation on flat wagons.

Maritime transportation provides companies with opportunity to deliver large volumes of goods by seas, rivers and channels. In addition, maritime transportation is applicable for all types of goods as water vehicles include wide diversity. Nevertheless, in comparison to previously

mentioned modes this mode has rather high operating costs, which increase costs of transportation. Besides operation costs of vehicles themselves, it is connected with ports' maintenance expenses. This includes expenses on construction and functioning.

Air transportation suggests cargo transportation on aircraft by air. Some of airfreight carriers are divisions of companies that provides passenger airlines. Air transportation has very high costs as well as maritime transportation. Nevertheless, volumes of delivered goods are lower than maritime mode. The most valuable advantage of this type of transportation is speed of delivery, which is the highest among described earlier modes. In addition, the only geographical restriction of air transportation is connected to required infrastructure – airports that are essential for aircrafts' take offs and landings. Another serious restriction is weather conditions. In case of bad weather, airport can prohibit flight due to international standards.

All modes that are described above have some superiorities over each other as well as significant restrictions that limit delivery of different cargoes. Table 1.1.1 shows differences between modes in form of advantages and disadvantages representation.

Table 1.1.1. Features of transportation modes

Mode	Advantages	Disadvantages
Road transportation	• In comparison to other modes, road transportation has lower overall costs. Generally, it is connected to the fact that it doesn't require special-purpose infrastructure. • Developed road infrastructure with extensive access to different locations. Road transportation is the oldest and most developed mode. • Rather easy to adjust schedule. Identification of optimal route includes selection among different possible solutions. For the concrete delivery it is possible to update	• Transportation over long distances can be very time-consuming. Even with well-developed road networks, speed of transportation by road vehicles is lower than railroad or air transportation. • It is more prone to congestion delays. Traffic jams in cities and heavy traffic lead to unexpected delays in delivery. • The probability that the goods will be damaged slightly higher in comparison to other modes.

	route quickly, which makes road transportation flexible.	• Problems concerned to international transportation:
		  • Some countries have regulation of transportation that differs from each other.
		  • Different fee charges on the customs.

Railroad mode	• Infrastructure is very developed which creates agile interconnections between locations. • Modern railroad transportation is the most environmentally friendly among other modes as it doesn't produce exhaust. • It doesn't connected to the weather conditions to the high extent.	• Schedule is rather strict. Mode has not so high flexibility, requires more time to adjust delivery. • The costs of railroad transportation can relatively high than road mode. • Railroad transportation may require additional transportation by other modes. In majority of cases, location of railroad station is not the final destination of the cargo. Therefore, the cargo should be transported with a help of another type of vehicles (e.g. trucks).
Maritime transportation	• It allows to transport large cargo shipments. Although it dependents on the size of the vessel, capacity of transport vessels is extremely high. • It can be easily integrated into the transport chain. For example, transportation in containers allows to continue	• This type of transportation is rather time-consuming. Transportation by sea assumes high volume of cargoes. However, time of delivery depends significantly not only on distance, but also on weather conditions that can be reasons of delays.

	transportation by road or railroad modes.	• Maritime transportation is often suffer from lack of flexibility. Many routes have schedules that are set by transportation providers, affected by weather conditions, etc. • Mode has additional costs in form of ports' fees and duties. • Usually it is necessary to continue transportation with the land transportation modes to deliver cargoes to final destination.
Air transportation	• The fastest mode of transportation, especially, for the delivery in case of far from each other locations. • Safe transportation of fragile and valuable shipments as it provides sufficient security.	• Air transportation mode has the highest value due to exploitation of specific facilities. Except utilization of planes and costs on fuel, different airports charge different amount of fees. • Conditions of airports functioning can lead to delay or even cancellation of flights. Usually it is necessary to continue transportation with the land transportation modes to deliver cargoes to final destination.

Source. Information was compiled from Department for Business, Innovation & Skill of the UK, 2012 by the author

For the purpose of getting more relevant results, this paper will cover land transportation modes – road transportation and railroad transportation. Other modes have very specific features, while road and railroad modes have rather common characteristics in cost-intensity and flexibility.

1.2. Transportation risks

Current economic environment is becoming more complex because of integration and internationalization. It causes higher level of uncertainty, which reflects in risks that can affect company's processes. Therefore, decision-making process in terms of risk controlling or even risk avoiding is essential part of risk management of the company. Transportation is one area in the company that can be affected by internal and external risks in significant degree.

However, to deepen in risk assessment it is necessary to define risk concepts and risk in transportation companies. Heckmann, Comes and Nickel (2015) highlight the fact that majority of existing risk theories are based on probability theory especially because of increasing uncertainty of environmental changes (both economic and natural). Defining risks is often concerned to identification of trigger-events with current probability of occurrence of those events. Meanwhile, the most conceptual definition was done by Jüttner, Peck and Christopher (2011), who stated it as probability of not meeting demand by supply.

Another issue of paper is providing core characteristics of transportation risks that is part of supply chain process (Fig.1.2.1). Heckmann et al (2015) summarized main categories of risks based on several researches.

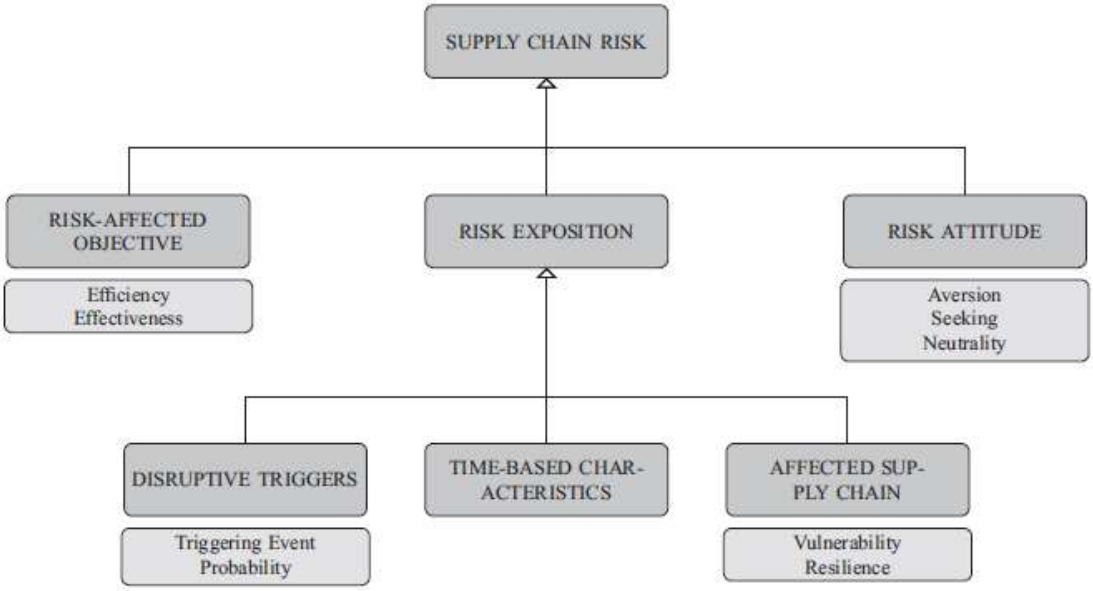

Figure 1.2.1. Core characteristics of transportation risks (Heckmann et al 2015)

The first category is risk-affected objective, which is related to maximization of profitability in effective and efficient ways. The possibility of risk is connected to the fact of not to satisfy the customers with provided services. The core category is risk exposition, which examines triggers of event occurrence. The last is risk attitude that subjective company'

management attitude in decision-making process (more risky projects lead to more possibility of risk).

Measurement of risk is one of the most important and quite controversial part of researches because there is still no universal approach for this. Nonetheless, the most popular approaches are connected to statistical theories of standard deviation and value-at-risk (VaR). Companies prefer to use these methods as basis for estimation because they provide mathematical solution for decision of optimization process. Basically, this allows to reduce monetary consequences of uncertain changes.

Risk is quantitative and qualitative representation of probable hazardous events. The authors propose different types and groups of risks. The variety of them is numerous. The most detailed representation of risk classification were made by Rangel et al (2015), which is represented in Fig.1.2.2. The author summarized approaches of different researchers by distinguishing external (green colour) and internal (pink colour) risks.

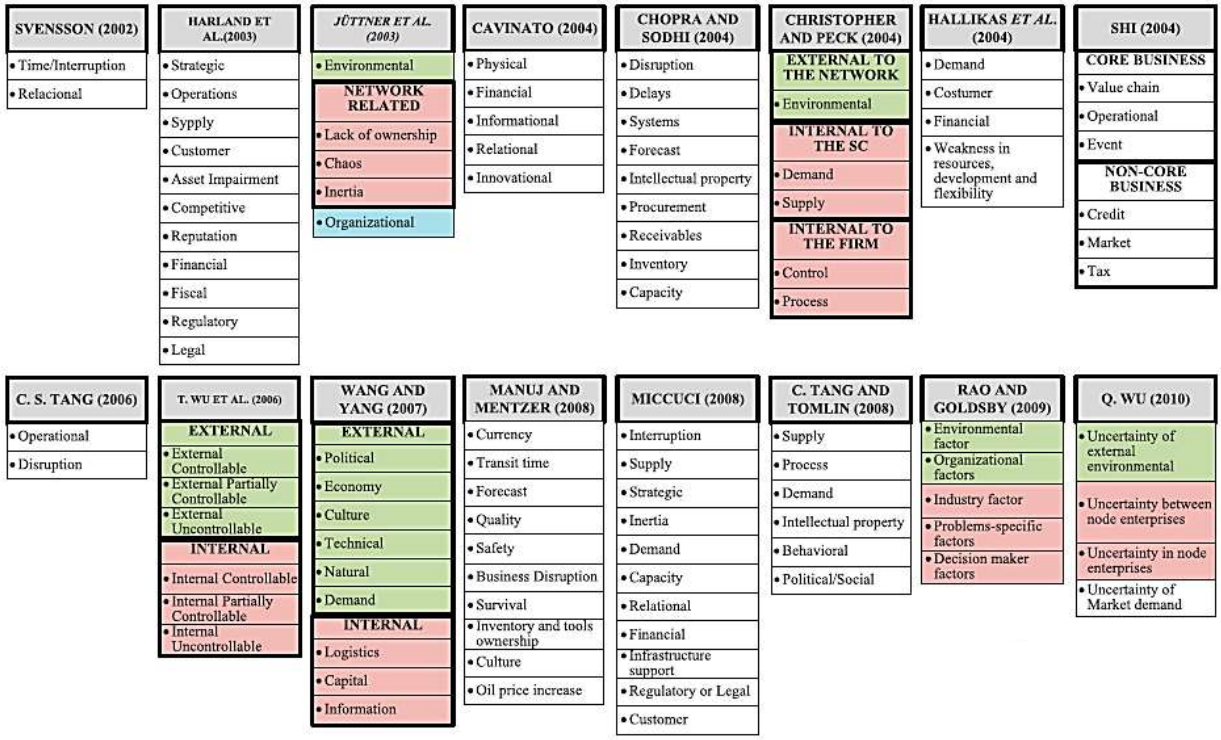

Figure 1.2.2. Mapping risk classification (Rangel et al 2015)

The context of transportation risk is connected to the definition of transport that related to risks of carriage and customers. In general, transportation definition contains process of dislocations of objects and people with a help of vehicles or other means. Naturally, transportation risks differ for each particular mode of transportation related to the fact that each mode has specific

features of operating activities. As transportation is connected to geographical changes of position, this process exposed to external risks that can be hardly eliminated by the drivers independently.

Jaeger (2010) emphasizes that risks of transportation appear as a combination of internal and external risks that increase magnitude of possible effects. As a rule external risks are outcomes of crisis events that leads to unfavorable consequences like disruptions of delivery, failure in transport system and even violation of infrastructure. To conclude these events, they can be summarized into three groups (Christophe 2011):

- Accident case caused by insignificant events (accident during transportation). This event disrupts vehicles' traffic in small extent. However, it leads to time wasting and, consequently, to late delivery. In this case, company should reroute vehicles to avoid locations of accidents.
- Crash case caused by significant events (accident of large vehicles or transports with dangerous cargoes during transportation).
  Such events lead to termination of movement on the particular area of route as infrastructure can be damaged and approaching to disaster zone is dangerous for drivers' health and security of the cargoes. Accident elimination requires special secure services.
- Crisis case caused by significant event (generally, connected with natural disasters). Such crisis is resulted in disruptions and termination of movement in large area (e.g. particular geographical region or even country). Crisis elimination requires mobilization of special forces and cannot be affected by the transportation company.

Before describing the risk management process, it is obviously important to understand what are the aims of managing risks. The definition of risk consists of two components: positive and negative. However, in terms of this paper organizations' risks are considered only as negative consequences of risk-related event.

Managers have different patterns of risk treatment after it was identified and assigned with determined quantitative value. Nevertheless, risks are always connected to particular fields of operations that is why not only risk managers have to deal with them. Skeen (2012) prepared possible managers' options for dealing with risk events that are summarized in the TARA acronym (Table 1.2.1):

Table 1.2.1. TARA acronym (MHA Consulting 2014)

Transfer	Transfer of the risks leads to occurrence of it at another stages of operation process or transferring of them to groups that can overcome them more successfully
Avoidance	The most common action for organization as risk is considered as failure caused by uncertainty
Reduction	This action requires sufficient knowledge about risks in general and appropriate tools for each risk minimization
Acceptance	If risks were not transferred or avoided by the organization this is the only way to deal with them

Finally, identification of risks is not enough for company to be able to give adequate response to possible negative events. Identified by the organization risks give opportunity to prepare appropriate sequence of actions that should be implemented by risk management department. However, this is not the only process of risk management, which performed by organization.

1.3. Process of risk management

Understanding risk management process and its stages is necessary part for provision sufficient interconnection of the concept with organizations' strategy and its components. Moreover, explanation of these interconnections requires description of basic risk management processes.

According to Ealy (1993), risk management process can be generalized by three main components which are risk assessment, risk control and risk finance. The first step of the process is risk assessment. Identification of risks, their analysis and evaluation of possible losses are core activities of risk manager that assesses companies' risks. Clear understanding of all or even core risks is essential for identification.

Risk control is considered to be the second step of risk management process and logically derives from risk assessment. Risk manager is already aware about potential risks of the company and is able to recognize their probable suggestive impact on organizations' activities and performance. Manager should put an effort to establish the best solutions for control. Generally, control includes actions aimed at avoiding of risks themselves and minimization of negative outcomes that lead to losses. Communication tools play powerful role as employees in different organizational units should be conscious of at least main risks that can occur within these units. Incentives for regional managers that are included in process of risk control would be also effective

arrangement that lead to active assistance of senior management. For the purpose of better risk control, organizations – both manufacturers and service-providers – utilize various techniques for controlling of inventory size, its delivery time or implement total quality management.

In addition, the last step is risk finance. This step should be interconnected with corporate financial strategy, because different companies have different acceptable levels of risk acceptance. There are various schemes for risk financing exists nowadays. However, the main purpose of majority of programs is to minimize possible risks or to transfer them.

Risk management became significant part of companies' corporate strategy, especially, for the companies that act nationally or globally (Ealy, 1993). Global competition accelerates processed of understanding that risk managers should play more important role in organization. Thus, it requires formulation of well-defined risk management strategy. Consequently, it should be interconnected with main components of organization corporate strategy – competitive, operating and financial strategies.

The author defines three components as a core of corporate strategy: competitive strategy, operating strategy and financial strategy. Including mentioned earlier concepts, the author defines risk management strategy as comprehensive process of risks' assessment, control and financing that is aligned to all organization's decisions and overall corporate strategy as it shown in Table 1.3.1.

Table 1.3.1. Pairing risk management discipline with corporate strategy components (Ealy 1993)

Components of risk management	Components of corporate strategy
Risk assessment	Competitive strategy
Risk control	Operating strategy
Risk finance	Financial strategy

However, the author approach of risk assessment includes only risks that occur in formulation of Michael Porter's five forces of competitive strategy. Therefore, Ealy considered mainly risks that can impact strategy significantly at the stage of assessment. According the framework, the following risks occur only at further stages, consequently, should be also assessed.

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Fundamental principal of risk management is to identify uncertainties that can lead to organizations' failure and minimize their effect. That is why for managers crucial part of risk management is assessment of the risks (or quantitative representation of them). According to calculated probabilities, it will be possible to estimate more precise value-at-risk and, consequently, to minimize effect or to cover money flow with financial instruments. However, Hillson (2007) admits that estimations are better to make without biases for more realistic results.

Risk management process as proposed algorithm has different views and elements or stages (Ealy 1993; Institute of Risk Management 2002; Hillson 2007; Berg 2010; NASA Official 2011). Illustration of this fact can be seen in Fig.1.3.1 and Fig.1.3.2.

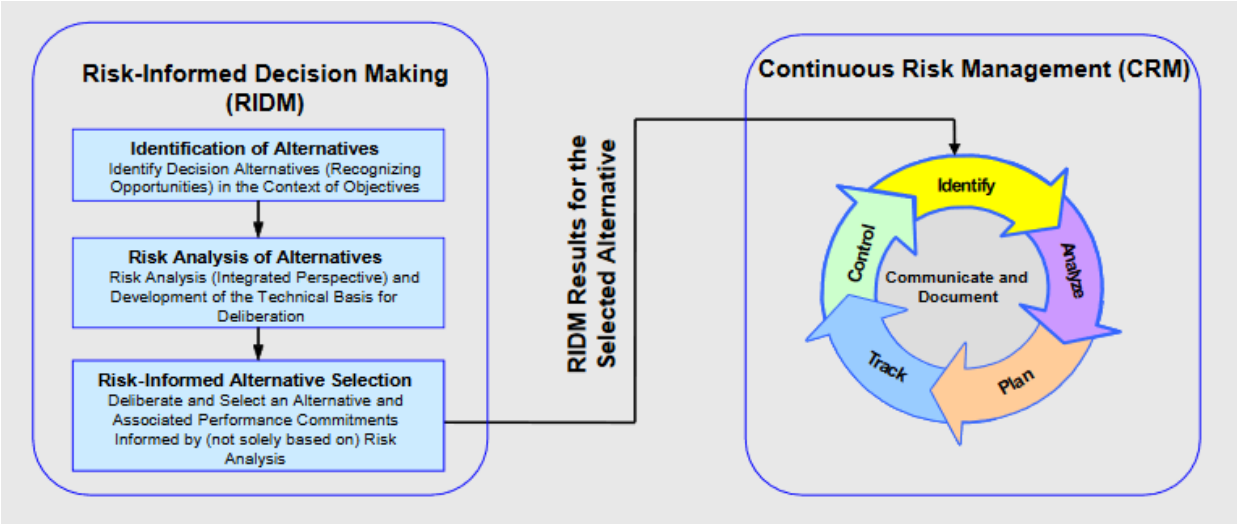


Figure 1.3.1. Continues risk management process (NASA Official 2011)

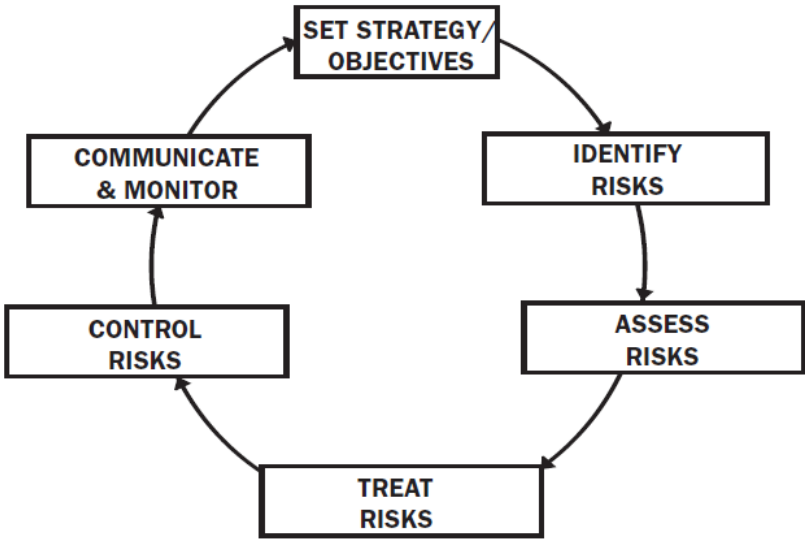


Figure 1.3.2. Continuous risk management process (Hillson 2007)

Nevertheless, with various representation of risk management processes, several steps seems to be common for every type, but can vary by title. For this paper, it will be considered five steps proposed by Hillson (2007) as the author provides generalization of steps with comprehensive approach to the process.

Risk identification is process of understanding nature of company's risks. Their representation and listing for the purpose of further analysis. Analysis is logical continuation of identification as it serves to make initial estimations of considered risks with constructing possible scenarios of risk events' realizations.

Evaluation of risks which is partly ranking is aimed to evaluate magnitude of risks that combines two characteristics: probability of risk occurrence and expected effect of the related event on operations. Level of risk acceptance appears on this stage as manager has to determine if particular risk is acceptable or it is necessary to put a serious effort on process of minimization.

Treatment of risk is significant process of preparation for the possible losses in future that will be connected to the risk event. On this step the manager highlights the most significant risks of the organization, takes into consideration related to these risks activities (or even departments) and begins to prepare planning to avoid contingencies.

The following step is connected with monitoring and reviewing or risks. Therefore, risk manager collects all processed data from previous steps and gain knowledge about current organization's risk environment.

Finally, the last step is aimed to apply all data and developed knowledge into company's strategy. This action allows to adjust strategy to main risks or group of risks, which makes possible to minimize several of them.

1.4. Transportation risk management evolution

Risk management evolution took place during past decades and current approaches are significantly different from how it looked like in 50th year of previous century. Evolution proceeded logically from risk management as managing risks originated within organization to consideration of risks as component that influence strategic decisions. The methods were developing as a part of risk management. Companies put an effort to collect all essential quantitative and qualitative information for analysis from different involved parties. This led to changes in understanding of risk communication as important part of the process.

Nielson (2005) summarized process of risk management evolution into three generations. The development reveals the essence of changes from managing internal risks to the new concept

of "enterprise risk management". The first generation, which is represents 1950s, gives understanding of concept genesis. It was connected with insurance managers that were aimed to control risks through buying insurance on different conditions. Transferring more responsibilities and rights for control of risks led to appearance of such terminology as "risk manager". The author mentioned expansion of new concept in scientific and academic literature and professional associations from 1960s. For example, new title of "Journal of Insurance" became "Journal of Risk and Insurance"; even names of large professional associations like the American Society of Insurance Management had undergone changes by adding risk component in 1975 – the Risk and Insurance Management Society. "Traditional approach" (Lam 2001) that was aimed to keep organization in shelter and to avoid risks showed failure according to the author. The system where risk manager focused on particular range of risks loses sight of the probable problems in other areas that can arise disasters.

Changes in terminology is not the main point, but they occurred understanding for companies that managing risks within organization is essential part of corporate sustainability. Through different methods of risk control and financing, managers began to improve performance by focusing on internal sides of risks. Responsibilities for control moved from top management to the level where risks generally occurred – to middle managers. Nevertheless, the main obligation was to avoid losses through getting the best insurance conditions. Other obligations concerned safety of organizations' facilities and assets protection. Managers had to collect data and estimate possible losses to be able to find appropriate risk premium. Building of cost-benefit frameworks for supporting of decision-making process for insurance buying developed managers' understanding of companies' risk and risks nature.

However, the idea is that companies cannot focus only on a few risks and using tools only to avoid particular list. Hedging with derivatives is a good solution for market risks minimization; nevertheless, it is not solution for human resources related risks. Still the possibility exists; it can undermine enterprise's activities. It was prerequisite for the second generation of risk management (Nielson 2005). Communication gained more significance as risk managers expanded their communication links with other managers and employees of organizations. It allowed to increase quality and amount of analyzed data. Consequently, managers got opportunity to implement effective risk controlling programs. Communication with external stakeholders became important objective for risk management because reporting of risks served for reduction of costs on attracted funds and insurance rates.

This trend reflected on the labour market as well. The previous system required narrow specialists with expertise in particular function (e.g. insurance). Chief Risk Officer (CFO) position

became core for enterprise risk management and had decidedly higher compensations conditions. Responsibility of CRO is in adding value to the company through implementation effective tools for risk control and be interconnection for all levels of management.

Sometimes disastrous events can be result of several jeopardies both significant and small ones. As an evidence (Lam 2001) suggests historical downfall of bank "Barings". The last and key reason of downfall was named human factor: its head derivatives trader held number of unauthorized trades in Nikkei stock exchange. On the one hand, market dropped significantly and it led to colossal losses of the bank. On the other hand, Nikkei index dropped because of natural disaster – Kobe earthquake. Consequently, integrated approach, which combines different tools for assessment and control of risks and proposed range instrument for their minimization, was becoming more popular over last two decades.

The interesting fact is that almost simultaneously business continuity management (BCM) concept had development. This is mode of crisis management, which evolved since 1970s. Although concept was not regarded as a part of risk management, objectives of BCM were rather close to it. Herbane (2010) describes appearance of business continuity management as tool for managing technical and operations-related risks that obstruct process of recovery after crises. This is the main difference between concepts: risk management tools and methods are aimed to identify and assess risk for further minimization and control, while business continuity management serves to maintain organizations' processes. According to Hiles (2007), reasons of crises varies from natural (like earthquake and flooding) to human related (like facilities loss and supply chain interruption). Consequently, BCM appeared to be adequate solution for companies that failed to implement effective risk management system.

New risk management system appeared and was called enterprise risk management. Lam (2001) defines this concept as integrated system that consists of internal company's business processes and external sources for risk transfer in order to optimize risk profile. Reports of the companies with established ERM system show much better results in the form of lower losses caused by disruptions and higher value on the market in comparison to companies with traditional approach. Nielson (2005) defines ERM as approach for the third generation of the risk management. Within this approach, managers consider organization as integral system with established risk management best practices and enhanced communication tools between all parts. Moreover, this concept requires to be integrated into corporate strategic planning system (Lenckus 2006). The author highlighted the evidences that many organizations appointed leaders of risk management to establish ERM programs within their organization.

Nonetheless, it should be stated clear that enterprise risk management process is not unified for everyone approach (Knutson 2013). Managers need to adjust it for particular needs and organizational structure. In this way, it will be possible to create relevant framework that includes all steps of risk management processes.

In general, academic authors consider risks from two points: the probability of risk's occurrence and the possible impact that event will cause. However, Davis and Lukomnik (2010) developed concept by adding new dimension of risk – velocity. Risk velocity defines time lag that originates in gap between risk occurrence and the following impact of it. This dimension is aimed to give organizations understanding appropriate moment to risk responding. It is obvious that sometimes late reaction can lead to harder consequences and make solutions less effective. To help develop ERM the authors propose framework:

- Scrutinize identified earlier risks.
- Add velocity as new parameter.
- Determine velocity and compare risks.
- Create new matrix of risks with three dimensions.
- Gaps between results of matrix and real state of risk management response are places for improvement.

One of the current questions is how to create the best way of communication with representatives of risk management to do it more effectively (Atkinson 2007). The problem is that risk management is technical area that can show problems with misunderstanding in communication. Primary ways of communications are calls (both individual and conference), e-mail and meeting. For this purpose, process of informing employees about risks by risk managers should be built as comprehensive communication with setting precise goal of it. Atkinson (2007) describes case of risk manager of company that employs three stage conference communication: pre-conference, conference itself and post-conference call. The interviewed manager supposed that open dialogue is one reason why the company's risk management program is improving annually.

However, even with theoretical development of risk management as a concept managerial implication of this knowledge were remaining underestimated and Barton, Shenkir and Walker (2009) consider that not sufficient enough level of managing uncertainty was one of the reasons of global financial crisis 2007-2011. ERM is represented as effective approach to evaluate uncertainty. In addition, the authors give evidences of companies that implemented enterprise risk management systems before crisis and were able not only to minimize effects of it, but also to

create additional value for their shareholders (Shimpi 2005; Barton et al 2009). The arrangements seems to be general: identification of significant risks, ranking them due to the possible impact and the probability of occurrence, design of proper and applicable metrics methods and tools.

Transportation companies had the same path of evolution from insurance management to ERM. This system is not implemented by all organizations. In some countries it is obligatory by legislation to utilize advanced tools for risk management. For example, US agency the Federal Motor Carrier Safety Administration implemented Compliance, Safety, Accountability program that has objectives to improve safety of transportation by application of information technologies (O'Connell, 2012). The system allows to get data about drivers' overall health conditions, unsafe behavior during driving, vehicle maintenance, conditions of cargos. Except benefits for operators and brokers, drivers have information from GPS about dangerous areas and problem situations.

Abkowitz (2002) discussed several tools to meet working obligations of risk managers that are strived to establish effective enterprise risk management system. They contains five recommendations:

1. Building knowledge about risks and communication.

Risk manager is employee with specific knowledge. One of the aims of risk manager and risk management department of transportation companies is to be able to communicate with internal and external environments to gain vision of new opportunities. Moreover, through different communication tools like conferences and trainings manager can share own vision with all the organization and get feedback.

2. Improvement of processes.

Risk management process includes several steps of identification, assessment of risks, control and monitoring performance. Constant improvement of this process will help to identify transportation facilities under risks and to avoid accidents. That is why manager needs to design risk management policy that describes main procedures and processes. Appropriate selection of risk management tools for all steps is significant responsibility as well.

3. Intelligence data collection.

The quality of decision-making process has strong relation with quality of collected by risk manager data. Today transportation companies have various information systems that allow to make profound analysis based on historical data. However, risk management requires relevant data with accurate connection to particular risk.

4. Solutions for emergency situations.

This issue reflects overall quality of organization's risk management, as planning of emergency situation is impossible without precise assessment of risk probability. However, costs of planning responses for whole range of risks are rather high. Risk manager has to determine what transportation risks should be involved in planning, to establish valid communication tools for better coordination.

5. Management of inbound data.

Transportation companies gain extremely big amount of data including information about customers, partners, competitors, environment conditions, dates and time of shipping, etc. Data collection requires efficient database, which can integrate processes of organization. Information systems for risk management collects data about conditions of transportation process – geographic information, position of vehicles, etc. Consequently, Abkowitz highlights four core systems:

a) Technologies for vehicle detection;

b) Geographic information system;

c) Global positioning system;

d) And means for communications.

The evolution of risk management began in 1950s, and it is still evolving by development of different characteristics of concept and implementation of additional related concepts such as strategy. Enterprise risk management is the latest integrated approach of risk management. Nevertheless, even this approach is not developed enough yet as it is hard to identify appropriate set of risk management tools and methods even for the representatives of particular industry.

1.5. Overview of risk management practices

Aabo, Fraser and Simkins (2005) provide the idea that there is no universal set of practices for enterprise risk management. Therefore, organizations should combine different approaches. One of the ways that can be effective solution is to follow best practices on the market.

Abkowitz (2002) emphasizes that utilization of appropriate practices of risk management will allow transportation risk managers to solve whole range of responsibilities that include:

- Planning operations taking into consideration risks;
- Estimation of risks' probabilities and connect risks to particular activities;

- Allocation of necessary resources for minimization of risks and deployment of these resources in opportune way;
- Ability to estimate caused damage of interruptions more accurate;
- Formulation of strategy that will be agile enough to minimize effects of occurred risks;
- Creation and development of advanced information system that supports risk management process of the organization.

All tools and methods are divided according to the stages of risk management process. Therefore, due to the steps illustrated in paragraph 1.3, presented practices will be structured according to these functions. To remind approach that was chosen in this paper, risk management process is divided into (Hillson 2007):

- Identification of risks;
- Analysis of risks;
- Evaluation or ranking of risks;
- Treatment of risks;
- Monitoring and reviewing the risks.

However, this division has overlapping in several part. That is why in this paragraph similar steps will be combined into processes. Identification is initial process that allows to spot risks concerning organization. As it was said before, analysis is aimed to understand nature of risks and to assign it to particular function or department. Consequently, these two steps can be combined into one continues process that should be named as "Identification of risks" process. Evaluation of risks as well as ranking is process when managers estimate probability of risks' occurrence and expected influence on company's activities. This part can be named as "Assessment of risks" process. The fourth step treatment has an objectives to develop methods to make impact on company by particular risk less significant or even to avoid this impact. In general, name of this process is "Minimization of risks" process. In addition, the last step is monitoring. It collects results of previous steps to prepare sufficient tools for risk control. By tracking and reviewing risks managers can implement control techniques or even adjust strategy due to the current conditions with risks. Therefore, this step will be assigned with name "Control of risks" process.

Risk identification process is the first one and it requires sufficient level of knowledge about organization in general and about external environment. Risk identification tools are aimed to support managers' process of all type of risk determination and to make summary for identified risk by including them in various frameworks. There are big number of methods for risk

identification including methods that are aimed to determine risks based on experts' review and with a help of different tools for visualization. However, this paper will cover only the most spread practices.

Delphi method is the most famous method of experts' review of risks identification. This method serves to support future forecasting by collecting and analyzing considerations of expert's group. Roberts and Giorgione (1995) describes that it includes several steps of iterations where experts give own estimations, then discuss them in groups and continue individually again. One essential principle of the method is anonymity. Delphi method provides collective solution of experts that is more objective than individual as people are prone to different biases (Thomas et al 2006). The expected outcome is the list of identified risks with their significance and possible influence on company's operations.

Brainstorming is as well method that requires significant expertise in field of risk management. Sometimes it is better for organizations that operate in market with high uncertainty to assign risk managers to particular risk areas. This approach will help to provide complex solution during brainstorming by representatives from different areas. It differs from Delphi method generally by procedure algorithm. Nevertheless, purpose of it is the same – to hold in-depth considerations and find out possible interconnections between risks' possible reasons and predicted impact (Hallikas et al 2002; Caglino et al 2012).

Another division of tools and methods for risk identification is connected to its graphical depiction. Diagramming approach or risks visualization helps to structure risks into particular schemes. This is very useful tools for organization as risk manager can educate other employees about risks related to particular area of activity. Corporate risk profile can be created and will reflect the risks that organization is exposed to. It helps to share knowledge within organization with a help of visual instruments.

Fault Three Analysis is technique that utilizes deductive method of risk identification and further assessment. In general, the model illustrates combinations of events that can occur according different risk realizations. The main framework of this method is visualization of predictable causes with estimations of effects (Thomas et al 2006). Relations between cause and effect are branches of represented in fault tree model (Fig.1.5.1). Risk events can be treated as possible failures, therefore, included in risk events factors are exact causes that are incorporated in composed event.

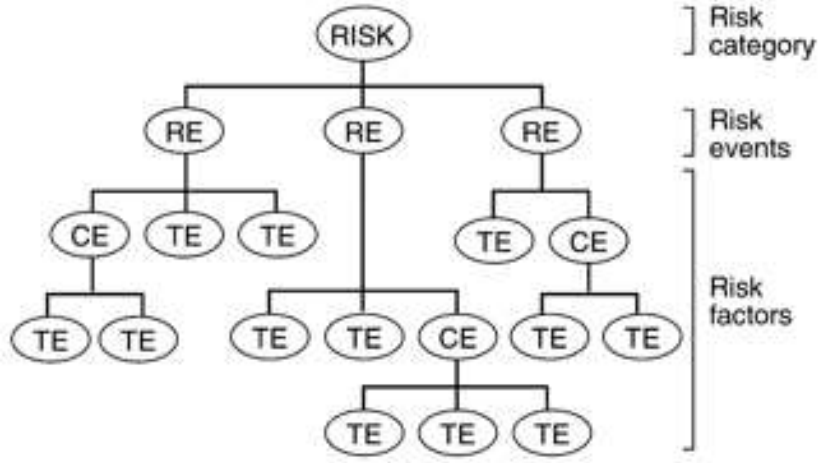


Figure 1.5.1. Fault tree model (Thomas et al 2006)

Actually, structured risks that have visual representation in view of maps or trees in some risk assessment instruments serves as hierarchy for probabilities division. As an example Thomas et al (2006) propose method of scenario modelling of risks that utilizes fault tree as an approach of transparent and full structuring of organization's risks. In practice, it display decomposition of possible company's risks divided into categories and sub-groups due to relationships to suitable characteristic (e.g. department, operation, area of activities, etc.). Scenario analysis is aimed to calculate probabilities of risk occurrence while structured tree model helps to depict it and systemize possible scenarios. This combination of tools illustrates how two related processes – identification and assessment – fulfil each other as scenario analysis is method of probabilistic risk assessment.

Probabilistic risks assessment tools calculates probabilities of expected failures. As well probabilistic risk assessment can be supportive tool for provision different method with sufficient data. When organization collects all related to operations data, it is easier to make prediction based on historical information. More complicated tools for risk assessment is simulation. However, this technique may be divided into two main principles: simulation can be based on historical data (Jian et al 2016; Azzi et al 2016) and based on random distribution like Monte Carlo technique (Acebes et al 2015).

Another separate technique that is related to quantitative methods of risk assessment is Balances Scorecard (BSC) method that was developed into Balanced Chance and Risk Card (BCR). BSC is instrument that divides risks into four blocks of 1) finance, 2) clients, 3) internal business-processes and 4) development and growth, whereas BCR changes approach to risk division and determines main strategic directions with competitive advantages (Reichmann 2000; Sanzhieva 2013). The expand number of blocks includes also the product or service and

employees. To all these factors that bring company to successful performance there are risks attributed in the model of BCR. Consequently, the manager can in advance divide possible risks into groups and be aware of possible disruptions.

The next steps of risk management processes are control and risk minimization. Generally, this tools can be divided into financial and non-financial (Amberg and Friberg 2016). The authors make examples of hedging as financial instrument and operational methods as non-financial.

However, according to risk management evolution analysis in paragraph 1.4, insurance appeared to be the most common financial tool of risk management (Dionne and Gollier 1992). This tool can cover possible losses on physical facilities of organization and protect cargo of the client during freight (Korezin 2008). The hedging is another financial tool that is aimed to cover cash flow of organization that leads to more stable conditions for operation. However, according to Dionne and Gollier (1992) research, utilization of hedging is generally evidence of large companies, while small enterprises use this method quite providently and prefer insurance as basic method.

Non-financial tools of risk control and minimization can be further utilized at the different levels: operational and strategic. Diversification covers both of these levels as solutions can be strategic (like geographical expansion and unrelated diversification) and operational (like related diversification). For the long period diversification remains as the general tool method for risk management (Korezin 2008). The evidences of Mau and Riley (2015) show that companies still intent to diversify not only to grow and conquer the market, but also to reduce risks of national market. However, it is not the perfect tool for avoiding unsystematic risks that are not connected to the market.

Another strategic tool that can be applied for needs of risk management is the method of real options. In context of this research, real options are considered as non-financial tool because it reveals opportunities for strategic solutions (Iyer and Sagheer 2011). Whereas calculation of real options is requirement of method, nature of decision to be made is strategic. Real options are perfect method for transportation companies as they operates on the market with quite high level of uncertainty. Real options can applied in various ways. Commonly to set opportunities for more agile decisions: like rejection option for non-reliable projects, options for improvement for particular direction of supply or relationships with customers (Hult et al 2010; Iyer and Sagheer 2011).

And the last method for risk management control and minimization is business process optimization. This method is applicable generally on operation level. Risks that are identified with

maps and assigned to particular operations can lead to disruption concerning particular activity. Consequently, risk manager should analyze process in context of risks and optimize it as possible (Németh-Erdődi 2008). This method is connected to total quality management that is close to field of risk managers' activities. Improvement of internal processes of the organization can reduce probable risk related to employees, which helps to concentrate on external risks that are generally independent from managers' solutions.

As it was stated in the beginning of the paragraph, there is no unified set of practices for particular organization. Each transportation company's risk manager has to take into consideration lots of factors to establish sufficient enterprise risk management system. Therefore, managers require technique for convenient evaluation of risk management practices. Effective technique will allow to compare different approaches to risk management practices for easier selection process.

CHAPTER 2. METHODOLOGY OF RISK MANAGEMENT PRACTICES EVALUATION

2.1. The problem of risk management practices evaluation

One of the main problem of any manager that creates framework or procedures for risk management is how to choose appropriate tools and methods for all steps of integral process. Very often companies understand value and specific features of utilization of one or other methods by trial and error. Nevertheless, acting on the competitive market organizations do not have much time to focus on development of own risk management system by implementation methods randomly or based on own perceptions. That is the main reason why companies need some technique that allows them to evaluate practices and compare them between each other.

For the purpose of the research, it is better to anticipate academic studies that are provided by researches and managerial application to study market benchmarks and competitors risk management practices. However, for managers it seems to be harder to hold this research as he or she is representative of competitor that are generally prefer not to share with their competitive advantages. Researchers also suffer from responses from organization. Nevertheless, number of responses shows ability of researcher to choose the most appropriate technique for data analysis and tools for data collection.

Estimation of risk management practices can be made with utilization of different methods. However, for manager of particular organization it can be hard to evaluation practices because several methods have crucial limitation that restrict possibility to make evaluation with relevant results. One of the main reasons of this problem is that transportation companies likely do not prefer to disclose information about internal processes and, especially, quantitative data, which considered as commercial secret.

This leads to the fact that it is quite hard to estimate risk management methods and tool with common approaches like statistical instruments and comparative analysis. Even case study requires close relationship and high level on insight knowledge, which is generally closed from outsiders. Therefore, number of possible methods for risk management practices' comparison will be overviewed in this paper, and the most appropriate one will be chosen as the basis of technique for evaluation of risk management practices.

2.2. Case method

Goodrick (2014) identifies case study as an in-depth examination, often undertaken over time, of a single case. More suitable for goal of this research type of case study is comparative case studies. It discloses descriptions of two or more cases for gathering common or diverse information about objects. Comparative case studies is perfect tool when it is necessary to discover deep knowledge about studying evidence.

In general, comparative case studies include exploration of objects' similarities, differences and, moreover, origins of these similarities and differences based on two or more cases. One of the main objectives for researcher is to identify specific characteristics of organizations that should be assessed during case studies. Understanding of them and their relations to particular case will help in construction of sufficient framework for research and will lead to relevant results. What is more, it reveals necessity for type of data determination– quantitative and qualitative. In majority of situations, researchers prefer to use both types for getting wide results and conclusions from case study. Therefore, methods of gathering information should be as well various and fulfil each other (e.g. interviews as way of getting primary data from personal meeting and analysis of documents as source of secondary data).

This method includes six steps that should be executed for gathering information and data with high quality. The researcher has to understand nature of the topic and the context of each organization that assessed during studies. However, the presented below steps can be repeated for the better design of research tools or better analysis of data (Goodrick 2014):

1. Formulation of research purpose to determine if case studies are the most appropriate method for this study.

The researcher has to set purpose of the research clearly and transparent. Based on wrong purpose formulation the researcher will get irrelevant results that cannot be applicable in theoretical and practical application. Therefore, the goal should be identified in the following manner:

- The case studies are aimed to determine similarities and differences between observed cases to formulate circumstances that lead to such state of affairs.
- The case studies are aimed to determine causes of identified similarities and differences that create specific characteristics for each case.
- The case studies are aimed to determine reason of similarities and differences that are laid in organizations' nature.

2. Determination of theories that will be tested during comparative case studies.

The evidence that researcher tries to explore should be substantiated by the existing theory. Obviously, it is possible that examiner found new effects that are still not covered by the academic literature. However, in majority cases researcher has to scrutinize literature on related topics to be able to justify evidence for study. It is useful not only for himself or herself, but also it serves as good foundation for building relationships with organizations' representatives.

From practical point of view, this approach facilitates process of preparation. Previous studies had already established appropriate tools for data collection, appropriate methods for analysis and interpretation of results.

3. Determination of types of cases and initial plan for case study process.

Balancing between in-depth studying and limited resources is cornerstone of this step. If the main goal of the research is profound knowledge about topic, it requires big number of cases. On the contrary, few cases may be involved in condition of possibility to get sufficient expertise from small number.

4. Identification tools and methods for gathering data for its further processing in designed frameworks or software. Consequently, realization of the studies.

The researcher should understand nature of the problem as well as instrument for data analysis, because, firstly, it is necessary to identify how to process data and only then to find out what exact data is needed for exact study.

5. Examination of alternative explanations for found evidences to test relevance of conclusions.

This step reveals the nature of the studied issues with possibility to interpret results in different way. The main idea is to look at the problem from another point of view and to try to disclose not obvious patterns that exist. This is self-examination of supposed results is analogue of statistical tests that give solutions to prove or to reject results.

6. Preparation of findings.

The final step is totally related to the first one where goal and objectives of studies were formulated. The logical consequence of stated in one or other manner objectives is obtaining of conforming conclusions. For case study method, it is possible to launch initial study with trial format of research and obtaining expected results. These results can be shared with experts on the field to comment how study design can be improved further.

Even if comparative case studies method seems to be a very good tool for extracting profound knowledge about organization, it has rather crucial practical limitations. Thus, the main practical limitation occurs for utilization of it by managers. Studying evidences about different organization is almost impossible when person is direct competitor of other organizations. Moreover, it require sufficient level of skills and related knowledge. The simplest example is connected to the collected data processing. If researcher uses both qualitative and quantitative data, he or she has to be expert in data transformation and then adaptation of the results for both methodologies. Different types of data are very often processing with a help of various software. Knowledge about them and how to implement them are key successful factors for researcher.

Furthermore, data collector has to have sufficient soft skills to be able to build relationships with interviewed respondents. For case studies that uses primary data as fundamental, it would be sophisticated even to establish connection with organization without communication skills. Interview as tool for gathering primary data for case study is complex process and is divided into structured and not structured. Actually, not structured type is better for getting broad results because the researcher can change and adjust questions during interview to highlight the most interesting issues and to emphasize one or the other topic.

Resource intensity seems to be major problem for researchers, especially, in conditions where research design requires big number of studies. That is why it is better to design research by substantiation small number of cases. Some assumptions allow to create small sample by making clusters of cases (e.g. assigning characteristics of one organization to group of them). However, the researchers that understand time-consuming of case studies with primary data as fundamental try to find out solutions with a help of secondary data. Examination of big amount of documents can substitute necessity of personal interviews. Nevertheless, it can lead to decrease of data quality and, consequently, quality of the studies' findings.

Another challenge with comparative case studies is related to time-consuming and number of cases. Studying one case can take so much time that it will create time lag between explored during cases results. This also leads to possible decrease in quality of findings. Talking about risk management practices, it is hard to identify cycle of shifts in risk management tools and methods. Therefore, it assumes additional studying of the topic how often companies change their tools to adjust practices for market conditions.

All arguments that were mentioned above show that comparative case studies are substantially effective method for comparison objects in contexts of chosen cases. Nevertheless, this can be irrelevant to make generalization of the results based on small number of cases.

Furthermore, studying specifics of different national approaches (e.g. Russian and Finnish) may lead to appearance of biases during interpretation of the results.

2.3. Statistical method

There are many various statistical methods for comparison exist. However, the most common tools, which do not require significant deepening into topic, are statistical test (FAO Corporate Document Repository):

- Standard t-test;
- Paired t-test;
- One-way analysis of variances (ANOVA);
- Two-way ANOVA;
- Linear regression.

Each tool is following specific requirements that allow to fulfil different occurred restriction. Standard t-test is general statistical test for comparison of mean values of two observation groups (e.g. of two sub-samples). Another test – paired t-test – is aimed to detect differences between two groups. Actually, it is suitable for exposure of particular characteristics that causes differences in results.

More profound tools for comparison are two types of analysis of variances. One-way ANOVA has the same functionality as t-test, but can be applied for comparison of three and more groups. Two-way ANOVA is another statistical test that is constructed for comparison mean values of two or more groups. The only difference is in nature of variables: in two-way ANOVA independent variables can be analyzed.

Another useful statistical tool is linear regression. It allows to compare means of groups within different objects. Moreover, it helps to estimate effect of particular independent variable on dependent variable and then to compare this effect estimation with different alternatives. Usability of this method is rather high for comparison as it shows how factors influence considered variable and what effect they have. The interesting moment is that there is no retroactivity in relations: if independent factor influence dependent variable with determined effect, there is no evidence that changes in dependent variable occur the same effect.

Nevertheless, if presented above tests and methods gives broad opportunities for comparison of different objects, all of them are restricted by significant assumptions. First of all, common for all tools' restriction is required size of sample. For applying statistical tools, sample size should be rather large, and complexity of methods generally requires more observations.

Knofczynski and Mundfrom (2008) highlight that sample size for multiple regression should be significantly higher than for correlation analysis.

Format of data is also important assumption for the tests. Examples of standard t-test require that distribution of data to be normal distribution; whereas, for paired t-test normal view of distribution is requirement for distribution of groups' deviations.

Any statistical method supposed formulation of the statistical hypothesis. Nonetheless, Cook (1999) emphasizes that uncertainty component of the data often lead to misinterpretation of test's results. That is why utilization of these methods in conditions of high uncertainty can probably give wrong conclusions from the designed or developed model. Even formulation of hypothesis can be reason of unexpected fault outcome from observations. Example of case with two samples for comparison, where means of general populations are defined as μ_a and μ_b, there are three obvious results according to possible hypothesis:

- $\mu_a > \mu_b$, that shows higher mean value (μ_a) for population "a";
- $\mu_a < \mu_b$, that shows higher mean value for population "b";
- $\mu_a = \mu_b$, that shows statistical equation of populations' mean values.

However, even these logically structured options can lead to misinterpretation in case t-test for $\mu_a - \mu_b$ will show negative outcome (Cook 1999). Effect of it will lead to rejection of alternative hypothesis and intention not to reject null hypothesis, which is actually wrong outcome because of negative outcome.

Statistical tools are multitasking means for comparison of different alternatives. However, estimation of risk management practices is connected to conditions of high uncertainty and due to various models with estimations on nonnumeric and non-precise data. Moreover, size of samples for statistical methods requires to be rather large and it is better to be more than 100 observations for reliable outcome that may allow to generalize conclusions on population.

2.4. Method of APIS

Decision support system APIS, which expands as Aggregated Preference Indices System, is convenient software for building well-founded solution based on method of aggregated indices (Kolesov et al 2004). It is aimed to provide operators with solutions in conditions of high uncertainty.

It is necessary to define objects for selection. Commonly, these objects are alternatives among which operator of APIS should select or determine preference. Chosen value of alternatives may be clarified as quality of complex object. This quality has to be estimated by DSS APIS.

Management systems, different projects of organizations, alternative of each decision-making process, etc. can be examples of complex object. Therefore, all of them possess own range of quality indices (e.g. productivity, efficiency rates, etc.)

Opportunity of utilization of DSS APIS is broad enough because it serves to find computed solution under uncertainty even in cases of studying nonnumeric, non-precise and incomplete data. These cases are include in the following list (Hovanov 2008):

- There is evidence of numeric information shortage on the concerning issue;
- Evaluations are subjected to uncertainty due to lack of information, non-precise data, etc.;
- Solution for the problem contains alternatives that are hard to compare due to lack of unified criteria;
- The object for estimation is sophisticated system that it is complicated to define indices of efficiency for comparison;
- It is necessary to make estimations based on experts' opinion;
- It is necessary to estimate different components of the object under study by decomposition of it and building hierarchy.
- Calculation of probabilities of different alternatives is based on information from sources with diverse level of reliability;
- Decision requires finding solutions for investments between several projects in conditions of lack of information, non-precise data, etc.

DSS APIS principle is based on theory of aggregated indices method that is realized with a help of computer calculation. Core framework of this method makes assumption that decision-maker (in this case, researcher) determines the whole process, especially, selection of alternatives and attributes. Each alternative is represented by composition of attributes (or characteristics). The number of characteristics is finite. The preference of decision-maker between alternatives is determined by comparison of numeric value calculated by function of attributes' values.

The final point of APIS calculation is to conduct aggregated indices for all branches of hierarchy presents in Fig.2.4.1. However, hierarchy shows visual representation of each alternatives' views. Integral index is decomposed into multi-attribute alternatives that are aimed to estimate higher layout by composition of estimated values. By the way, estimated value of alternative's preference is numeric function, which is presented as single preference index (or individual/special preference index). This preference index is criterion for justification of the choice at each stage of estimation of preference and further comparison. Consequently, APIS

requires to calculate and collect all individual preference indices to identify aggregated index for integral factor and, therefore, evaluation of alternatives. In other words, the value of aggregated preference index is combination of individual preference indices' estimations.

Except estimations of values of single preference indices, APIS takes into consideration "significance" of these indices in the process of aggregated index estimation. This significance is weight-coefficient, which is, actually, parameter for APIS imputation to set ordinal information for aggregated preference indices values. Weight-coefficients have positive or equal zero values. However, there are two possibilities for APIS to assign particular value:

- Estimated by experts' significance of single index.
- Estimation of weight-coefficient in conditions of uncertainty.

In the first case, experts set their preferences. Then, based on ordinal information for preference indices values APIS constructs weight-vector that assigns particular weight to each index. The second case is situation without concrete distribution of experts' preferences. Therefore, the researcher uses nonnumeric information collected from different sources and is able to set intervals for weight's value to adjust it.

In general, described above method of aggregated preference indices can be summarized by four steps (Hovanov 2008):

1. Step (0). Forming a set of the considered alternatives and determination of the list of attributes.
2. Step (1). Construction of function for estimation of individual preference indices.
3. Step (2). Selection of synthesizing single preference indices function.
4. Step (3). Calculation of weight-coefficients' values.

In conclusion, the main precedence of DSS APIS in comparison to mentioned above methods is ability to make calculation based on information in conditions of high uncertainty. Especially, it is realized in gathering information on weight-coefficients with no specified numeric value. Their estimations are objectives of the system's determination. As a result, it becomes possible to estimate single preference indices for further calculation of aggregated index. Fig.2.4.1 with example of structure will be used as illustration. Aggregated index Q(1;1) decomposed into two single preference indices – Q(1;0) and Q(2;0). The researcher gets estimations for Q(1;0) and Q(2;0) as well as their significance levels for weight-coefficients. Based on this information it is possible to calculate aggregated preference index for Q(1;1). When indices Q(2;1), Q(3;1), Q(4;1)

and Q(5;1) are figured out with the same manner, APIS is ready to calculate aggregated preference index value for Q(1;2) as long as significance of second layout indices are identified.

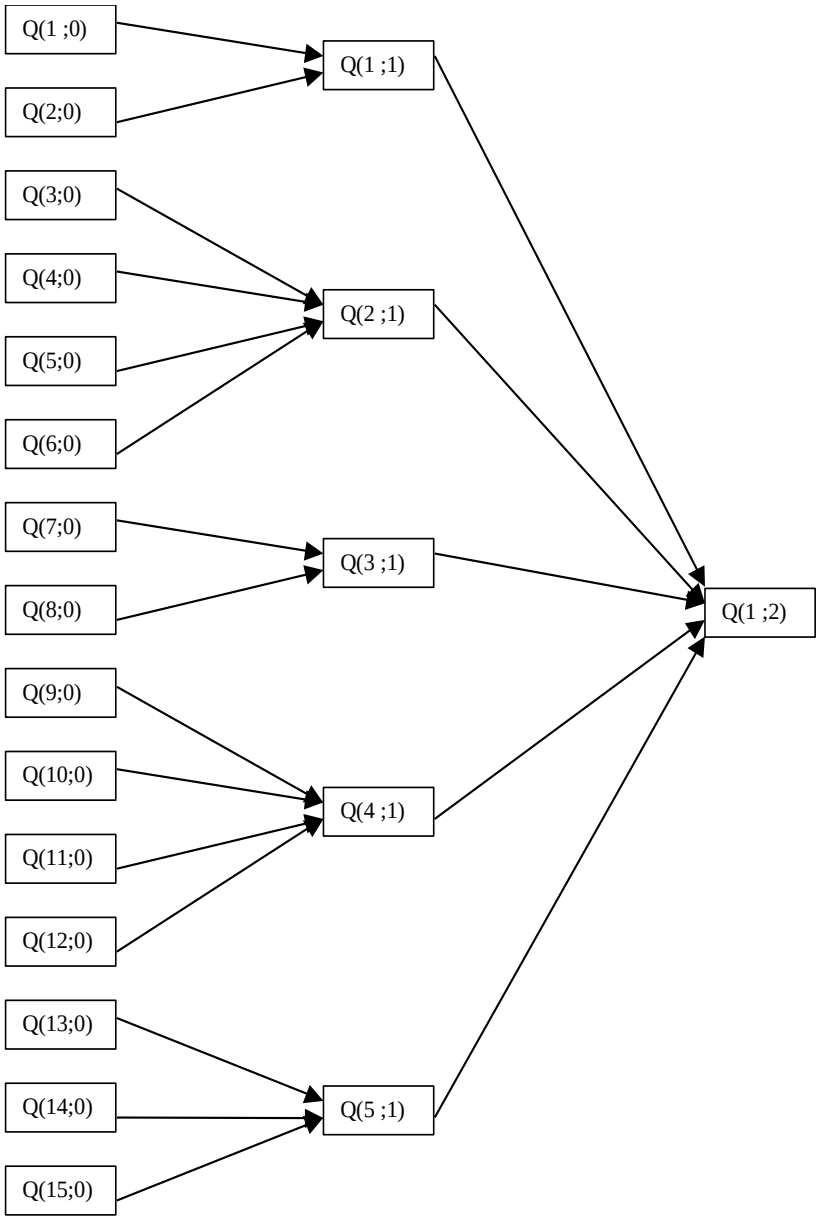


Figure 2.4.1. Example of structure of aggregated indices for DSS APIS

Source. Kolesov et al 2004.

Taking to account all mentioned above, DSS APIS is defined as the most appropriate method from considered in this chapter. It satisfies conditions of the study as it will represent needed result for evaluation and comparison of risk management practices and allow to overcome limitations concerned with responses number and gathered information.

The result of APIS calculation is ranked representation of alternatives' choice based on mean values of alternatives. To take into consideration accuracy of estimation APIS calculate

standard deviation of mean value with proposed confidence intervals. All estimations are visualized with diagrams, which display final ranking of alternatives based on mean values with confidence intervals.

2.5. Technique for evaluation of risk management practices

As APIS was determined as the most appropriate tool for evaluation of risk management practices, its methodology will be implemented for practices evaluation process. First of all, several conditions should be accepted:

- There is evidence of numeric information shortage on the concerning issue;
- Evaluations are subjected to uncertainty due to lack of information, non-precise data, etc.;
- Solution for the problem contains alternatives that are hard to compare due to lack of unified criteria;
- Multi-criteria choice of alternatives under shortage of information about decision criteria priorities;
- Experts will be primary source of data.

The next step of the technique is to design initial structure of risk management practices. Integral index of this structure will be “Risk management practices”. According to paragraph 1.5, overview of risk management practices shows that the most suitable division of this object is decomposition of it into processes of risk management (e.g. identification, assessment, communication, etc). Each step represents particular part of complex process and contains big range of mentioned tools and methods. Taking as an example three different risk management processes, the integral index “Risk management practices” should be divided into “Process 1”, “Process 2” and “Process 3” as it presented in the Fig.2.5.1.

However, processes are required to be decomposed into smaller groups of methods that are combined by particular features. For example, methods for identification risks can be either qualitative or quantitative. Making an assumption that each process of risk management can be decomposed into two general groups, the structure acquires the third layer that consists of “Combined group of methods 1”, “Combined group of methods 2”, “Combined group of methods 3”, “Combined group of methods 4”, “Combined group of methods 5” and “Combined group of methods 6”. Finally, the next layer is groups of risk management methods and tools themselves. Further decomposition into separate practices will make structure large-scaled and inconvenient both for experts and for data analysis. Consequently, initial structure of risk management practices has form of hierarchy, where each new layer is decomposition of layer situated above. Initial

hierarchy that consists of four layers is presented on Fig.2.5.1. There is one alternative for estimation combined group of methods as complex object. For this purpose, there is no need to decompose them into groups of methods; it is necessary just to assign attributes directly to combined groups.

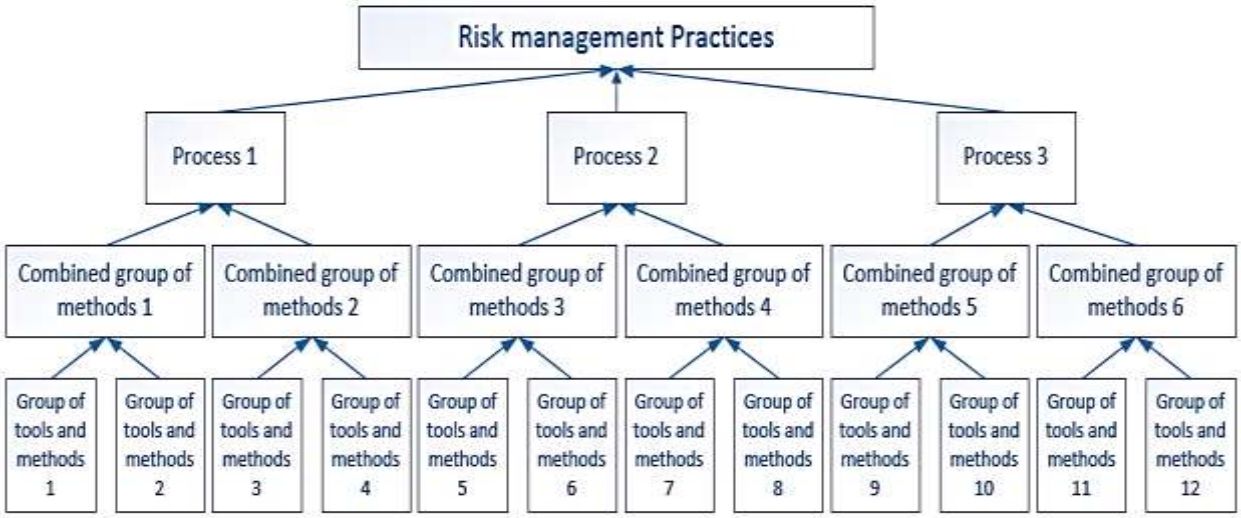


Figure 2.5.1. Designed model of initial structured hierarchy of aggregated characteristics for risk management practices

The next step of technique is to determine appropriate attributes for risk management tools and methods. It will be the last layer of the structure. Therefore, estimation of this attributes will be aim of data collection. Formulation of list of attributes requires precise understanding of what is the main objectives of the evaluation, because at this point two different options exist:

- There is possibility to create list just for evaluation and comparison of risk management practices of two or more alternatives (e.g. national practices of companies' origination countries).
- There is possibility to combine first option with additional opportunity to evaluate and compare practices of one organization with each other.

Choice of option will affect expected list of attributes. For the first option, the manager is free to choose attributes that are relevant to the particular group of methods and tools. This condition is enough to be able to compare alternatives. Nevertheless, the second option supposes selection of attributes that will reflect specifics of all tools and methods within combined group. As a result, manager gets broader analysis and outcomes.

The list of attributes is complex process of selection. The researcher should understand characteristics of each tools on a par with advantages and disadvantages of them. Therefore, it will

be easier to find out which attributes are common for tools and methods within one group. There are two requirements that are necessary for getting data with desired quality:

1. To formulate attributes in context close to organization's operations.
2. Not to prepare big number of attributes.

The first requirement is connected to the difficulty of topic. For respondents that are experts in particular field – in this case, this is risk management – it is easier to answer the questions formulated in customary way. Such design of questionnaire in general will help to decrease required time to respond and possibly increase response rate of research as experts can be more customized to this. The second requirement is related to the human nature and respondents' behavior. Big number of attributes increases number of proposed questions in questionnaire. Experts from organizations have to discharge job liabilities, and responding the questionnaire requires additional time. Consequently, in case of wide range of attributes experts can just to refuse to answer.

After list of attributes is determined, it is necessary to specify factors' metrics. They can be both qualitative and quantitative. There is no specifics in case of quantitative data; nevertheless, qualitative data requires imputation in APIS in numeric view. That is why obligations of the manager is to find ways for numeric representation of the qualitative data. Possible solutions for it can be assignment of particular value for the qualitative factor or simple utilization of ranking system.

The next step is development of final hierarchy as the last layer of attributes is already known and metrics are identified. Therefore, the model of final hierarchy can be merged. This model is presented in Fig.2.5.2.

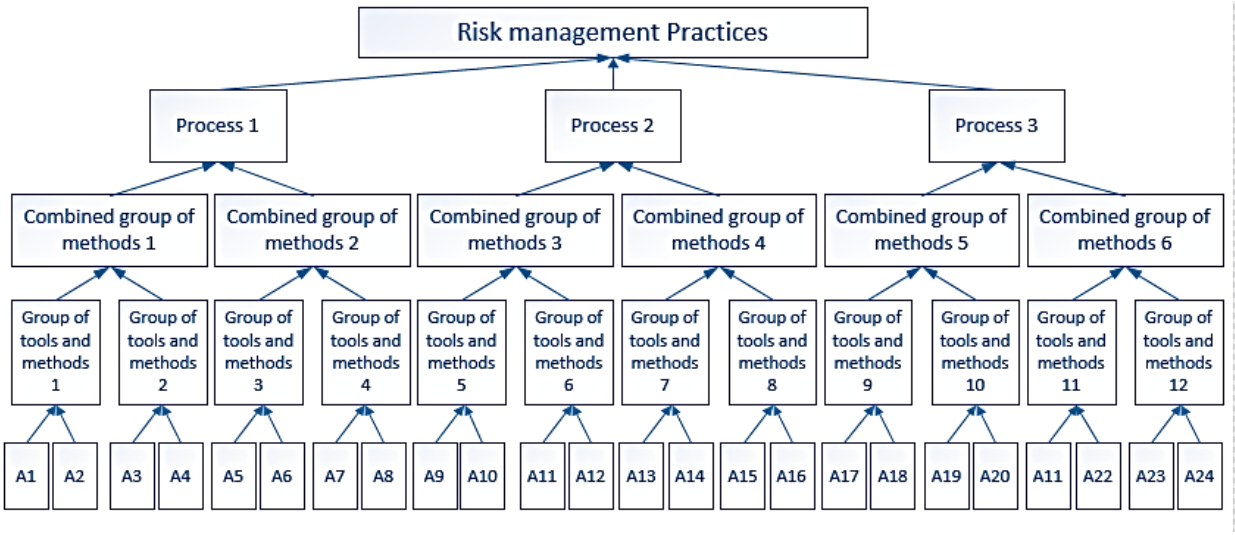


Figure 2.5.2. Designed model of final structured hierarchy of aggregated characteristics for risk management practices

The following steps are aimed to identify appropriate method for data collection and design of this instrument. The needed data is responses from experts. The main purpose of designed technique is to evaluate risk management practices and compare values of different objects. Different objects may have various scaling like measures, gradations, etc. DSS APIS calculations of aggregated indices helps to avoid these differences in dimensions for further interpretation. Estimation of attributes by experts displays their preferences among alternatives. The results of estimations will be formed as values of attribute-vectors.

Frechtling et al (2002) propose the following methods for data collection:

- Survey;
- Interviews;
- Observations;
- Case studies.

Survey is convenient to gather information from large number of respondents as form of it is quite standardized and range of questions is set precisely. Survey can contain questions about various topics and in different form (e.g. multiple choice). In addition, content of it may collect profound level of knowledge by right and clear formulation of question and proposed alternatives. It is perfect tool for researches that study evidences of respondents in several dimensions – geographical, time lag, organizations' size, etc. When attributes are identified clearly and metrics allow representing data in view of numeric data, survey is the perfect tool. However, it does not take into account characteristics and context that are not included in questions.

Interview is more complicated process that involves personal interaction into process of evaluation. It can be held both independently and as the additional part of assessment. The main reason to conduct interview instead of remote methods is high level of topic's sophistication. This case requires collecting data from respondents with in-depth knowledge with possibility to adjust questions during conversation. Another reason is level of data specification; survey cannot incorporates personal attitudes for particular issues because it is standardized and impersonal tool. The main problem of interviewing is needed resources, especially, time. Interviews suggest availability of experts through special communication tools or existence of free time for personal conversation.

Observation requires deep involvement of evaluator or researcher. The evaluator becomes direct data collector as he or she incorporates into operations as an observer. Getting information right from observations helps to develop understanding of the topic in closer contact with process. Observation method gives opportunity to get data personally, without intermediary. However, studying companies' specifics supposes interactions with companies that are generally are not ready to allow outsiders to learn internal processes.

Case study is self-contained method that assumes not only data collection, but also further analysis with particular means. However, overall process of gathering information though case study will give complex data concerning particular case. Serious discrepancy of this method is descriptive nature of collected data. Consequently, researcher has to adapt data and reorganize it in applicable form.

Actually, all this methods can be utilized for getting data from experts. However, majority of methods requires lots of resources and established relationships with representatives of transportation companies. According to list of mentioned further advantages, the most suitable method for current technique of risk management evaluation is survey in the form of multiple choice. Survey is possessed of range of proper characteristics that allows to communicate with companies' experts effectively:

- It is appropriate tool to collect data with descriptive nature and is aimed to disclose a range of topic;
- Costs that researcher incur are not so high in comparison to other methods (the only needed resource is time) and surveys are accepted by the public as a credible indicator of researches;
- Moreover, results can be processes with different statistical software.

To prepare appropriate data for APIS imputation, it is necessary to divide survey into two blocks. The first one will cover experts' estimation of attributes that were included into groups, while the second block is aimed to estimate experts' preferences in options of choice between alternatives within one group (or part) of structured hierarchy.

After needed number of responses was achieved, manager is able to begin calculations in APIS. To include all data into APIS, the collected responses should be averaged out by calculation of mathematical mean of all experts. The experts' preference of alternatives within group should be stated according to majority of responses.

The final part is result interpretation, which require to analyze mean values for aggregated indices and deviations that are delivered from APIS. Mean values show which alternatives' "quality" is higher among group of alternatives; while deviations show possible errors of evaluation. For means with high deviation, it is better to give adjusted comments as it shows that APIS had lots of iterations with rather big range of results. Boundaries of deviation are actually confidence intervals that obviously should be taken into consideration during analysis.

Concluding processes that were described above, there are six steps of creation of transportation risk management practices' structural model (Fig.2.5.3).

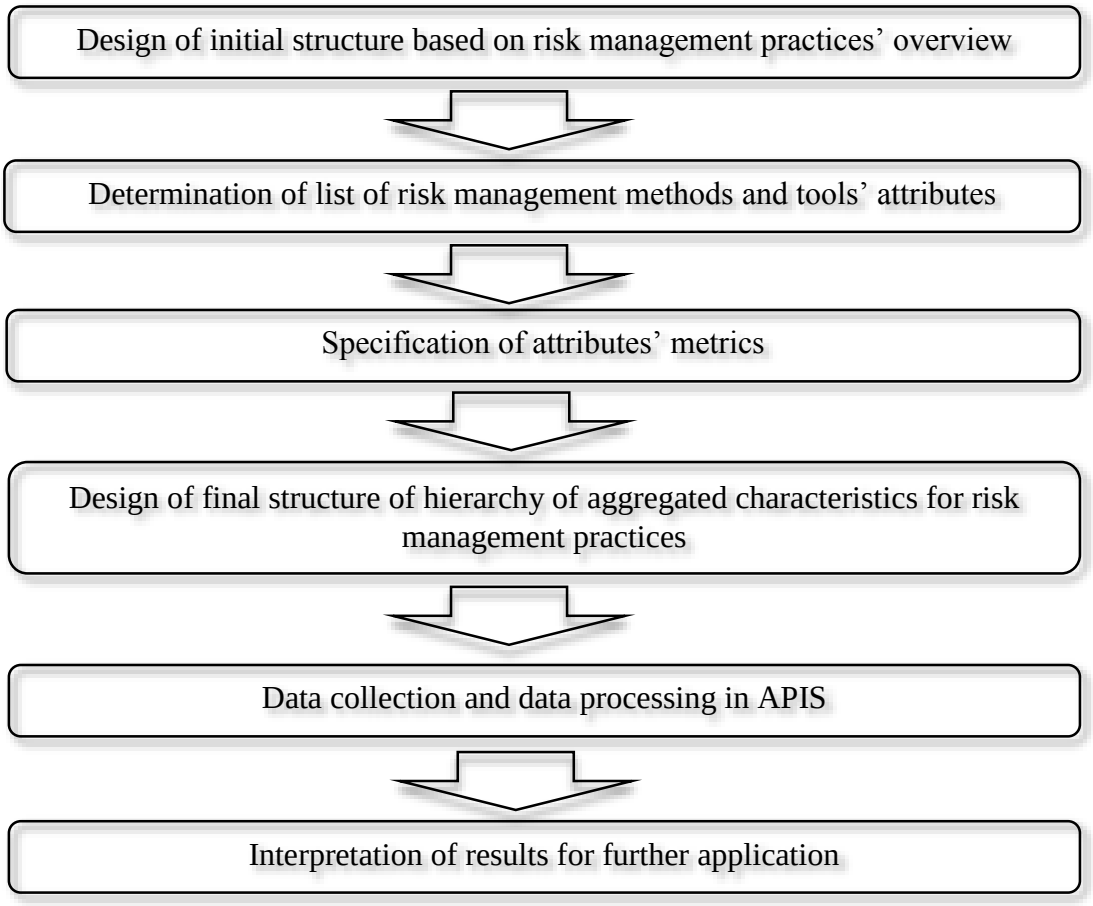


Figure 2.5.3. Algorithm of risk management practices' evaluation

CHAPTER 3. APIS MODEL OF RUSSIAN AND FINNISH RISK MANAGEMENT EVALUATION

3.1. Structural model of transportation risk management practices

This paragraph describes construction of the APIS model of Russian and Finnish risk management evaluation according to technique designed in the paragraph 2.5.

For this purpose and visualization of results decision support system APIS will be used. It is perfect tool for building agile systems for multi-criteria estimation including qualitative, fuzzy and incomplete information. For example, APIS is widely used for estimation of quality and effectiveness. Usage of presented DSS requires to structure particular form of data. Structured hierarchy of aggregated characteristics for risk management practices will be based on paragraph 1.5. that overviews different risk management practices for transportation companies.

As risk management practices were defined as enumeration of whole range of companies methods and tools that are aimed to manage risks through all risk management processes, integral index of structure – "Risk management practices" – will be decomposed into two groups of processes:

1. Identification and Assessment of risks;
2. Control and Minimization of risks.

Each group includes two actual processes of risk management. However, the core idea of this is concealed in similarities. Identification process has seamless transition into assessment process. Managers generally do not anticipate them on practice, because estimation of risks' occurrence probability is logical continuation after risks were identified. The same thing with control and minimization. Companies implements different methods to be able to control probable risks and as sequence utilize various instruments for risks' minimization.

The next layouts are following logic of risk management practices division. For the first group of process groups of methods are divided into combined group of methods: identification and assessment - into Quantitative and Qualitative methods; control and minimization – into Financial and Non-financial methods. This is a point when it is not logical to decompose groups of tool and methods into particular instruments, because it will be not convenient for experts to estimate the whole range of practices. Therefore, groups of tools and methods are the one from the bottom layout. The decomposition principle is based on overview of risk management practices. Groups of tools and methods are divided into following way that is shown in Fig.3.1.1.

Figure 3.1.1. Initial structured hierarchy of aggregated characteristics for risk management practices

The next step is to establish list of attributes. It was mentioned in paragraph 2.5 that there are two option for attributes' list creation. As this thesis is aimed to get broad results for empirical part, provided list of characteristics will be created by identifying similarities within group to be able to compare methods and tools' group within risk management practices of transportation companies representatives of particular country. Table 3.1.1 contains attributes that are related to particular group of methods and tools.

Table 3.1.1. The attributes of groups of methods and tools

The groups of methods and tools	Related attributes
Probabilistic risk assessment	The degree of renewability
	The accuracy of estimation
Experts' review and Risk structuring	The level of understanding of organizational risks
	The frequency of main organizational risks' revision
	The degree of team's cross-functionality
Insurance and Hedging	The share of projects under financial tool
	The frequency of occurrence of the insured event
Diversification, Business process optimization and The method of real options	The willingness of the company to use the tool
	The degree of influence on the company's activities
	The cost-intensity of method

On this layout, the lowest level is particular attributes that should be estimated by experts. They shape in tools and methods, which create groups. The number of level is highly depends on complexity of structure and supposed division of characteristics. The further analysis includes diagram that is aimed to visualize qualitative data in numeric view. It gives opportunity to compare characteristics and groups in particular level. The final version of structured hierarchy of aggregated characteristics for risk management practices is presented in Fig.3.1.2.

The survey was the most appropriate tool for getting needed data. Presented structure influences questionnaire as it is necessary to ask not only about what tools companies use, but also about characteristics of tools. There are two steps: 1) to get information about what characteristics experts evaluate higher in choice of risk management tools and methods and 2) to compare how experts' preference reflect tools available in reality.

By the way, initial steps of model design was presented in this paragraph, while the following steps from 5 to 6 will be staged in further paragraphs:

5) Data collection and data processing in APIS.

6) Interpretation of results for further application.

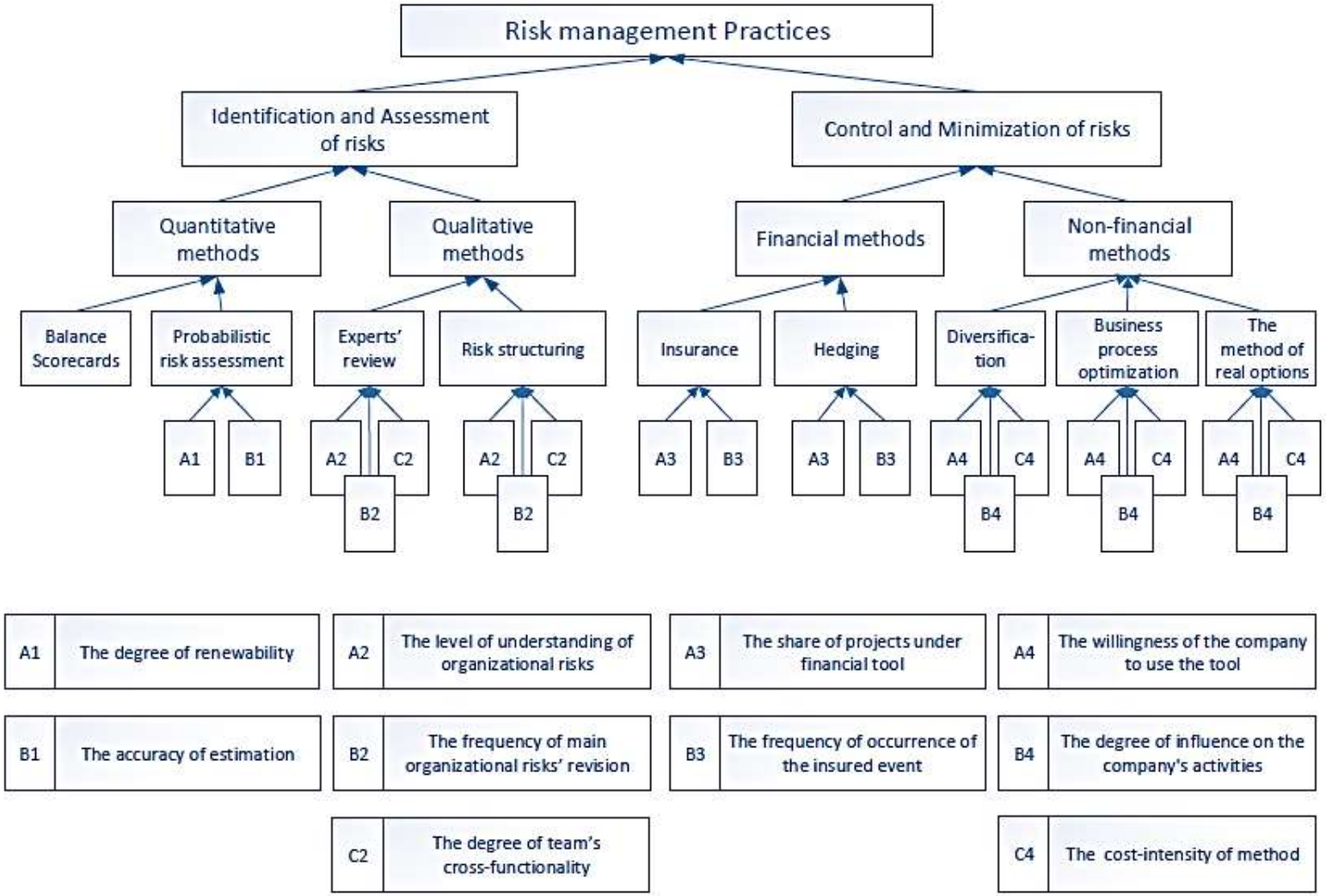


Figure 3.1.2. Structured hierarchy of aggregated characteristics for risk management practices

3.2. Sample description and data collection

As one research purpose was to compare Russian and Finnish practices, this research includes two sub-samples. The sampling method is judgmental sampling because it is required for evaluation and comparison of transportation companies from Russian and Finland. The first sub-sample includes 521 transportation and logistics companis from the Russian Federation and the second one is 588 transportation and logistics companies from Finland. All the companies were found with a help of databases. "Skrin" (СКРИН – Russian) were used as a source of Russian transportation companies as it is database of national enterprises. "Amadeus – Bureau van Dijk" database provides information of European companies; therefore, it was a source of Finnish companies' information. The following samples include information about organizations' names, incorporated forms, country identity and contact details.

In practice, questionnaire provides answers for structured hierarchy presented in the Fig.3.1.2. The survey was determined as the most suitable tool of data collection for this research. It was designed directly for imputation results into DSS APIS. To get quantitative results for qualitative metrics there are two main part of estimation in presented above hierarchy:

1) Group of tools and methods' attributes;
2) Degree of importance or level of preference among tools and processes within particular group.

Consequently, questionnaire is divided into 2 parts. The first part is aimed to evaluate the attributes of the tools and methods used in the identification and assessment of risks, as well as in control and minimization of risks (Fan 2011) for the seven-point scale. The chosen scaling allows to estimate response more precisely and gives experts opportunity to mark less extreme variants.

For weighted estimation APIS requires to set ordinal information for aggregated preference indices values. It means that experts should choose preference between alternative (e.g. attributes, groups of tools) and set relation if they are equal or some alternatives are more or less preferable. That is why the last section of questions is expert opinion about evaluation of the significance of the elements of aggregated measures in the hierarchy on a five-point scale, where 1 – low importance (low priority), 5 – high importance (high priority).

The responses for this section determine:

- The degree of importance of particular attributes of the tools compared with others;
- The level of preference among tools within the group;
- The level of preference of methods types of risk management process;

- The degree of importance of the processes of risk management.

As the survey was created to study practices of Russian and Finnish companies, it was translated into Russian for easier perception issues. The English version of survey for gathering data from Finnish companies is presented in Appendix 1. For convenience of companies' experts, online version of both surveys were created and added as a link to the letter. The mailing of letters took place in two stages:

1) Mailing to corporate e-mails with proposal to redirect it to specialist;
2) Target mailing to organizations' managers of related department.

Final sample of research consists of 9 Russian and 7 Finnish experts' responses. The respondents were representatives of senior and middle management levels from risk management departments. There were possibility not to disclose company's name in the survey. Moreover, for the purpose of getting more results it was admitted that the organizer of the study ensures not to disclose the company's name for those who decided to leave this information. Companies could contact organizer of the study in case of any questions. There were two cases of back calls that change format of survey into structured interviews with description of the project.

3.3. Comparative data analysis and results

DSS APIS requires data processing for further imputation of data into the program interface. Received from companies primary data was divided into two groups:

- Estimation of attributes;
- Estimation of significance of attributes and methods within one group.

Estimations of attributes serves for the calculation of aggregated indices, which shows value of the methods and tools. To combine all experts' opinions for Russian and Finnish companies separately, the estimations were calculated as average values of all experts in particular country. Estimations of significance of attributes and methods within one group were used to set ordinal information for weighted-coefficients. This information allows to assign more precise value of coefficients as their values become adjusted to experts opinions. For estimation and comparison of two countries this data was summarized and experts' preferences (significances) were set up in three ways:

1. One attribute or group has higher significance than other, which is denoted as ">".
2. One attribute or group has lower significance than other, which is denoted as "<".

3. One attribute or group has the same significance as other, which is denoted as "=".

The survey results adduced to mathematical average are included in the Table 3.3.1.

Table 3.3.1. The average values of Russian and Finnish attributes' estimation

Attributes:	**The average ranks of Russian companies**	**The average ranks of Finnish companies**
1. Identification and Assessment		
1.1 Quantitative methods		
1.1.1. Balanced Scorecards	4,8	4,4
1.1.2. Probabilistic risk assessment		
1.1.2.1. The degree of renewability	5,2	5,2
1.1.2.2. The accuracy of estimation	5,0	4,8
1.2. Qualitative methods		
1.2.1. Experts'' opinion		
1.2.1.1. The level of understanding of company's risks	4,8	3,8
1.2.1.2. The frequency of main organizational risks' revision	5,0	3,6
1.2.1.3. The degree of team's cross-functionality	2,8	2,6
1.2.2. Risk structuring		
1.2.2.1. The level of understanding	4,8	5,6
1.2.2.2. The frequency of main organizational risks' revision	5,0	5,2
1.2.2.3. The degree of team's cross-functionality	2,8	3,8
2. Control and Minimization		
2.1. Financial methods		
2.1.1. Insurance		
2.1.1.1. The share of projects under financial tool	6,2	5,8
2.1.1.2. The frequency of occurrence of the insured event	2,4	2,8
2.1.2. Hedging		
2.1.2.1. The share of projects under financial tool	2,0	2,6

2.1.2.2. The frequency of occurrence of the insured event	2,0	2,8
2.2. Non-financial methods		
2.2.1. Diversification		
2.2.1.1. The willingness of the company to use the tool	6,6	5,8
2.2.1.2. The degree of influence on the company's activities	5,2	4,4
2.2.1.3. The cost-intensity of method	4,8	3,2
2.2.2. Business project optimization		
2.2.2.1. The willingness of the company to use the tool	6,0	5,4
2.2.2.2. The degree of influence on the company's activities	4,8	4,8
2.2.2.3. The cost-intensity of method	5,6	4,8
2.2.3. The methods of real options		
2.2.3.1. The willingness of the company to use the tool	1,8	4
2.2.3.2. The degree of influence on the company's activities	1,3	4,4
2.2.3.3. The cost-intensity of method	1,8	3,5

Processed in APIS data represents the range of statistical values – mean, standard deviation, minimal and maximal values, probability of dominance in pairs and covariance/correlation - both for weight-coefficients and for aggregated indices. The listed values for weight-coefficients has exploratory character that generally reflects ordinal information for weight-coefficients. The mean and deviation values of each group has the principal value for data analysis. They show estimated values for aggregated indices and confidence interval or, otherwise, error estimations. The graphical representation of APIS results for comparison of the countries practices and comparison of tools and methods utilization within one country are included in Appendix 2 and Appendix 3, representatively. The numeric values are presented on Russian and Finnish hierarchies in the Figures 3.3.1 and 3.3.2.

Figure 3.3.1. Hierarchy of aggregated indicies with values for Russian companies

Figure 3.3.2. Hierarchy of aggregated indicies with values for Finnish companies

As it can be concluded risk management practices aggregated index for Finnish transportation companies is significantly higher than for Russian companies: Finnish mean equals 0.7 in comparison to Russian 0.3. The interesting fact is that for these indices APIS calculated mean without any deviation (App.2, Fig.A.2.1). This indicates that there is no error for the estimation.

Going down in the hierarchy, this layer represents stages of core risk management processes – 1) Identification and Assessment of risks (App.2, Fig.A.2.2) and 2) Control and Minimization of risks (App.2, Fig.A.2.8). Finnish companies have higher indices' values for both groups. In this case, small deviations exist; however, difference in mean's values is quite high: 0.225 for Russian companies and 0,775 for Finnish. It allows to conclude that in general, according

to experts' opinion of surveyed companies Finnish practices are better not only on the first layout, but also on the second.

The third layout shows more diversified results, because Russian companies' quantitative methods from identification and assessment (App.2, Fig.A.2.3) and financial methods from control and minimization (App.2, Fig.A.2.9) have higher values than values of Finnish companies: 0,775 and 0,225, representatively in both indices. In opposite way, qualitative methods (App.2, Fig.A.2.5) and non-financial methods (App.2, Fig.A.2.12) of Finnish companies show higher value. Finnish qualitative methods equals 0,775 and non-financial equals 0,277, while Russian companies' means for this indices shows only 0,225 and 0,277, representatively. Deviations in all mentioned cases are identified as low and don't affect result as confidence intervals have no intersections.

The last layout gives estimations for exact group of tools and methods that were calculated with primary data collected from survey. This layout shows more interesting results presented in Table 3.3.2:

Table 3.3.2. Mean values of groups of tools and methods

	Russian companies	**Finnish companies**
Probabilistic risk assessment	0,914	0,086
Experts' review	0,9136	0,0864
Risk structuring	0,277	0,723
Insurance	0,9136	0,0864
Hedging	0,5	0,5
Diversification	0,575	0,425
Business process optimization	0,425	0,575
The method of real option	0,15	0,85

This table shows that Russian companies has higher values, in general, in methods that are connected to numeric calculations: probabilistic risk assessment and insurance. In addition, the dominant values relates to experts' review. Among non-financial method Russian companies has the higher mean only for diversification. Hedging has the same values for representative of both countries.

Another part of calculation of aggregated indices is estimation of groups of tools and methods within particular country. Results for this part are represented in Figures 3.3.3 and 3.3.4.

It was possible to calculate only groups' means in qualitative, financial and non-financial methods because, APIS requires imputation of the same attributes for particular groups for comparison. Nevertheless, results in this stage of empirical part are sharper than in the previous one. For example, Russian organizations prefer experts' review with value of 0,52 slightly more than risk structuring equals to 0,475 (App.3, Fig.A.3.1). The interesting fact is that these aggregated indices have big deviations that have intersections almost for all range of confidence intervals. It is possible that inconsiderable changes in sub-group aggregated indices can lead to changes in results. Transportation companies in Finland prefer to use risk structuring tools and methods instead of experts' review. APIS assigned the value of 1 to risk structuring method, while mean of experts' review equals 0 (App.3, Fig.A.3.4). Russian transportation companies have pretty the same situation in financial methods, where insurance value for aggregated indices equals to 1 and hedging value, consequently, equals to 0 (App.3, Fig.A.3.2). Financial methods' preferences in Finland have closer to each other values: 0,775 for insurance and 0,225 for hedging (App.3, Fig.A.3.5).

The important part of estimation within countries is non-financial methods values in both countries (Table 3.3.3).

Table 3.3.3. Mean values of non-financial tools and methods

	Russian companies	Finnish companies
Diversification	0,664	0,85
Business process optimization	0,507	0,405
The method of real option	0,425	0,345

The experts show that in both countries transportation companies' preference state in the following order: diversification, then business process optimization, then the methods of real options. However, Finnish companies in average utilize diversification with higher probability than other instruments, while Russian companies use combination of the presented non-financial methods.

Figure 3.3.3. Aggregated indices of practices' groups of Russian transportation companies

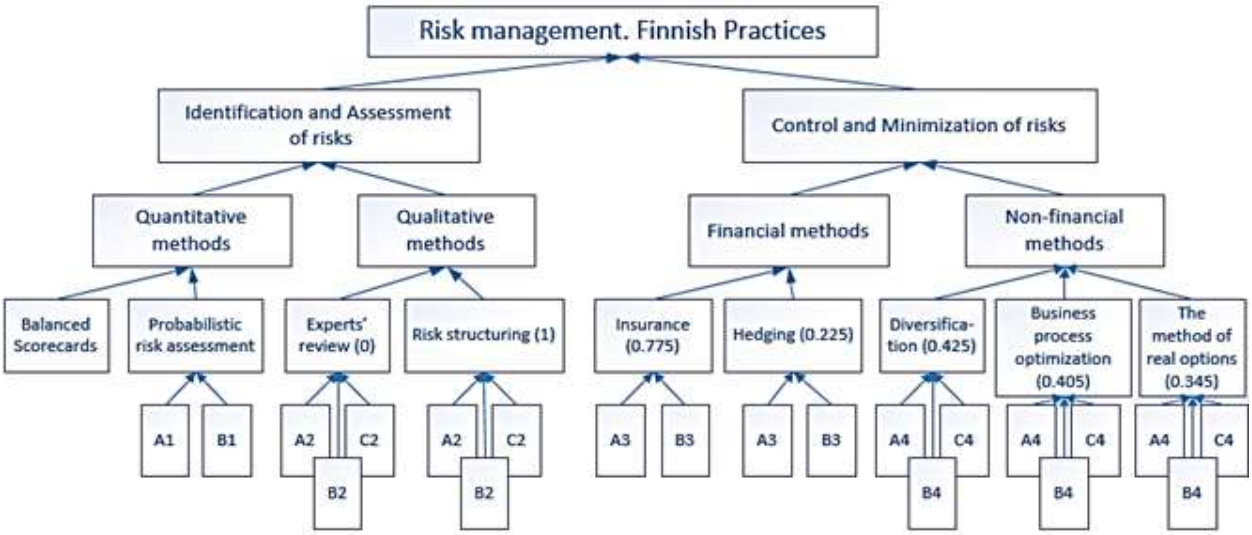


Figure 3.3.4. Aggregated indices of practices' groups of Finnish transportation companies

3.4. Theoretical contribution

This thesis reveals theory about risk management in transportation companies. The most valuable part of it is consideration of risk management evolution process and review of risk management practices. The development of the concept has a big impact on risk management process in general and on tools and methods that evolved from insurance into advanced practices of risks' identification, measurement, managing and minimization. Moreover, concept of risk management, which is actually enterprise risk management nowadays, is still evolving for past 10 years by imposing more value on risk management communication both internal and external.

The main theoretical contribution of this paper is design of the technique for evaluation of risk management practices. This technique is based on utilization of DSS APIS. Decision Support System APIS allows to obtain results even in the following conditions:

- There is evidence of numeric information shortage on the concerning issue;
- Evaluations are subjected to uncertainty due to lack of information, non-precise data, etc.;
- Solution for the problem contains alternatives that are hard to compare due to lack of unified criteria;
- Multi-criteria choice of alternatives under shortage of information about decision criteria priorities;
- Experts will be primary source of data.

It is the most appropriate method for fulfilment of objectives of this research as the presented other methods for comparison can be used in listed conditions.

The technique has plaint algorithm:

1) Design of initial structure according to risk management practices' overview.
2) Determination of list of methods and tools' attributes.
3) Specification of attributes' metrics.
4) Design of final structure of aggregated indices.
5) Data collection and data processing in APIS.
6) Interpretation of results for further application.

Empirical part of this paper was application of designed technique. It began from model design in form of structured hierarchy of aggregated indices, which is the most significant part of technique approbation. Then, based on received from transportation companies' experts from Russian and Finland, calculations were held in DSS APIS, and it delivered sufficient results. Actually, this technique can be used for research purpose in different directions that will be covered in paragraph 3.5.

3.5. Managerial implication and limitations

Managerial application of this technique using DSS APIS can be very broad. The core result of presented technique is designed APIS model of Russian and Finnish risk management evaluation. The advantage of this model is avoidance of significant problems, concerning data collection and results interpretation, which include:

- Shortage or even lack of qualitative data that can be processed by statistical tools.
- Uncertainty that takes place due to complexity of estimation given attributes.
- Subjectivity of results. The collected data reveals joint experts' opinions set by getting personal preferences not to exact tools and methods, but to related characteristics.
- Difficult to interpret results. The outcome of processed by APIS data is numeric value of aggregated index that contains mean value and deviation. Results can be interpreted and compared to each other.

As it presented in technique, the aim of APIS calculation is to get aggregated indices of all layouts. It will allow managers to get numeric representation of particular instrument or group of methods and tools. Consequently, it is possible to compare these values and to give considerable explanation in decision-making process of tools and methods' choice.

For managers that act in competitive markets in conditions of limited time, this technique will allow to minimize costs on decision-making process, in general, and avoid influence of personal experience that can negatively affect choice of one or another tool or method.

Moreover, it allowed to evaluate and compare national approaches of Russian and Finnish transportation companies. Finnish companies showed significantly higher result without deviation. Such big difference can reveal better practices for managing risks in operations of transportation companies. Consequently, Russian companies can use Finnish practices as a benchmark with nationally related adjustments. The result of qualitative methods for risks' identification and assessment will be good example of it. It showed that Russian transportation companies estimate experts' opinion higher than Finnish representatives do. On the opposite, Finnish transportation companies attributes higher value to the group of risk structuring method. It reflects national approaches to identification and assessment of risks. Russian companies had to rely more on experts' review because level of uncertainty and risks on the Russian market is greater. Therefore, it is possible to make two conclusions:

1. Russian transportation companies should apply risk-structuring methods better in order to improve understanding of all possible risk of organizations.

2. Finnish companies that are willing to enter Russian market should take into consideration that risk manager's personal expertise will be advantage for managing risks in conditions of Russian market.

By the way, national context of risk management practices is not only one approach for technique utilization. There is opportunity as well to compare organizations of different level. For example small and medium transportation companies can evaluate and compare their tools and methods with large organizations' practices. This is will be useful in different sense:

- Methods to be improved can be detected during analysis.
- Small and medium transportation companies can learn and become aware about specific characteristics of their large competitors.

Another utilization of the technique is estimation of current risk management system within one organization. Companies that have activities on national or global markets in general separate organization structure by regional division and departments. It happens that local senior managers sometimes are not essentially interested in putting a lot of effort to improve performance. Therefore, APIS framework for risk management practices assessment can serve as tool for risk managers of regional departments' evaluation. The results of assessment can be base of building incentives for managers.

Finally, the last approach for managerial implication of this technique is industry's risk management analysis. According to obtained results, it is possible to make several general conclusions. Russian companies put an effort to identify risks and evaluate probabilities of their occurence as well as control and minimize risks with a help of financial methods. Moreover, representative estimate experts' review as significant tool, while in Finland managers prefer to utilize risk structuring tools and methods. One of the possible solution for this difference in countries' practices is different level of market uncertainty. Russian market have more risks in various directions, therefore, Russian transportation companies intend to calculate risks and rely more on expertise and personal knowledge of experts that have experience on this market. For Finnish companies significance of risk estimation is lower in comparison to Russian colleagues. Nevertheless, results of this study can be used as benchmark for the Finnish companies that are willing to enter Russian market.

However, the presented model has several practical limitations that should be taken into consideration during hierarchy construction and research process.

This method allows to make estimations in conditions of high uncertainty. However, it will not be legit to generalize conclusions to the all representative of industry. DSS APIS is aimed to make calculations in case of lack of data. That is why it is acceptable to use it as an instrument for studying of different industries that representatives are not willing to share their personal information. In this case, building technique requires complex approach to be able to find particular attributes of needed indexes that organizations are ready to share and that will be objective metric for estimation. It relates directly to data collection that is challenging process. However, well-designed and comprehensible survey will help to overcome challenge with large sample and acceptable small number of responses due to methodology.

Moreover, utilization of this technique requires significant knowledge in the field of studied topic. Building of hierarchy is essential part of method using APIS. Without relevant input in form of attributes it is impossible to have relevant results and, likewise, meaningful figures for aggregated indices. Managers should take into consideration not only particular attributes of tools and methods, but also bring them into correlation of particular practice within organization and internal processes.

The last limitation give opportunity for further technique development. It is obvious that some organizations have different level of geographical expansion. They can have operations only on domestic market, have regional expansion, have international operations and even worldwide activities. Consequently, different companies have different conditions that makes generalization of the results less accurate. One solution for this limitation is to make division of samples with strict conditions. Nevertheless, it will significantly decrease size of responses acceptable for analysis of one group of companies. That is why possible opportunity of improvement will be connected to development of data collection tool that will allow to adjust specifics of various types of companies in order to hold broad analysis of national transportation risk management practices.

Conclusion

Transportation companies' activities are affected by the range of risks significantly. That is why it is especially necessary to be able to manage risks at any stage of occurrence. Transportation companies provide clients with solutions of delivery goods and are aimed to make decisions with adjustments on potential risks. One of the main problem of any manager that creates framework or procedures for risk management is how to choose appropriate tools and methods for all steps of integral process.

Estimation of risk management practices can be made with utilization of different methods. However, for manager of particular organization it can be hard to evaluation practices because several methods have crucial limitation that restrict possibility to make evaluation with relevant results. One of the main reasons of this problem is that transportation companies likely do not prefer to disclose information about internal processes and, especially, quantitative data, which considered as commercial secret. This leads to the fact that it is quite hard to estimate methods and tool with common approaches like statistical instruments and comparative analysis.

The goal of the thesis was to design technique for evaluation of risk management practices of national transportation companies. As a result of this thesis, the goal was achieved by design model of structured hierarchy and approbated on the example of Russian and Finnish transportation companies.

Managerial application of this technique has three directions:

- Comparison of national risk management practices of transportation companies;
- Evaluation of risk management system within one organization to estimate current practices;
- Analysis of industry trends concerning risk management tools.

However, this techniques still requires further development for taking into calculations specifics of companies with various sizes and different modes of transportation. As well, possible opportunity for improvement will be connected to development of data collection tool that will allow to adjust specifics of various types of companies in order to hold broad analysis of national transportation risk management practices.

List of references

1. Aabo, T., Frase,r J., Simkins, B. 2005. The Rise and Evolution of the Chief Risk Officer: Enterprise Risk Management at Hydro One. Journal of Applied Corporate Finance. Vol. 17 Issue 3, p5-5. 1/4p.
2. Abkowitz, M.D. 2002. Transportation Risk Management: A New Paradigm. Transportation Research Record.
3. Acebes, F., Pereda, M., Poza, D., Pajares, J., Galán, J.M. 2015. Stochastic earned value analysis using Monte Carlo simulation and statistical learning techniques. International Journal of Project Management. Vol. 33 Issue 7, p1597-1609.
4. Agafonov, Y., Bitinas, S. 2010. Risk Management in Baltic Logistics. Journal of Business Management. Issue 3, p123-130. 8p.
5. Amberg, N., Friberg, R. 2016. Three Approaches to Risk Management-and How and Why Swedish Companies Use Them. Journal of Applied Corporate Finance. Vol. 28 Issue 1, p86-94. 9p.
6. Atkinson, W. 2007. Communicating with Your Risk Managers. Risk Management. Vol. 54 Issue 11, p28-32. 4p.
7. Azzi, C., Rogstadkjernet, L., van Wingerden, K., Choi, J., Ryu, Y. 2016. Influence of scenario choices when performing CFD simulations for explosion risk analyses: Focus on dispersion. Journal of Loss Prevention in the Process Industries. Vol. 41, p87-96. 10p.
8. Barton, T.L., Shenkir, W.G., Walker, P.L. 2009. ERM: The Evolution of a Balancing Act. Financial Executive. Vol. 25 Issue 10, Special section p10-14. 4p.
9. Berg, H.-P. 2010. Risk Management: Procedures, Methods and Experiences. RT&A #2(17). Vol. 1. pp.79-95.
10. Cagliano, A.C., De Marco, A., Grimaldi, S., Rafele, C. 2012. An integrated approach to supply chain risk analysis. Journal of Risk Research. Vol. 15 Issue 7, p817-840. 24p.
11. Christopher, M. 2011. Logistics and Supply Chain Management. Harlow: Pearson Education.
12. Clark, R.M. and Besterfield-Sacre, M.E. 2009. A New Approach to Hazardous Materials Transportation Risk Analysis: Decision Modeling to Identify Critical Variables. Risk Analysis, Vol. 29, No. 3.
13. Cook, R.D., Weisberg, S. 1999. Applied Regression Including Computing and Graphic. Wiley, New York.
14. Davis, S., Lukomnik, J. 2010. Risk Velocity, the Unknown Dimension in ERM. Compliance Week. Vol. 7 Issue 72, p56-57. 2p.

15. Dionne, G., Gollier, C. 1992. Comparative Statics Under Multiple Sources of Risk with Applications to Insurance Demand. GENEVA Papers on Risk & Insurance - Theory. Jun1992, Vol. 17 Issue 1, p21-33. 13p.
16. Ealy, T.V. 1993. Bringing risk management into the boardroom. Risk Management. Vol. 40 Issue 4, p30-37. 5p.
17. Fan, W., Gu, J., Tang, H., and Gao, X. 2011. Risk Management in End-to-End Global Supply Chain. ICCTP 2011, pp. 3772-3782.
18. FAO Corporate Document Repository. 6 Basic Statistical Tools. http://www.fao.org/docrep/w7295e/w7295e08.htm (accessed April, 22).
19. Frechtling, J., Frierson, H., Hood, S., Hughes, G. 2002. The 2002 User Friendly Handbook for Project Evaluation. An Overview of Quantitative and Qualitative Data Collection Methods, 43-62. The National Science Foundation. http://www.nsf.gov/pubs/2002/nsf02057/ (accesses April, 18).
20. Goodrick, D. 2014. Comparative Case Studies, Methodological Briefs: Impact Evaluation 9, UNICEF Office of Research, Florence.
21. Hallikas, J., Virolainen, V.M., and Tuominen, M. 2002. Risk analysis and assessment in network environments: A dyadic case study. International Journal of Production Economics 78, no. 1: 45–55.
22. Heckmanna, I., Comesb, T., Nickel S. 2015. A critical review on supply chain risk – Definition, measure and modeling. Omega. The International Journal of Management Science. Vol. 52, pp.119–132.
23. Helmick, J.S. 2010. Managing Risk and Security: The Safeguard of Long-Term Success for Logistics Service Providers. Transportation Journal (American Society of Transportation & Logistics Inc). Vol. 49 Issue 3, p69-70. 2p.
24. Hendricks, K.B., Singhal, V.R. 2005.An Empirical Analysis of the Effect of Supply Chain Disruptions on Long-Run Stock Price Performance and Equity Risk of the Firm. Production and Operations Management. Vol.14, No. 1, p. 35–52.
25. Hiles, A. 2007. The definitive handbook of business continuity management (2nd ed.). London: Wiley.
26. Hillson, D.A., Simon, P.W. 2007. Practical Project Risk Management: The ATOM Methodology. Vienna, VA: Management Concepts.
27. Holland, J. 2005. Calculating Risks in the Chinese Logistics Market. World Trade. Vol. 18 Issue 9, p32-32. 1p.

28. Hovanov, N., Kornikov, V., Seregin, I. 1997.Qualitative information processing in DSS ASPID-3W for complex objects estimation under uncertainty. Proceedings of the International Conference "Informatics and Control". St. Petersburg (Russia).
29. Hovanov, N.V. 2008. Decision Support System APIS for MEAD. Advanced User Guide. Decision Support System.
30. Hult, G.T.M., Craighead, C.W., Ketchen, Jr., David, J. 2010. Risk Uncertainty and Supply Chain Decisions: A Real Options Perspective. Decision Sciences. Vol. 41 Issue 3, p435-458. 24p.
31. Institute of Risk Management. 2002. A Risk Management Standards. IRM: 2002. https://www.theirm.org/media/886059/ARMS_2002_IRM.pdf (accessed April, 16).
32. Iyer, K.C., Sagheer, M. 2011. A real options based traffic risk mitigation model for build-operate-transfer highway projects in India. Construction Management & Economics. Vol. 29 Issue 8, p771-779. 9p.
33. Jaeger, J. 2010. Managing Risks in the Supply Chain: Useful Tips. Compliance Week. Vol. 7 Issue 76, p54-77. 2p.
34. Jenkins, D.R. 2015. Management and Investment Risk Diversification Indices. Employee Benefit Plan Review. Oct2015, Vol. 74 Issue 4, p26-35. 10p.
35. Jian, W., Xiaofu, X., Ning, Z., Zhe, L., Shijie, W. 2016. Time-varying failure rate simulation model of transmission lines and its application in power system risk assessment considering seasonal alternating meteorological disasters. IET Generation, Transmission & Distribution. Vol. 10 Issue 7, p1582-1588. 7p.
36. Knofczynski, G.T., Mundfrom, D. 2008. Sample Sizes When Using Multiple Linear Regression for Prediction. Educational and Psychological Measurement. Vol. 68 N. 3, pp.431-442.
37. Knutson, C. 2013. The right ERM solution may be simpler than you think. North Western Financial Review. Vol. 198 Issue 21, p6-6. 1p.
38. Kolesov, D.N., Mikhailo, M.V., Hovanov, N.V. 2004. Evaluation of Complex Financial and Economic Institutions with the Support System Decision ASPID-3W. Textbook. OTSIM. St. Petersburg, 62 pp.
39. Koresin, A.S. 2008. The Instruments of Integrated Risk Management in a Transport Company. Proceedings of the Russian State Hydrometeorological University. A theoretical research journal. St. Petersburg: RSHU Publishers. Issue 7, pp. 154-165.
40. Kye, D., Lee, J., Lee, K.-D. 2013. The perceived impact of packaging logistics on the efficiency of freight transportation (EOT),.International Journal of Physical Distribution & Logistics Management. Vol. 43 Iss: 8, pp.707 – 720.

41. Lam, J. 2001. Demystifying ERM. Risk Management. Vol. 48 Issue 2, p46-46. 1p.
42. Lenckus, D. 2006. ERM an opportunity for risk managers. Business Insurance. Vol. 40 Issue 21, p20-20. 1/3p
43. Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S., Rao, S.S. 2006. The impact of supply chain management practices on competitive advantage and organizational performance. Omega. The International Journal of Management Science. Vol. 34, pp.107–124.
44. Mau, S., Riley, S.M. 2015. Geographic Diversification and Risk Reduction for the Privately Held Company: From Here to Where? Allied Academies International Conference: Proceedings of the Academy for Studies in International Business (ASIB). Vol. 15 Issue 2, p12-12. 1p.
45. MHA Consulting. 2014. Four Types of Risk Mitigation and BCM Governance, Risk and Compliance (GRC). http://www.mha-it.com/2013/05/four-types-of-risk-mitigation/ (accessed April, 12).
46. NASA Official. 2011. NASA Risk Management Handbook. Version 1.0. http://www.hq.nasa.gov/office/codeq/doctree/NHBK_2011_3422.pdf (accessed April 14).
47. Németh-Erdődi, K. 2008. Risk Management and Loss Optimization at Design Process of Products. Acta Polytechnica Hungarica. Vol. 5, No. 3. pp.105-115.
48. Nielson, N.L., Kleffner, A.E., Lee R.B. 2005. The Evolution of the Role of Risk Communication in Effective Risk Management. Risk Management & Insurance Review. Vol. 8 Issue 2, p279-289. 11p.
49. O'Connell, C. 2012. A New Era for Transportation Risk Management. National Underwriter / P&C. Vol. 116 Issue 11, p34-34. 1p.
50. Olson, C.E. 1968. Risk and the Transportation Investment Decision. Transportation Journal (American Society of Transportation & Logistics Inc). Vol. 8 Issue 1, p37-42. 6p.
51. PricewaterhouseCoopers (PwC). 2015. Assessing the global transport infrastructure market: Outlook to 2025. https://www.pwc.com/gx/en/transportation-logistics/pdf/assessing-global-transport-infrastructure-market.pdf.
52. Rangel, D.A., Kamel de Oliveira, T. and Leite, M.S.A. 2015. Supply chain risk classification: discussion and proposal. International Journal of Production Research, Vol. 53, No. 22.
53. Reduction of transportation risks seen possible trough integration of insurance, loss/calims management. 1996. Insurance Advocate. Vol. 107 Issue 50, p17. 2p.
54. Reichmann, T., Form, S. 2000. Balanced Chance and Risk Management, in: Controlling, 12., pp.189-198.
55. Roberts, R., Giorgione, S.T. 1995. Comparison Risk Ranking Application. Journal of Accountancy. Vol. 179 Issue 5, p85-88. 4p.

56. Rodrigue, J-P (2013), The Geography of Transport Systems, Third Edition, New York: Routledge.
57. Sanzhieva T. 2013. Risk-Management and Modern Concepts of Strategic Management of a Transport Company. Transport Business in Russia. Vol. 1, pp.79-84.
58. Shimpi, P. 2005. ERM From Compliance To Value. Financial Executive. Vol. 21 Issue 6, p52-55. 3p.
59. Thomas, A.V., Kalidindi, S.N., Ganesh, L.S. 2006. Modelling and assessment of critical risks in BOT road projects. Construction Management & Economics. Vol. 24 Issue 4, p407-424. 18p.
60. Tseng, Y., Yue, Yue, W.L., Taylor, M. 2005. The Role of Transportation in Logistics Chain. Eastern Asia Society for Transportation Studies. Vol. 5, pp. 1657 – 1672.
61. Vikulov, V., Butrin, A. 2014. Risk Assessment and Management Logistics Chains. LogForum. Vol. 10 Issue 1, p43-49. 7p.

Appendixes

Appendix 1. The survey for data collection from Finnish transportation companies

Graduate School of Management
St. Petersburg State University

LUT Lappeenranta University of Technology

The survey of expert opinions of transportation companies' representatives with the aim of studying risk management practices

This questionnaire is a tool for expert opinions' collection of representatives of Finnish transportation companies for the further comparing with Russian companies. The survey is conducted as part of research of Finnish practices for the master's thesis of School of Business, Lappeenranta University of Technology and Graduate School of Management, Saint-Petersburg State University.

The organizer of the study ensures not to disclose the company's name. The collected information will be processed using DSSS APIS and will reflect a generic character. The study involves a large number of Russian and Finnish companies, therefore, your answers are very important to obtain results with high quality.

If you have questions, please, contact the organizer of the research directly.

The section of practices' estimation based on presented model

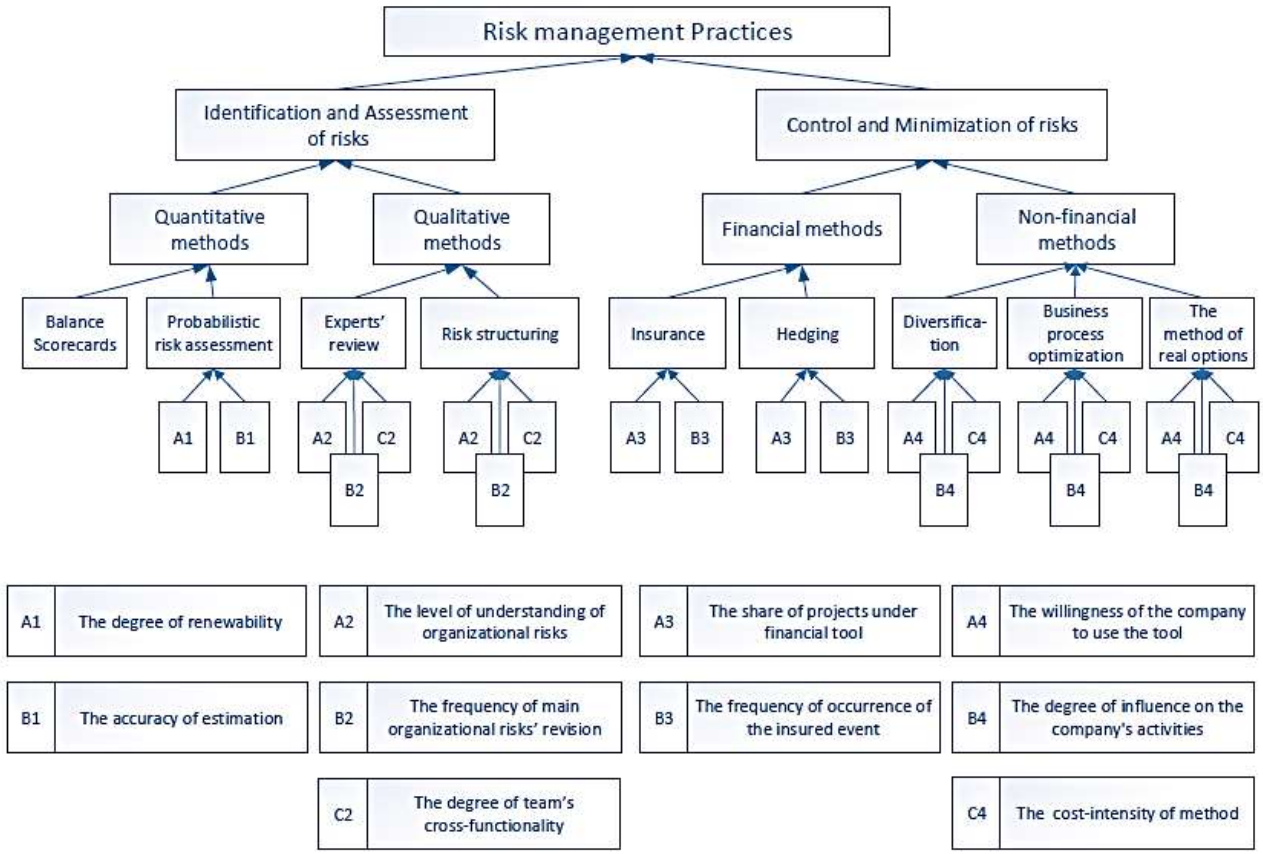


Figure. The structure of the hierarchy aggregated measures of risk management practice

Note: 1) Balanced Scorecards - method of using the company's financial performance indicators;
2) Probabilistic risk assessment - tools and methods, which include estimations of probabilities of specific risks

This hierarchy represents the main risk management practices divided on subgroup to be able to assess practices based on the characteristics by using DSSS APIS.

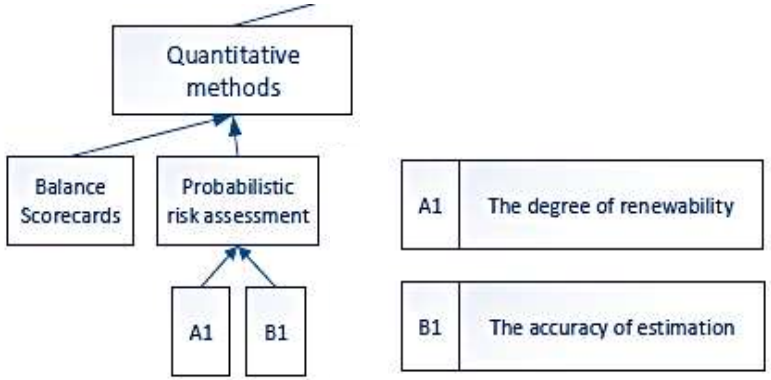
Attention! If your company does not use particular tool or method, please, mark in such cases option "1" in seven-point scale. In the five-point scale to assess the importance of tools in a group, please, choose preferable options, even if company does not use presented tools.

Responding to questions, base your answer on not only the current tools, but also on used earlier tools in your company.

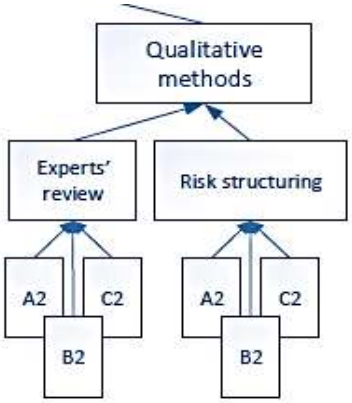
The next section of questions is aimed to evaluate the characteristics of the tools and methods used in the identification and assessment of risks, as well as in control and minimization of risks for the seven-point scale

We remind you that on non-used tools or groups in all areas, please, mark "1".

	1	2	3	4	5	6	7
Please, estimate the following characteristics of group **probabilistic risk assessment** :							
The degree of renewability of previous risk evaluation *(2 – very rare, 7 – very often)*	☐	☐	☐	☐	☐	☐	☐
The accuracy of estimation *(2 – very low accuracy,* *7 – very high accuracy)*	☐	☐	☐	☐	☐	☐	☐
Please, estimate effectiveness of **Balance Scorecards method**:							
Effectiveness of BSC *(2 – very low effectiveness ,* *7 – very high effectiveness)*	☐	☐	☐	☐	☐	☐	☐

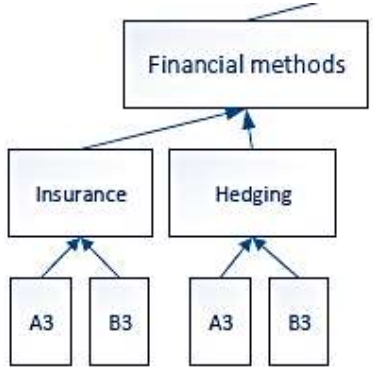


	1	2	3	4	5	6	7
Please, estimate the following characteristics of group **experts' review** (Delphi methods, interviewing, etc.):							
The level of understanding of organizational risks *(2 – very low awareness of risks,* *7 – very high awareness, complete understanding of risks)*	☐	☐	☐	☐	☐	☐	☐
The frequency of main organizational risks' revision *(2 – even one time per year,* *7 – the frequency is connected to number of projects)*	☐	☐	☐	☐	☐	☐	☐
The degree of team's cross-functionality (participants of analysis) *(2 – only representatives of risk management department,* *7 – representatives of all organization departments)*	☐	☐	☐	☐	☐	☐	☐
Please, estimate the following characteristics of group **risk structuring** (risk ranking, risk map, etc.):							
The level of understanding of organizational risks *(2 – the list of potential risks exists,* *7 – company understands all risks with probability of emerging)*	☐	☐	☐	☐	☐	☐	☐
The frequency of main organizational risks' revision *(2 – even one time per year,* *7 – the frequency is connected to number of projects)*	☐	☐	☐	☐	☐	☐	☐
The degree of team's cross-functionality (participants of analysis) *(2 – only representatives of risk management department,* *7 – representatives of all organization departments)*	☐	☐	☐	☐	☐	☐	☐



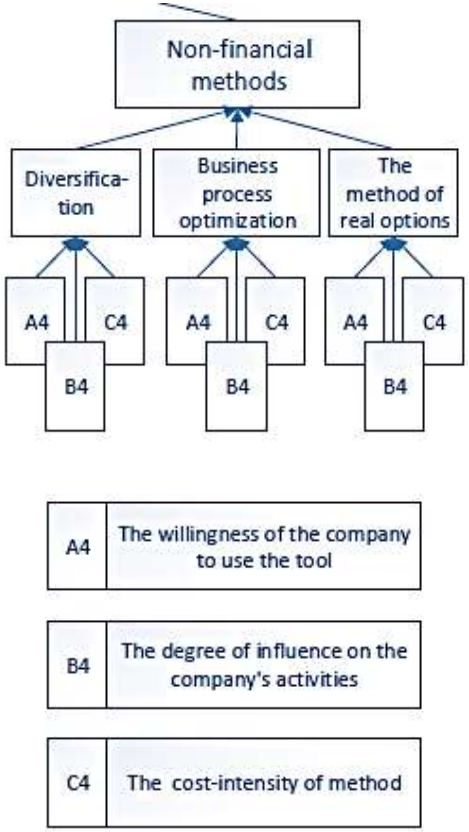
A2	The level of understanding of organizational risks
B2	The frequency of main organizational risks' revision
C2	The degree of team's cross-functionality

	1	2	3	4	5	6	7
Please, estimate the following characteristics of financial method – **insurance**:							
The share of projects under financial tool *(2 – insure only important, 7 – insure all projects)*	☐	☐	☐	☐	☐	☐	☐
The frequency of occurrence of the insured event *(2 – very rare, 7 – very often)*	☐	☐	☐	☐	☐	☐	☐
Please, estimate the following characteristics of financial method – **hedging**:							
The share of projects under financial tool *(2 – only important , 7 – all projects)*	☐	☐	☐	☐	☐	☐	☐
The frequency of occurrence of the insured event *(2 – very rare, 7 – very often)*	☐	☐	☐	☐	☐	☐	☐



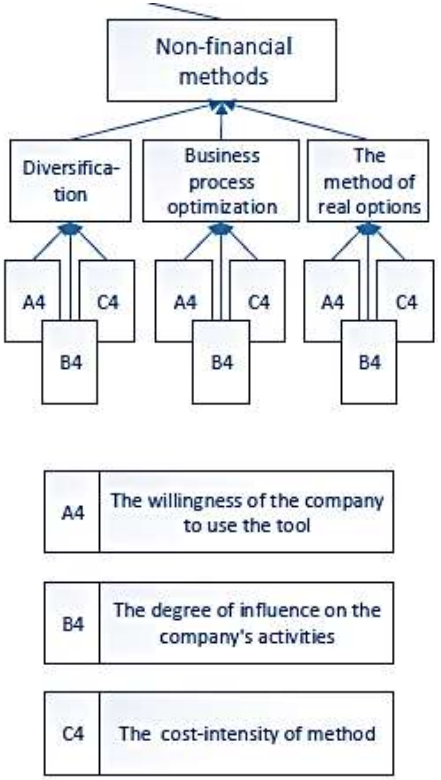
A3	The share of projects under financial tool
B3	The frequency of occurrence of the insured event

	1	2	3	4	5	6	7
Please, estimate the following characteristics of **diversification** (geographical, range of services, etc.):							
The willingness of the company to use the tool *(2 – very low willingness, require revision strategy, long process* *7 – very high willingness, management have a flexible system of decision-making)*	☐	☐	☐	☐	☐	☐	☐
The degree of influence on the company's activities *(2 – affects to a small degree ,* *7 – seriously alters the company's activities)*	☐	☐	☐	☐	☐	☐	☐
The cost-intensity of method *(2 – costs are extremely small,* *7 - high costs, it is necessary to attract funding)*	☐	☐	☐	☐	☐	☐	☐
Please, estimate the following characteristics of **business process optimization**:							
The willingness of the company to use the tool *(2 – processes are revised extremely rare,* *7 – the company regularly optimizes existing processes)*	☐	☐	☐	☐	☐	☐	☐
The degree of influence on the company's activities *(2 – affects to a small degree ,* *7 – seriously alters the company's activities)*	☐	☐	☐	☐	☐	☐	☐
The cost-intensity of method *(2 – costs are extremely small,* *7 - high costs, it is necessary to attract funding)*	☐	☐	☐	☐	☐	☐	☐



The method of real options is on the next page

Please, estimate the following characteristics of **the method of real options** as tool of agile management of companies' activities (the option to change the target market, the option of refusal, the option of improvement, etc.):							
The willingness of the company to use the tool *(2 – management performs a fixed list of obligations, ,* *7 – management has the flexibility to manage the company through strategic decision-making)*	☐	☐	☐	☐	☐	☐	☐
The degree of influence on the company's activities *(2 – affects to a small degree ,* *7 – seriously alters the company's activities)*	☐	☐	☐	☐	☐	☐	☐
The cost-intensity of method *(2 – costs are extremely small,* *7 - high costs, it is necessary to attract funding)*	☐	☐	☐	☐	☐	☐	☐



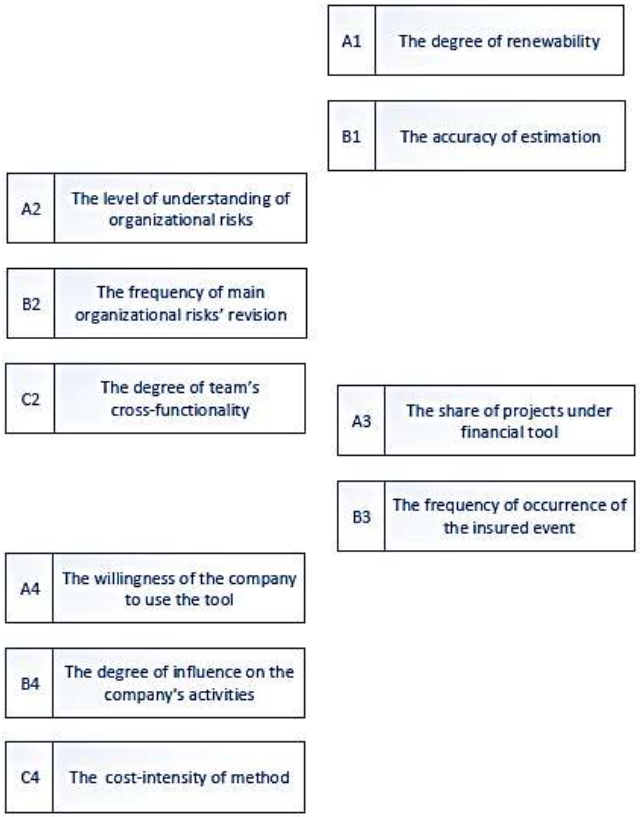
The last section of questions is your expert opinion in evaluating the significance of the elements of aggregated measures in the hierarchy on a scale,

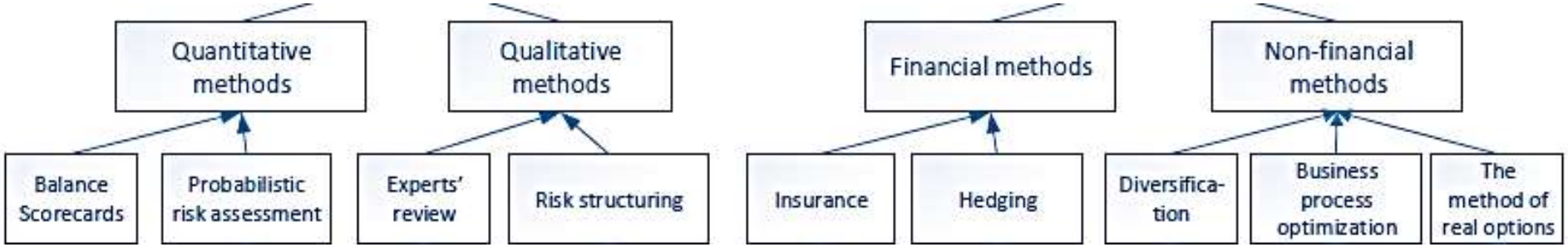
where 1 – low importance (low priority), 5 – high importance (high priority).

The answers for this section will help to determine:

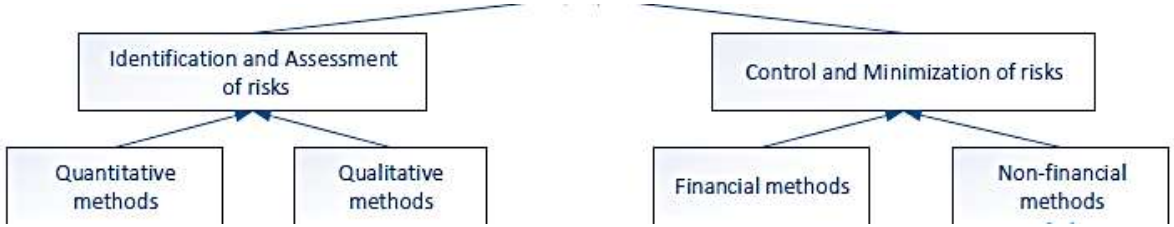
- The degree of importance of particular characteristic of the tools compared with others;
- The level of preference among tools within the group;
- The level of preference of methods types of risk management process;
- The degree of importance of the processes of risk management.

Evaluation of characteristics of importance	1	2	3	4	5
Please, estimate the following characteristics of **methods probabilistic risk assessment** :					
The degree of renewability	☐	☐	☐	☐	☐
The accuracy of estimation	☐	☐	☐	☐	☐
Please, estimate the following characteristics of **group methods of experts' review and risk structuring:**					
The level of understanding of organizational risks	☐	☐	☐	☐	☐
The frequency of main organizational risks' revision	☐	☐	☐	☐	☐
The degree of team's cross-functionality	☐	☐	☐	☐	☐
Please, estimate the following characteristics of **group insurance and hedging:**					
The share of projects under financial tool	☐	☐	☐	☐	☐
The frequency of occurrence of the insured event	☐	☐	☐	☐	☐
Please, estimate the following characteristics **group diversification, business process optimization and the method of real options**:					
The willingness of the company to use the tool	☐	☐	☐	☐	☐
The degree of influence on the company's activities	☐	☐	☐	☐	☐
The cost-intensity of method	☐	☐	☐	☐	☐





Level of tools' preference	1	2	3	4	5
Please, estimate the following **quantitative methods of identification and assessment of risks**:					
Balance Scorecards	☐	☐	☐	☐	☐
Probabilistic risk assessment	☐	☐	☐	☐	☐
Please, estimate the following **qualitative methods of identification and assessment of risks:**					
Experts' review	☐	☐	☐	☐	☐
Risk structuring	☐	☐	☐	☐	☐
Please, estimate the following **financial methods of control and minimization of risks :**					
Insurance	☐	☐	☐	☐	☐
Hedging	☐	☐	☐	☐	☐
Please, estimate the following **non-financial methods of control and minimization of risks**:					
Diversification	☐	☐	☐	☐	☐
Business process optimization	☐	☐	☐	☐	☐
The methods of real option	☐	☐	☐	☐	☐



Level of methods' preference	1	2	3	4	5
Please, estimate the following **methods of identification and assessment of risks**:					
Quantitative methods	☐	☐	☐	☐	☐
Qualitative methods	☐	☐	☐	☐	☐
Please, estimate the following **control and minimization of risks:**					
Financial methods	☐	☐	☐	☐	☐
Non-financial methods	☐	☐	☐	☐	☐

Level of significance of risk management	1	2	3	4	5
Please, estimate the following **risk management processes**:					
Identification and assessment of risks	☐	☐	☐	☐	☐
Control and Minimization of risks	☐	☐	☐	☐	☐

This section is the last one.
The researchers are very grateful for your time and your valuable answers!
Please, save the results in ".doc" or ".pdf" format and send it by mail to the organizer.

Appendix 2. APIS values of aggregated indices for Russian and Finnish practices

Note: In the following figures "Ru" states for Russian companies, "Fin" states for Finnish companies.

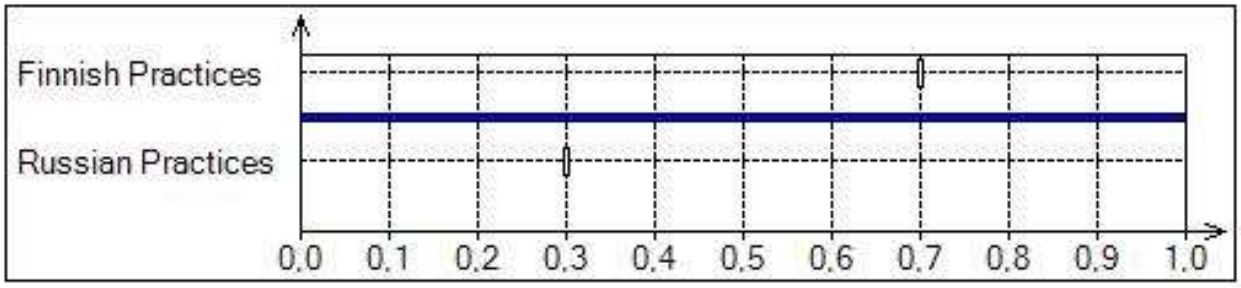


Figure A.2.1. Values for Russian and Finnish practices

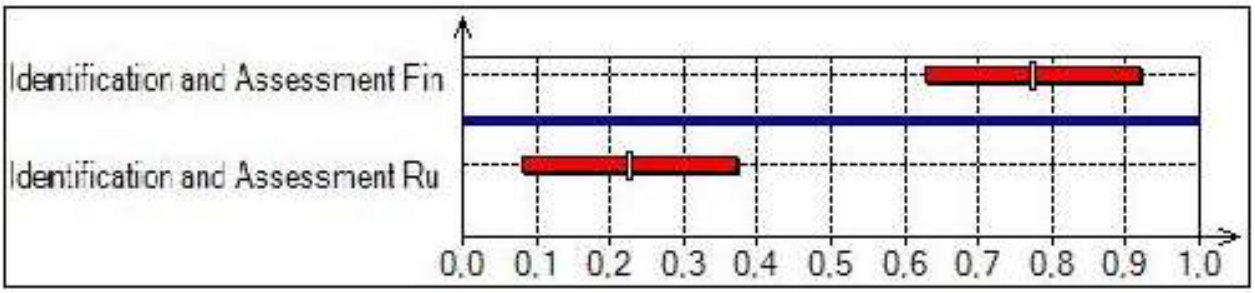


Figure A.2.2. Values for Russian and Finnish identification and assessment processes

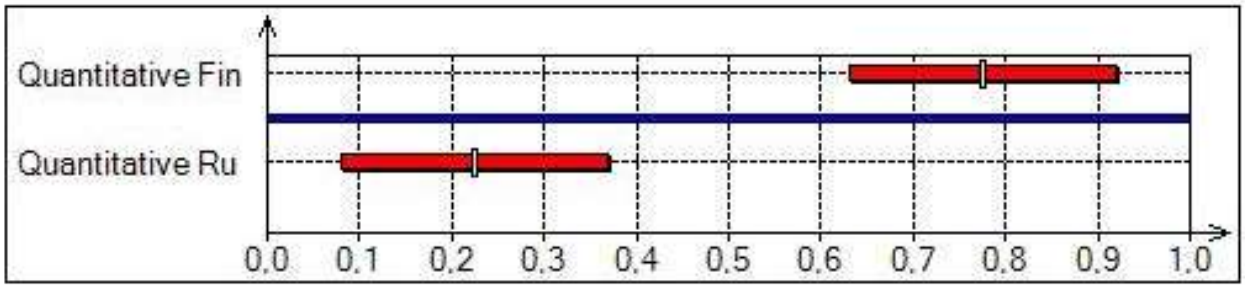


Figure A.2.3. Values for Russian and Finnish quantitative methods group

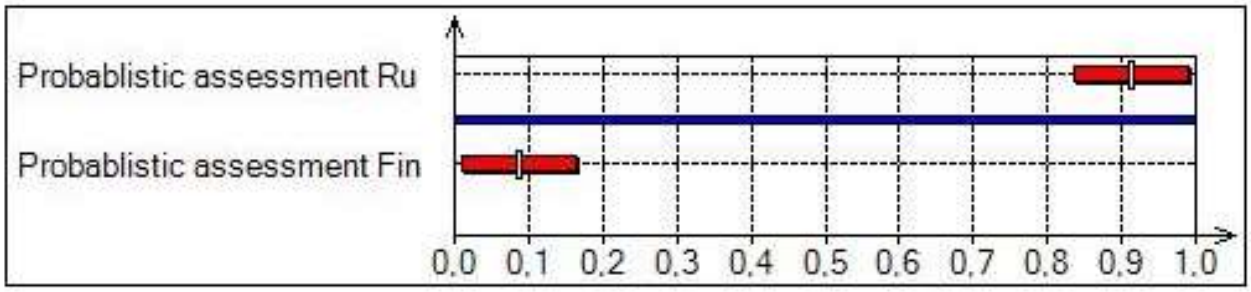


Figure A.2.4. Values for Russian and Finnish probabilistic assessment methods

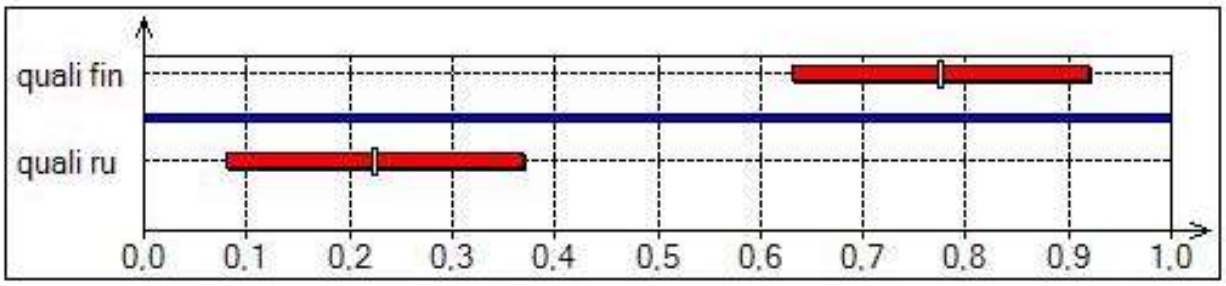


Figure A.2.5. Values for Russian and Finnish qualitative methods group

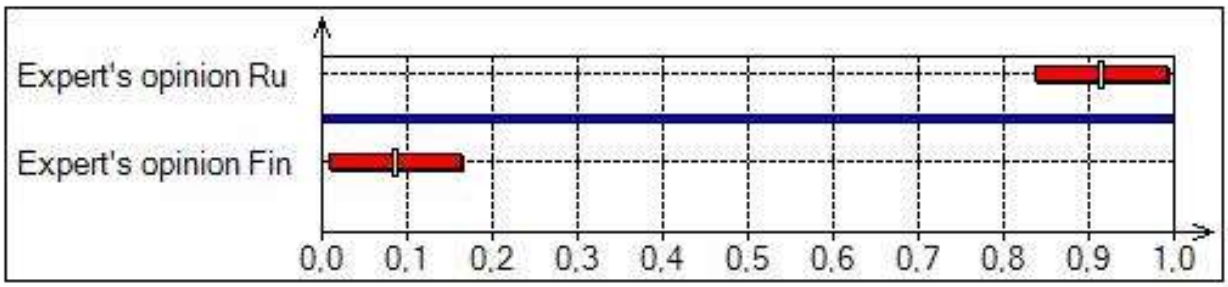


Figure A.2.6. Values for Russian and Finnish experts' opinion methods

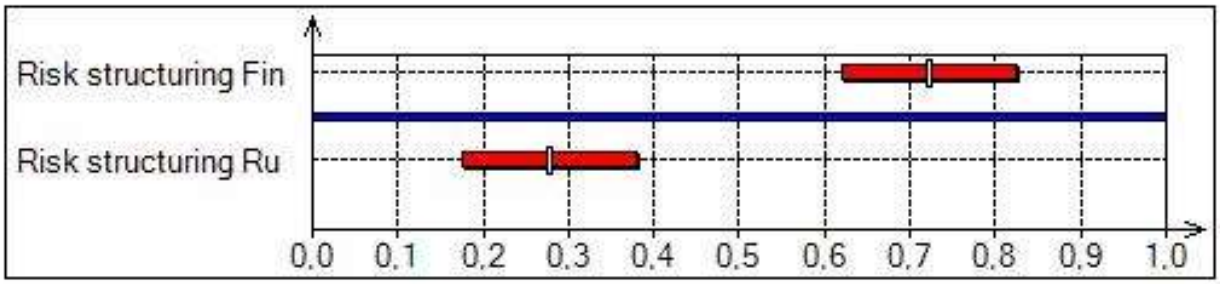


Figure A.2.7. Values for Russian and Finnish risk structuring methods

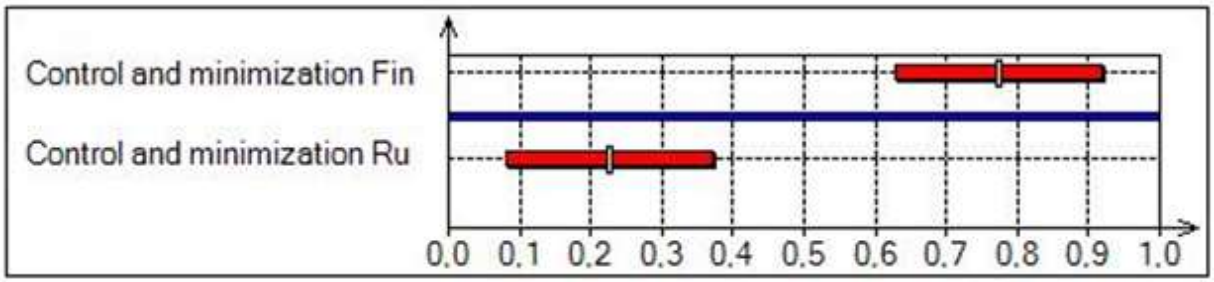


Figure A.2.8. Values for Russian and Finnish control and minimization processes

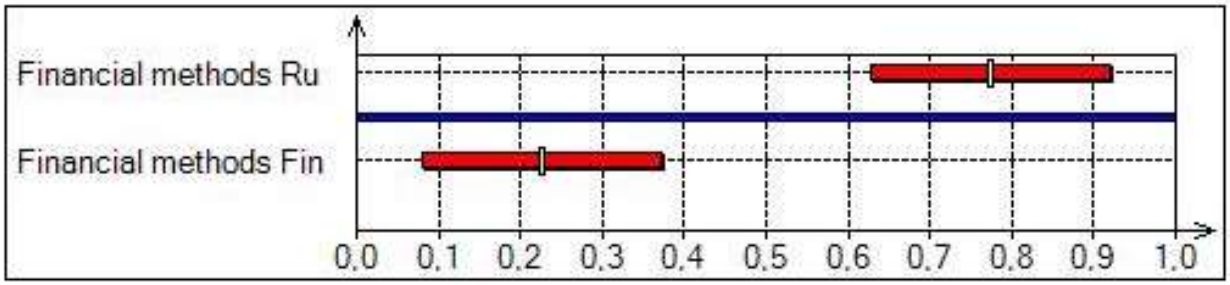


Figure A.2.9. Values for Russian and Finnish financial methods group

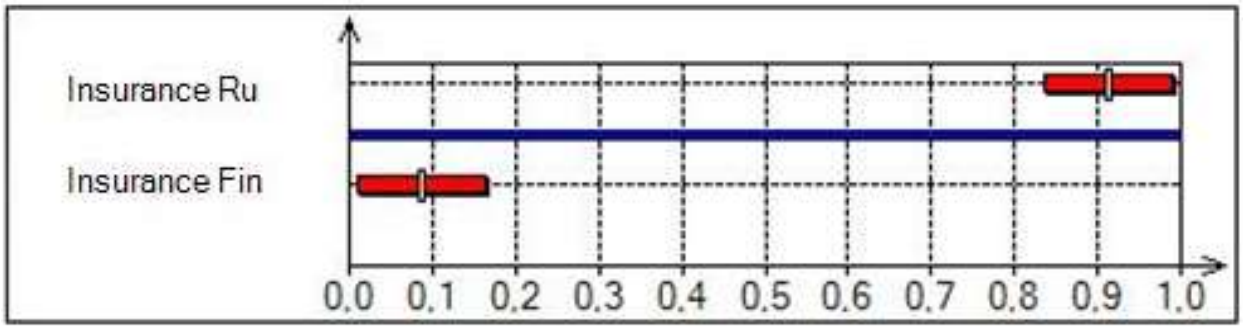


Figure A.2.10. Values for Russian and Finnish insurance method

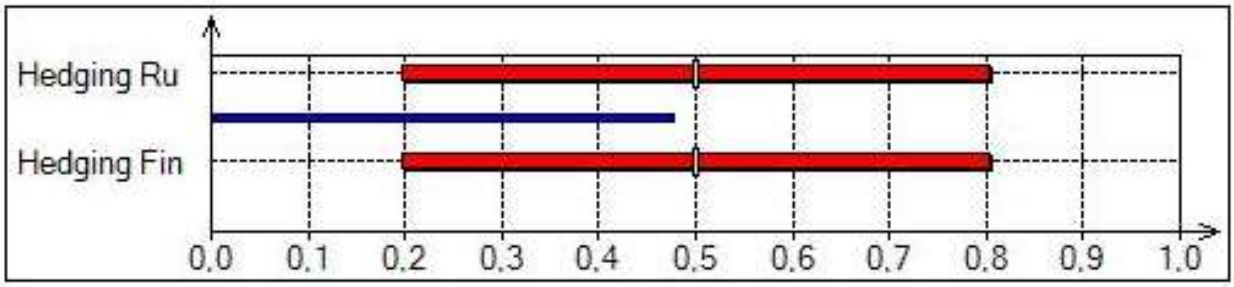


Figure A.2.11. Values for Russian and Finnish hedging method

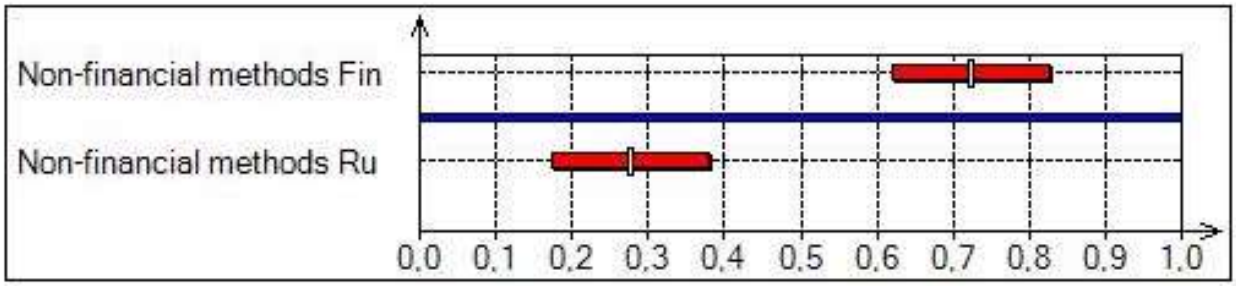


Figure A.2.12. Values for Russian and Finnish non-financial methods group

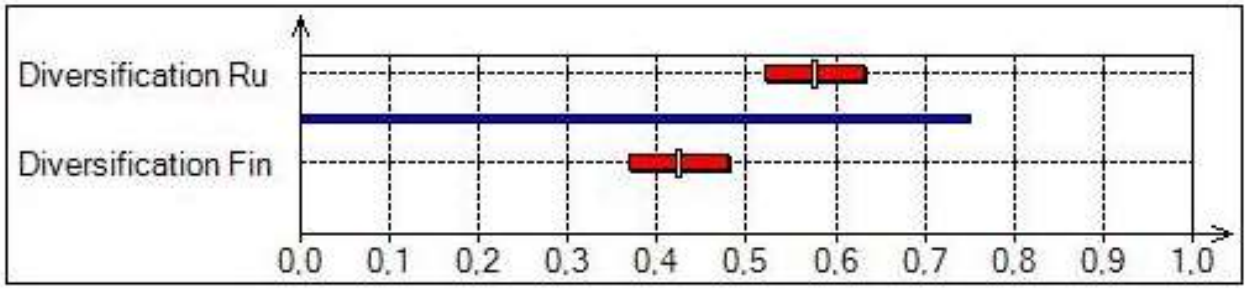


Figure A.2.13. Values for Russian and Finnish diversification method

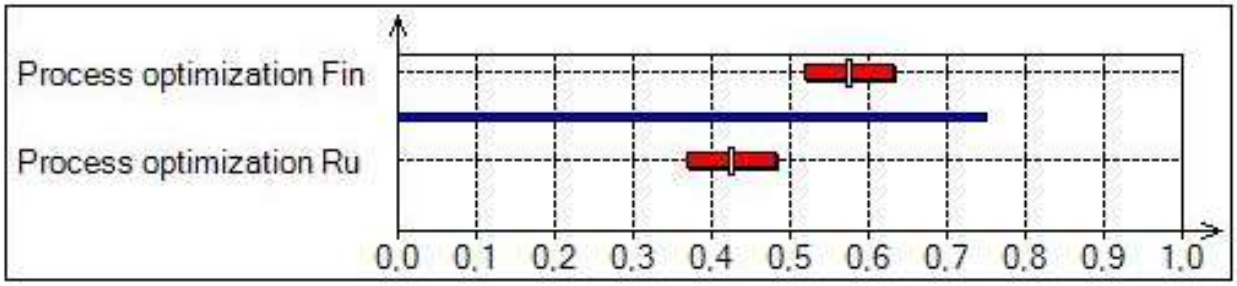


Figure A.2.14. Values for Russian and Finnish business process optimization method

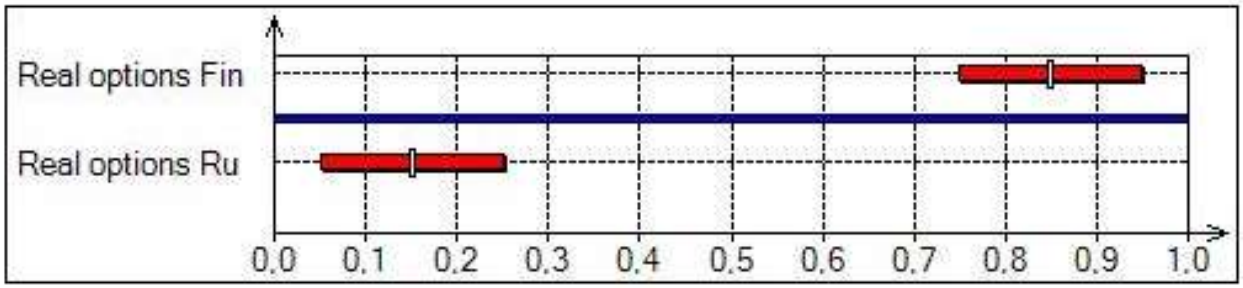


Figure A.2.15. Values for Russian and Finnish method of real option

Appendix 3. APIS values of aggregated indices for practices' groups

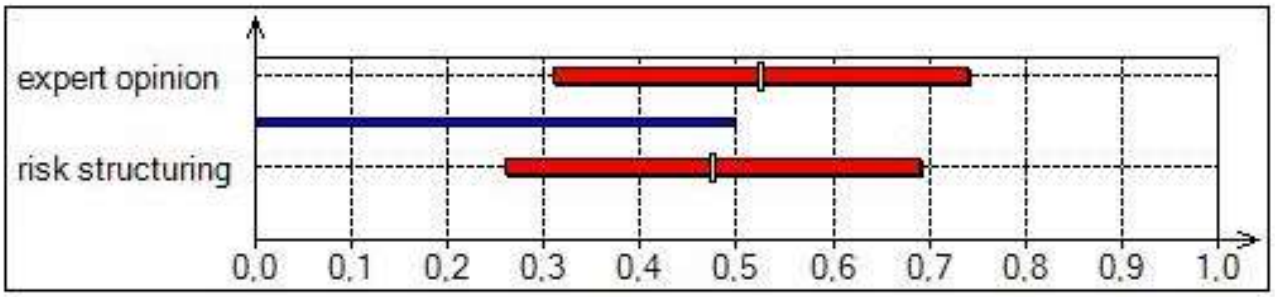


Figure A.3.1. Russian qualitative methods

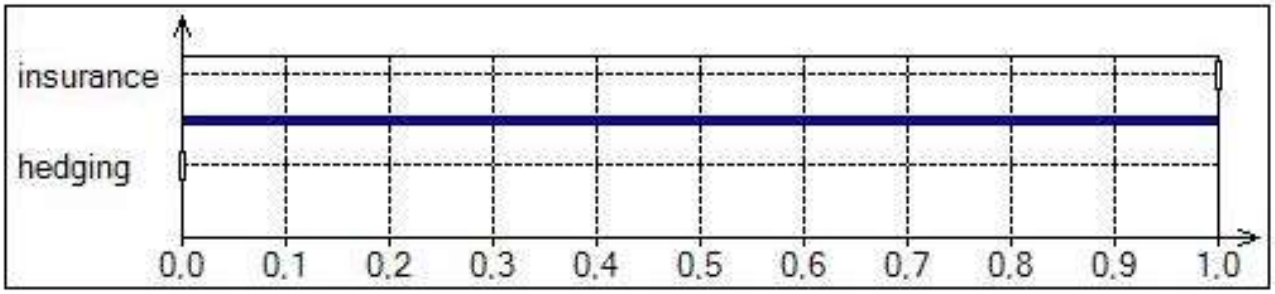


Figure A.3.2. Russian financial methods

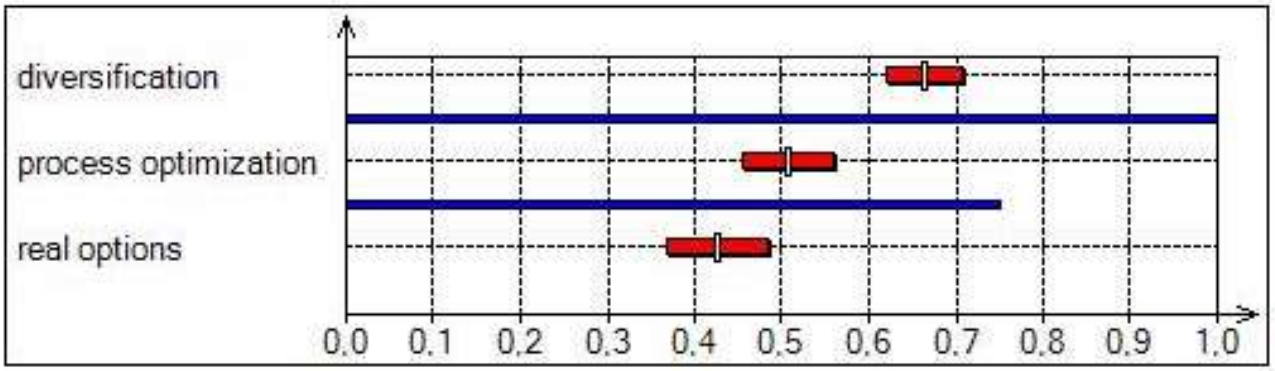


Figure A.3.3. Russian non-financial methods

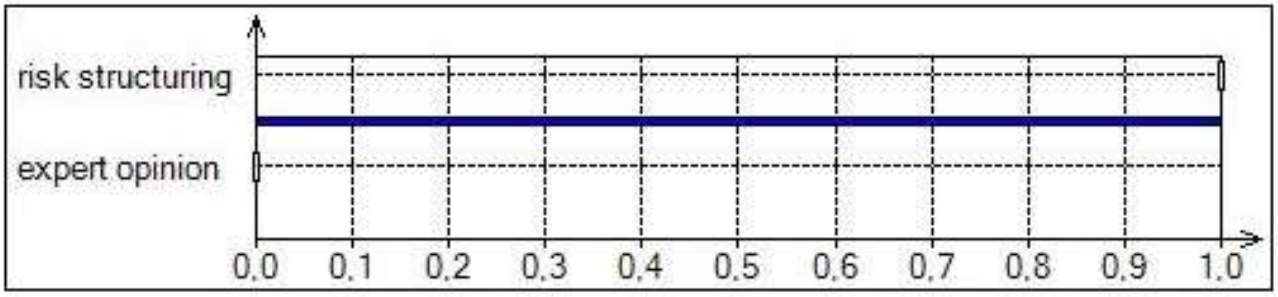


Figure A.3.4. Finnish qualitative methods

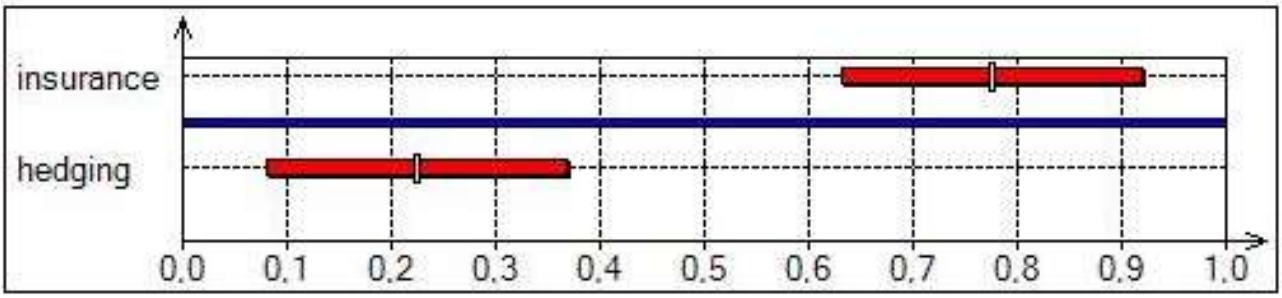


Figure A.3.5. Finnish financial methods

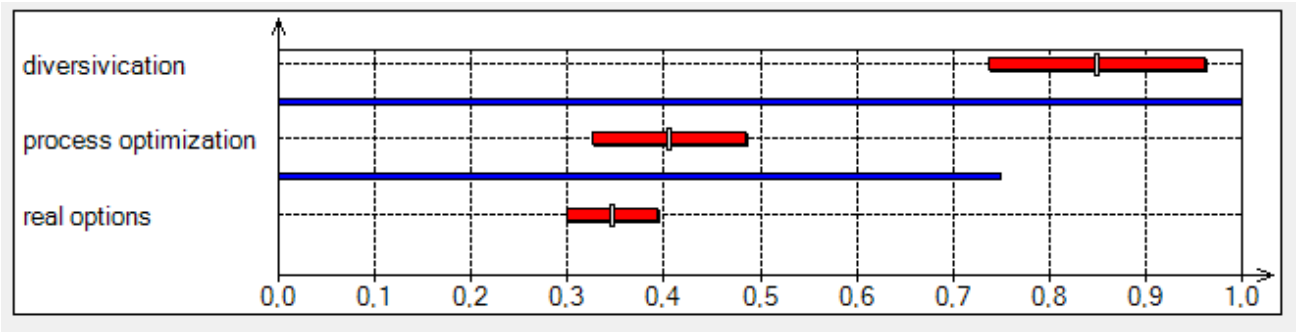


Figure A.3.6. Finnish non-financial methods