

RISK MANAGEMENT FOR ENTERPRISES

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Abstract. *New economy is a very new type of economy which is based on the global economy. This type of economy assumes that all enterprises – which participate on this form of economy – have almost unlimited access to computers, computer networks and medias of communication (internet, mobile internet, mobile phones,...). Similar to enterprises of the "old economy" enterprises of the "new economy" have to take care about their risks. But those risks are different and more complex. This paper will show necessary and efficient methods of risk management for enterprises of the new economy.*

Keywords: *risk management, financial risk, commercial risk, at administrative risk, potential loss, risk reporting.*

1. Introduction

What means “risk”?

“Risk” has a lot of definitions. In general we can say that risk is a description of an event which will cause a negative effect on us.

The word “risk” has its roots in:

- Latin: *risicare* – which means “to run the risk of..”;
- Ancient greek; *ρίζα* – which means root or rock;
- Greek: *ρίζικόν* – which means rock;
- Arabic: *rizq* – which can be seen as “by grace of God”;
- Etymology: *resecum* – which means something like riff.

So if someone tries to reach e.g. an aim of a project which cannot or might not be reached in a way as the person has planned we are talking about “risk”.

In a more positive way risk can be seen as a chance. For enterprises means the phrase “no risk – no fun” the same as “if you will not take some risk you will not have success on the market”.

If we consider all risks of an enterprise we will get:

- **risks caused by the market,**
if the business volume is highly dependent on market environment the risk is determined by the market and the market behaviour, e.g. products of a telecommunication company.

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- **risks caused by society,**
the productivity can be highly dependent on the behaviour of the society, e.g. strike, change of a government, cultural aspects.
- **risks caused by individuals,**
the quality of products and/or services are dependent on the qualification and knowledge of managers or other staff.
- **risks caused by technical systems,**
reliability and availability of technical systems which are used for producing products or offering services are very important.
- **commercial risks,**
availability and the delivery of components which are necessary for producing products or offering services determine the reliability of the delivery process.
- **financial risks,**
a bad performance of payments of customers can cause a low monetary liquidity of an enterprise.
- **administrative risks,**
a very important component is a false estimation of scenarios of the future, e.g. too low budget for research.
- **risks caused by events in nature,**
in past years risks caused by nature have been ignored. E.g. the “simple” event of volcanic eruptions can lead to delays or cancellation of flight.

2. Risk management. Catalogue of risk

Risks are a permanent part of business activities. So this permanent and controlled handling of risks cannot be avoided. In some countries the existence of a risk management system in a company/enterprise is mandatory.

If we think on risks we immediately associate it with the term “risk management” which means to handle risks in a proper way.

Risk management consist of 3 phases:

- **Identification** of risks.
In this phase all (possible) risks – which can happen e.g. to a project – have to be listed.
- **Quantification.**
In this phase a measurement has to be defined or developed in order to be able to quantify each risk. “To quantify” means to

associate a risk with a number in order to present a weight for the importance of the occurrence of each risk event.

- **Control.**

In the last phase a control mechanism has to be developed in order to be able to minimize the damage which will be caused by the occurrence of a risk. Risk limitation is a part of risk control.

Risk management can be seen as a kind of insurance for managers against unexpected risks which cause monetary loss.

3. Risk management requirements

An efficient risk management system consists of:

- **early-warning system,**
which is a system in order to detect upcoming risks and sends warning signals.
- **internal monitoring system,**
which is a system to store and evaluate all risks and their combinations – a business intelligence system focused on reports for potential risks.
- **risk controlling system,**
which is a system to get a “controlled” overview over risks and the probability that one or more of them will happen in order to minimize the loss or to prevent from any kind of damage.

A risk management system can be compared with a complex route guidance system (Table 1). This “route guidance system” has a similar functionality as we know from the systems we are using in order to find location *A* to location *B* by e.g. car.

Table 1

Comparison between risk management system and route guidance system

risk management system	route guidance system
catalogue of different potential risks	map of an area
early-warning system	module which “knows” when to change the direction, positions of radars, position of traffic jams
internal monitoring system	module which knows the position of the car
risk controlling system	module which calculates the optimal route depending on the actual position of the car

A risk management is not a system which only reports risks and the probability of a risk event. It has to be a decision support system for the management. It is a kind of “business intelligence” system or it can be seen as a part of a business intelligence system. Of course it has to be a decision support system for the complete enterprise.

A prerequisite for a risk management is to identify all already known risks and future risks which can have impact on the success of an enterprise.

As listed in a previous chapter the risks can be categorized and listed as follows:

- risks caused by the market;
- risks caused by society;
- risks caused by individuals;
- risks caused by technical systems;
- commercial risks;
- financial risks;
- administrative risks;
- risks caused by events in nature.

At the end a risk catalogue can be created which has to be used during the complete risk management process.

4. Determination of relevance of risk

After all risks have been identified the “degree of importance” has to be determined. It is necessary in order to get a “feeling” which risk is more or less relevant and might cause damage. If a risk is relevant depends on:

- probability of the event which causes the risk;
- extent of loss.

The extent of loss can be estimated based on

- statistics;
- experienced data;
- intrasector comparison;
- studies or similar models;
- subjective opinion.

Remark: The determination of the extent of loss based on subjective opinion is sometimes a doubtful method. Doing it in this way is acceptable if there are no other data available.

5. Potential loss

The potential loss shows the percentaged loss of own capital in case of an event which causes damage.

The calculation of the potential loss can be done by the method “value-at-risk”.

The value at risk can be defined as:

- possibility of negative deviation from expected value

or

- negative realisation of a financial value characterized as risk.

If the expected profit is a stochastic variable which is distributed according a normal distribution:

$$P \sim N(\mu, \delta),$$

the value at risk with confidence coefficient 99% is calculated by:

$$VaR_{99\%} = -N^{-1}(0.01) \cdot \sigma - \mu = 2,32634 \cdot \sigma - \mu$$

and the value at risk with confidence coefficient 95% is calculated by:

$$VaR_{95\%} = -N^{-1}(0.05) \cdot \sigma - \mu = 1,64485 \cdot \sigma - \mu.$$

6. Risk reporting

Risk reporting has a central importance for risk management and the functionality of risk management. Assumed is that all involved persons are willing to communicate. This means that all involved persons report potential risks and risks which could not really be handled in the past (maybe up to now).

Even single risks with low importance can grow up to one very important risk. In order to avoid this situation efficient observation criteria have to be defined.

The frequency of risk reporting has to be defined by the management of an enterprise. The frequencies of reporting can be different for different departments of the enterprise.

The implementation of a central risk manager can be taken into consideration by the management. He will be the central point for analysis of all risk reports. He will report aggregation of risks to the management.

7. Risk aggregation

Common method of risk aggregation is to add all amounts of damage (or loss). From mathematical point of view this can only be done in case all events happen at the same moment or defined time interval. In fact this will not be the case in reality.

If we consider two events (A and B) the single probabilities of those events are assumed as $P(A) = 0.05$ and $P(B) = 0.03$. If both events are independent the probability that A and B happens at the same time will be the product of $P(A)$ and $P(B)$.

$$P(A \cap B) = P(A) \cdot P(B).$$

If those events are not independent it can be very difficult to estimate $P(A \cap B)$. But $P(A \cap B)$ can be e.g. only 0.001 which is less than $P(A) \cdot P(B) = 0.05 \cdot 0.03 = 0.0015$.

So it will be more appropriate to estimate the expected loss using covariances of the risk factors. So the total risk can be measured and presented as variance of equity return:

$$\sigma^2 = \sum_{i=1}^n x_i^2 \cdot \sigma_i^2 + \sum_{i=1}^n \sum_{\substack{j=1 \\ i \neq j}}^n x_i \cdot x_j \cdot \sigma_{i,j}$$

with

x_i – quota of impact on own capital for risk factor i ;

σ_i^2 – variance of impact on own capital for risk factor i ;

$\sigma_{i,j}$ – covariance of impact on own capital for risk factors i and j

$$\sigma_{i,j} = \sigma_i \cdot \sigma_j \cdot \rho_{i,j};$$

$\rho_{i,j}$ – correlation of impact on own capital for risk factors i and j .

The formula is easy to understand but there are following problems which can be seen in practice.

- Risk based on a set of risk factors has to be measured as impact on the variance of equity return. Necessary information are in general not available in historical data.
- Correlation coefficients cannot be estimated because of unavailability of historical data.
- Quota of impact on own capital have to be calculated.

So finally most of the enterprises are on a very good way to implement risk management tools and methods. Estimating efficient and sufficient parameters will cause a lot of troubles because historical data are

not available. But this situation can improve if business intelligence systems are available and working.

8. Conclusion

Daily business is conducted by a lot of risks. Managing any kind of enterprise means also managing all risk on the way to success.

In order to be able to get appropriate information and take good decisions risk management has to be implemented in enterprises. Sometimes it is required by a national regulator. In any case performing risk management as an insurance against getting into big troubles caused by interfering events which can cause loss and damage.

If a manager knows all possible risks he will be able to handle them and to minimize a potential loss or a potential damage. And so in the end he will be able to increase the profit.

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