# Proposed risk control in strategic management project for Qomrud River in Iran

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***Abstract*—**One of the most important targets of the leadership is preventing and identification of the errors and frauds. The cost of the possible control measures must be compared with the probability of appearance of such fraud or error and the consequences. A sever flood was occurred on the 31 of March 2009 in the city of Qom, Iran, enhancing the climate change impacts of this event on the holly place of Hazerat Masome, situated in the bank of the Qomrud river with more than 1300 years last. It is shown that in some cases only 30 cm flood was enough to overturn the cars and caused dead. This will be presented with some interesting pictures taken by the author. Regarding climate changes the question was come to consideration that what is the most likely cost or duration for improving the river channeled and damaged infrastructures, or more usefully what budget or schedule do I need to ensure a 90% (or any other percentage) probability of success?. When you assign a cost or duration to an individual task within a project you are, in effect, trying to predict the future; you don't *know* what that task is going to cost or how long it will take until it has been completed. When you assign costs or durations you are simply making educated guesses as to what these will be. The evaluation system offers the leaders the required data necessary for the administration of that event. But it's still the job of those being in charge to create and launch such a system. Risk quantification is the process of measuring the probability of a risk and its impact on project objectives. Unlike risk assessment, risk quantification aims to produce verifiable numerical values. Risk quantification typically uses techniques such as Monte Carlo simulation and decision analysis to determine the cost and schedule contingencies that will be required, based on the levels of uncertainty (= risk) in the various components of a project; to determine probabilities of completing within a certain cost or by a certain date; to identify realistic project targets (cost, schedule, functionality, quality).

***Keywords*—** Climate changes, Monte Carlo simulation, risk quantification, uncertainty,

## I. Introduction

After the occurrence of the flood on the 31 of March 2009 in the city of Qom in Iran, the authorities were subjected to the decision of possibilities of whether to divert the river out of the center of the city or to make other improvement to the in suit damaged structures such as bridges and the canals and not divert the river [1, 2, 3, 4]. Then other alternative were come to Decision, called the combined approach i.e. Making small improvement to the infrastructures to make possible to pass part of the extreme flood and the rest should be diverted, but the diversion part can be postpone to the future time when the budget will be available.

The purpose of this paper comes from the basic need of every company to understand the status of their own complex information system and refers to making a decision regarding the control and safety which should be offered to these systems to obtain an objective vision of its current state. The owner of the system is able to determine the level of adhesion to the control targets [6, 9, 11, 15], whether as a self-evaluation, or as a reference related to a balance, or an independent cross – examination. For every product, one can specify [16, 121, 26, 29]:

• the identification of the process;
• the purpose declaration for each process;
• the declaration of possibilities (how to keep the process under control in order to see if the target has been achieved);
• the I.T. resources;
• the criteria of information, by specifying the importance of the process for which is applied;
• the critical factors of success;
• the target indicators;
• the performance indicators.

This evaluation tool can become for the company:

• a self-evaluation method which decides where is the company situated;
• a method for the use of the results of the evaluation in order to establish the targets for that company's future development, based upon the level wished to be reached, which dose not necessarily implies level 5;
• a planning method for the reach of the desired purposes;
• A method to establish the priorities in the development of the projects based on a classification of the projects and analyze of their benefits as compared to the costs. In many cases, the level indicators for the two evaluations, the position of the society and its desired position, will be separated on the graphic by a pause, a blank, measure which offers a visual impression of the quantity of work that must be done to close the space and achieve strategic targets [4, 7, 12, 16, 28]. This space must also be described in order to plan a series of projects which help the company achieve strategic targets in the data safety department and their control.

The process of analyze of the discrepancies will turn into a list of all the required actions to remove the discrepancy between the current state and the correspondent strategic purpose. This

Manuscript received July 30, 2009: Revised version received September 18, 2009. (Write the dates on which you submitted your paper for review as well as the revised version). This work was supported in part by the Qom University. Department of Civil Engineering (sponsor and financial support acknowledgment goes here).

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list of the discrepancies will be used in order to plan a suitable list of projects which will make these projects. There will probably exist a plenty to plenty kind of relationship in the drawing of the discrepancies and projects. Fig.1 shows the graphic representation of the discrepancies and targets

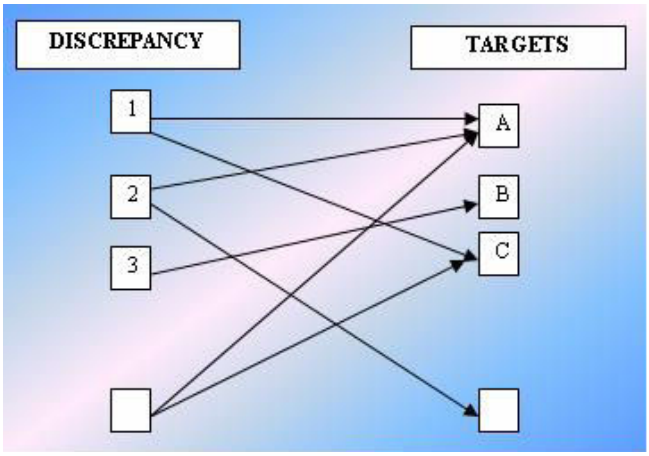


Fig.1- The graphic representation of the discrepancies and targets

## 1.1 Concept of risk

Risk is a concept that denotes the precise probability of specific eventualities. Technically, the notion of risk is independent from the notion of value and, as such, eventualities may have both beneficial and adverse consequences. However, in general usage the convention is to focus only on potential negative impact to some characteristic of value that may arise from a future event.

Risk can be defined as the threat or probability that an action or event will adversely or beneficially affect an organisation's ability to achieve its objectives. In simple terms risk is 'Uncertainty of Outcome', either from pursuing a future positive opportunity, or an existing negative threat in trying to achieve a current objective.

### 1.1.1 Definitions of risk

Risk is a Combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or ill health that can be caused by the event or exposure(s). Risk is the unwanted subset of a set of uncertain outcomes.

There are many definitions of *risk* that vary by specific application and situational context. The widely inconsistent and ambiguous use of the word is one of several current criticisms of the methods to manage risk. One is that risk is an issue, which can be avoided or mitigated (wherein an issue is a potential problem that has to be fixed now.) Risk is described both qualitatively and quantitatively. In some texts risk is described as a situation which would lead to negative consequences.

Qualitatively, risk is proportional to both the expected losses which may be caused by an event and to the probability of this event. Greater loss and greater event likelihood result in a greater overall risk.

Frequently in the subject matter literature, *risk* is defined in pseudo-formal forms where the components of the definition are vague and ill-defined, for example, *risk* is considered as an indicator of threat, or depends on threats, vulnerability, impact and uncertainty.

In engineering, the definition *risk* often simply is:

Risk = (probability of an accident) × (losses per accident) (1)

Or in more general terms:

Risk = (probability of event occurring) × (impact of event occurring) (2)

One of the first major uses of this concept was at the planning of the Delta Works in 1953, a flood protection program in the Netherlands, with the aid of the mathematician David van Dantzig. The kind of risk analysis pioneered here has become common today in fields like nuclear power, aerospace and chemical industry.

There are more sophisticated definitions, however. Measuring engineering risk is often difficult, especially in potentially dangerous industries such as nuclear energy. Often, the probability of a negative event is estimated by using the frequency of past similar events or by event-tree methods, but probabilities for rare failures may be difficult to estimate if an event tree cannot be formulated. Methods to calculate the cost of the loss of human life vary depending on the purpose of the calculation. Specific methods include what people are willing to pay to insure against death, and radiological release (e.g., GBq of radio-iodine).] There are many formal methods used to assess or to "measure" risk, considered as one of the critical indicators important for human decision making.

Financial risk is often defined as the unexpected variability or volatility of returns and thus includes both potential worse-than-expected as well as better-than-expected returns.

In statistics, risk is often mapped to the probability of some event which is seen as undesirable. Usually, the probability of that event and some assessment of its expected harm must be combined into a believable scenario (an outcome), which combines the set of risk, regret and reward probabilities into an expected value for that outcome.

Thus, in statistical decision theory, the risk function of an estimator $\delta(x)$ for a parameter $\theta$, calculated from some observables $x$, is defined as the expectation value of the loss function $L$,

$$R(\theta, \delta(\theta x)) = \int L(\theta, \delta(x)) f(x|\theta) dx \quad (3)$$

In information security, a *risk* is written as an asset, the threats to the asset and the vulnerability that can be exploited by the threats to impact the asset - an example being: Our desktop computers (asset) can be compromised by malware (threat) entering the environment as an email attachment (vulnerability).

The risk is then assessed as a function of three variables:

1. the probability that there is a threat
2. the probability that there are any vulnerabilities
3. the potential impact to the business.

The two probabilities are sometimes combined and are also known as likelihood. If any of these variables approaches zero, the overall risk approaches zero.

The management of actuarial risk is called risk management.

*1.1.2 Risk versus uncertainty*

Risk: Combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or ill health that can be caused by the event or exposure(s)

Uncertainty must be taken in a sense radically distinct from the familiar notion of Risk, from which it has never been properly separated. The term "risk," as loosely used in everyday speech and in economic discussion, really covers two things which, functionally at least, in their causal relations to the phenomena of economic organization, are categorically different. ... The essential fact is that "risk" means in some cases a quantity susceptible of measurement, while at other times it is something distinctly not of this character; and there are far-reaching and crucial differences in the bearings of the phenomenon depending on which of the two is really present and operating. ... It will appear that a measurable uncertainty, or "risk" proper, as we shall use the term, is so far different from an immeasurable one that it is not in effect an uncertainty at all. We ... accordingly restrict the term "uncertainty" to cases of the non-quantitive type.

A solution to this ambiguity is proposed in *How to Measure Anything: Finding the Value of Intangibles in Business* and *The Failure of Risk Management: Why It's Broken and How to Fix It* by Doug Hubbard:

**Uncertainty**: The lack of complete certainty, that is, the existence of more than one possibility. The "true" outcome/state/result/value is not known.
**Measurement of uncertainty**: A set of probabilities assigned to a set of possibilities. Example: "There is a 60% chance this market will double in five years"
**Risk**: A state of uncertainty where some of the possibilities involve a loss, catastrophe, or other undesirable outcome.
**Measurement of risk**: A set of possibilities each with quantified probabilities and quantified losses. Example: "There is a 40% chance the proposed oil well will be dry with a loss of $12 million in exploratory drilling costs".

In this sense, Hubbard uses the terms so that one may have uncertainty without risk but not risk without uncertainty. We can be uncertain about the winner of a contest, but unless we have some personal stake in it, we have no risk. If we bet money on the outcome of the contest, then we have a risk. In both cases there is more than one outcome. The measure of uncertainty refers only to the probabilities assigned to outcomes, while the measure of risk requires both probabilities for outcomes and losses quantified for outcomes.

## II. ADAPTATION TO CLIMAT CHANGES

Adaptation to climate changes (CC) is emerging as one of the main requirements in satisfying the environmental performance criteria of sustainability for buildings. CC impacts will require buildings to perform satisfactorily in varying environments, but this is a dynamic process that demands an ability to adapt performances in response to constantly varying conditions.
However, there are many issues involved such as what impacts climate change will have and how to balance occupant needs with considering the adaptive reuse and the relation of these two factors. The first step in identifying opportunities for adaptation of existing buildings is to meet the demands posed by CC and adaptation that addresses other change factors. Current sustainability assessments tend to be relevant to new construction, and focus on economic and environmental aspects of sustainability, and excluding social criteria.

### 2.1 Climate Change Impacts of Iran

Based on the research and assessment carried out during the CC Enabling Activity Project under UNFCCC, and using the scenarios proposed by IPCC, it is estimated that if the CO2 concentration doubles by the year 2100, the average temperature in Iran will increases by 1.5 - 4.5ºC which will cause significant changes in water resources, energy demand, agricultural products, and coastal zones.
The direct adverse impacts of CC include changes in precipitation and temperature patterns, water resources, sea level rise in coastal zone, flooding of rivers, agriculture and food production, forestry, drought frequency and intensity, and human health. The indirect adverse economic impacts are resulted from the response measures taken by the developed countries. Reduction in efficiency of thermal power plants, decrease in hydropower production resulting from lower water level in dams, damages to the infrastructures due to the river floods, destruction of coastal and offshore oil, gas and petrochemical installations in southern coastal zones caused by severe sea storms, are the significant impacts of CC. It is estimated that global warming causes an increase in electricity demand of about 20,000 MW in the next 50 years [1].

### 2.2 Climate Change Impacts of Qom City

As most of historic structures were building close to the river in some cities, they are potentially more damageable because of extreme floods.
On 31 March 2009 a very sever flood occurred in the Qomrud river which was very rare in its hydrological aspects, and resulted in some lost of life. One month later a seminar was held under responsibility of the author in the University of Qom to investigate different features of that. It was difficult to give it a certain return period, because of the climate changes. The author believes that similar event could happen even in the spring of dry years, which needs new method of investigation rather than traditional hydrological approaches. Fig. 2 shows old bridge called Alikhani Bridge (The same name of the author) nearby of of Hazerat Masome in Qom city, 100 years ago in dry season (a) as well as in wet season (b).

a) dry seasons.

b) wet seasons.
Fig. 2.Alikhani Bridge in Qom city 100 years ago-dray and wet season.

Fig. 3 a. shows the Qomrud river basins.
The very important matter is that even in the old time such damages were not recorded in the city of Qom, even the Panzdahe Khordad dam was not built in the upstream of the city which is built 80 kilometer far of that. After construction of the dam in 1394 the river nearly was without water and it was asphalted for traffic of the cars, and no one could imagine such flood occurrence. But it happened so sever with a lot of damages. As the dam spillways was not over as you can see in Fig. 4. Therefore this flood is only from downstream of the dam and not from the whole of the shown basin in Fig. 3. Now we can imagine if the dam was over flow what could happen there? One important reason is that in old time the river bank and bottom was wider as we can see in Fig. 2.

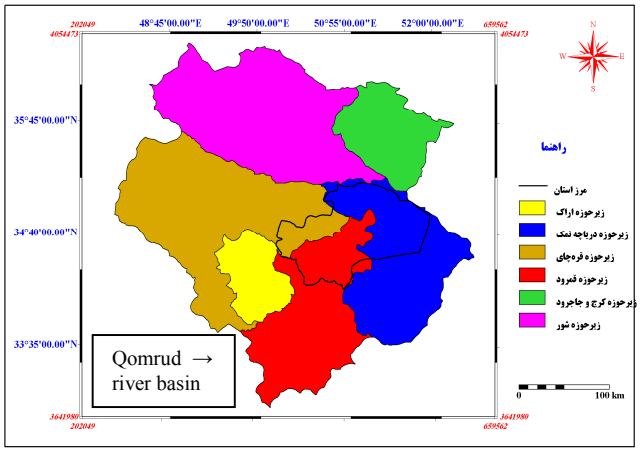


Fig. 3 Qomrud river basin


Fig. 4

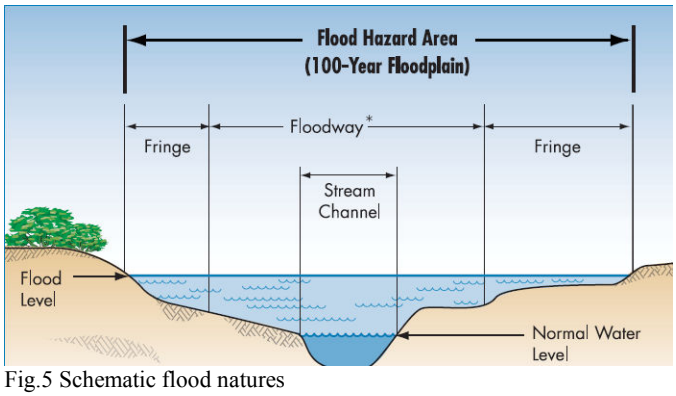


Fig.5 Schematic flood natures

Later because the city was rapidly developed without sound engineering studies, the bank of the river was occupied. Fig.5 shows Schematic flood natures. Recently even some new infrastructures were built. So suddenly with the flood they collapsed. 15 cm of this flood was enough for person removed and 60 cm for removing the cars. Fig 6 a and b respectively shows the under construction canal of the river only a few weeks before the flood. And Fig 6c shows on the day of flood.

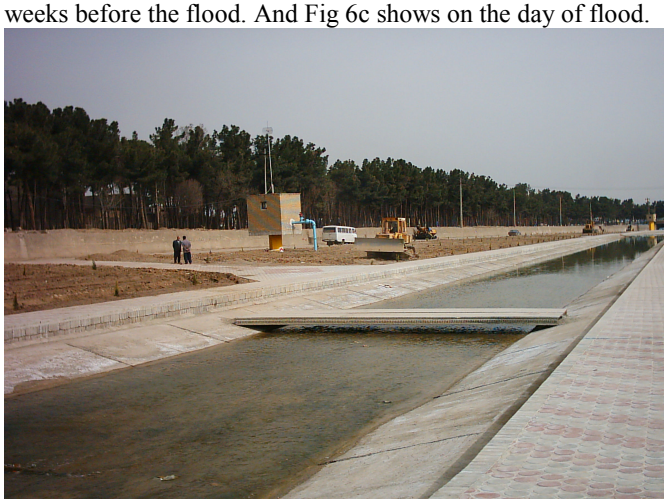

Fig. 6a

Fig. 6b

Fig. 6c

Fig.7a damages in Qom city close to holly place.

Fig.7b damages in Qom city close to holly place.

Fig.7c damages in Qom city close to holly place

Fig. 7d .damages in Qom city close to holly place (continued).

Fig.7e. damages in Qom city close to holly place (continued).

**2.3 Impacts of Climate Changes**

a. Temperature and Precipitation
b. Water Resources
c. Agriculture
d. Forestry and Land Use
e. Coastal Zones
f. Health
g. Energy and Industrial Processes

**2.4Why is uncertainty important?**

Statistical uncertainty is a critical factor in the reasonable estimation of financial loss from a probabilistic event such as an earthquake or typhoon and flood. Risk by definition is "uncertainty in an outcome". If the outcome of an event is known with certainty, there is no risk. The Risk Curve is constructed by taking the statistical mean and COV (Coefficient of Variation) of the event curve to calculate probabilities of each event contributing to a specific level of loss [26, 11, 19]. Fig.8. shows the intensity duration curve for Salarie station close to the Qom city.

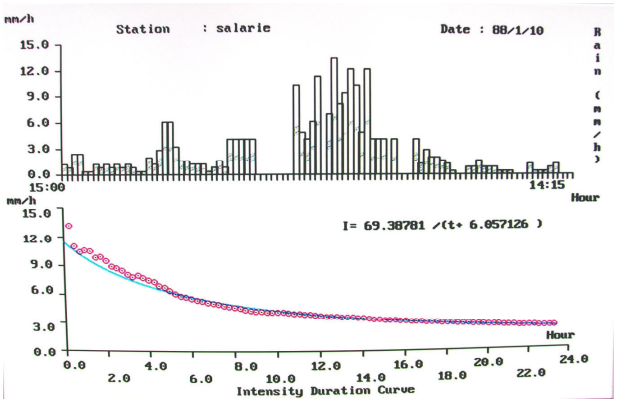


Fig. 8. Intensity duration curve for Salarie station.

## III. PROCEDURE FOR PROBLEM FORMULATION

**3.1** Risk **Management Outsourcing**

While large institutions can afford large risk management staffs, smaller firms frequently can not support onsite personnel with the range and depth of skills required to maintain an effective and robust risk management process that includes [8, 9, 24]:

• Risk monitoring
• Independent evaluation
• Model vetting
• Policy and guideline development
• Hedge fund / Money manager due diligence
• Quarterly reports to Board / Trustees /Investors the purpose in choosing the main projects is that of identification of those projects where one can have quick results and benefits Fig. 9. The most suitable candidates for quick benefits are usually those where the discrepancies are smaller and the closing price and the failure risks are also smaller, and the impact upon the benefits of the business is higher [10, 23].

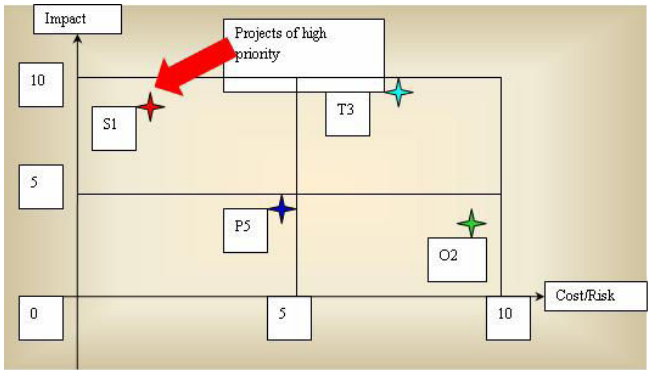

Fig.9-The position in relationship with the impact on the business and risk

The manner in which the priority is being attributed to the projects is through the identification of the rapid benefits that can be achieved. The best candidates for rapid benefits are usually those projects in which the gaps are smaller, where the costs to close a gap are as small as possible, where the risk of failure and the impact of the benefits on the business are higher. The projects could be evaluated for impact and cost/risk on a scale from 0 to 10 for each of these variables. The projects can be pointed on a graphic that can become a support tool for the decision of the manager, showing the relative impact and the costs/risks. The projects that have a bigger impact and a relatively small price are better candidates as well as quicker winners. In the recent years, the fact that there is a need for a reference for a proper frame of work for the safety and control in I.T. has become more evident for the moderators, users and suppliers of services. The effective administration of the I.T. has a major importance in the success and survival of the company.
For many companies, the data and the technology they have, represent the biggest values. Indeed. The information and the information systems are general for the entire company from the user platform to the local networks and those of bigger cover, to the servers of the user within the computers. Many companies recognize the potential benefits produced by technology [20, 27]. Yet, the successful companies understand this and administrate the associated risks with the introduction of new technologies. Thereby, the administration needs a good appreciation and a basic understanding of the risks and limitations within the I.T. in order to supply adequate controls.

## IV. Problem Solution

### 4.1 Risk Quantification Software

Integrated Business Compliance has wide experience in developing and selling software which allows a client to quantify the risks associated with all areas of the business. By quantifying these risks, the client gains the ability to reduce the attendant risks, either at source, or by implementing relevant training programmers.
By putting in process systems that run the business, Integrated Business Compliance will enable management to identify compliance breaches when they occur, and provide tools to deliver control in this area.
The benefits of this are that by reducing the risk, the client increases the amount of time for more productive work. This not only reduces costs, but increases productivity.
Within the financial services industry, by not breaching the rules, the client will not be subject to the "naming and shaming" that the FSA imposes on those businesses that are not performing satisfactorily. This will reduce the bad publicity and keep sales at a predictable level [14]. The consequent benefit of following the compliance rules is also that there will be enhanced customer satisfaction, and hence repeat business.
Administration has to decide how to reasonably invest in the safety and control of I.T. to balance the risks and the control investments in a very unpredictable I.T. environment. Even if the control and safety system of the data helps in the administration of the risks, it does not eliminate them.
In addition, the precise level of risk can never be estimated because there is always an uncertainty level. As a consequence, the administration must decide upon the level of the risk that can be accepted [17].
Judging from the level of toleration, especially when it is compared to the price, this can be a tough call of the administration. This is why, the administration needs a frame of work for the generally accepted practices of security and control of the I.T.'S in order to evaluate its current situation [9].
It is necessarily for the **users** of the I.T. services to be assured that true security and control exist. Yet, now-a-days, a good implementation of the I.T. control and data systems, whether they are commercial, nonprofit or governmental, is disturbed by confusion [22]. The confusion comes from the different manner of evaluation such as ITSEC, TCSEC, and ISO9000, which reveal the inner COSO evaluation controls. As a result, the users need a general settlement as a first step. Frequently, the controllers are following the steps in international standardization efforts, because they are continuously being faced with the need to prove their opinion over the inner control upon the administration. This is a very difficult job. ([9]). The business environment means competition, exchange and cost. The companies are being reorganized with the modernization processes and are using the I.T. investments to improve their competition position. The reorganization of the business, the correct size, the external sources, the authorization, are all changes that come to interact with the manner in which the companies and the governmental organizations work. These changes have and will continue to have other major

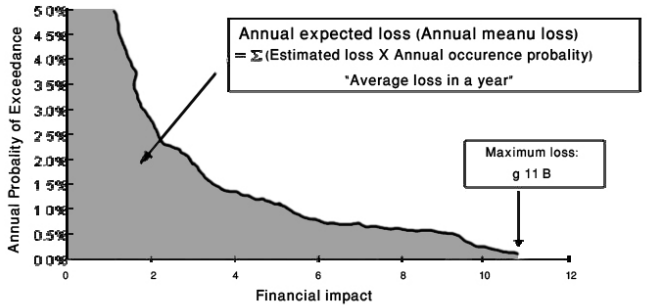


Fig. 10. Financial impact

impacts for the administration and the operational control structures within one company [26].
The accentual is on the achievement of the cooperative target and the price effectiveness implies an always growing trust in technology as a major element in most of the companies. The organizational automation of the functions, through its nature, dictates the embodiment of a much stronger control mechanism for computers and networks, both being based upon hardware and software. As far as the rapid change is concerned, if the managers, the I.S. specialists and controllers will be able to really fulfill their duties, their abilities will have to evolve as quickly as the technology and the environment. They have to understand the technology of the involved controls and their always changing nature. In order to achieve these changes, the development of the framework for the control of the I.T. target has a major importance for the effective progress in informational and technological control field [14, 16].
The degree of complexity of the projects is a factor that can influence the method of control as well as that of report. An evaluating system based on the four mentioned activities in the Cobit standard of I.T. evaluation is extremely useful or the project manager in order to control:
- the planning and organization processes;
- the acquiring and implementation processes;
- the assistance and support processes;
- monitoring processes.

### 4.2 The Risk Curve

The Risk Curve is the cornerstone for understanding the risk of a financial loss with catastrophic consequences to your company. The Risk Curve is a graphic representation of the probability of a specific loss associated with a specific return period, such as that expected once every 500 years, 100 years, 50 years, etc. With this knowledge as input, traditional business/financial models are used to evaluate tax and time-value of money issues connected with risk management actions. Based on individual estimates of impact from all probable events, the Risk Curve captures financial loss by measuring the uncertainty of an outcome [7, 24, 29]. This measurement of uncertainty is the basis for evaluating the effectiveness and risk of financial instruments and capital investment under consideration. (Fig.3)

### 4.3 Monte Carlo Simulation

**Monte Carlo simulation** is a technique for predicting the outcome of a project, particularly in terms of budget and schedule, by 'running' the project on a computer. By predicting the outcome in advance you can ensure that your budgets and schedules are realistic. When you assign a cost or duration to an individual task within a project you are, in effect, trying to predict the future; you don't *know* what that task is going to cost or how long it will take until it has been completed. When you assign costs or durations you are simply making educated guesses as to what these will be. These guesses can be stated explicitly in such forms as "*this task will probably take 4 weeks to complete, but it could be as little as 3 weeks or as long as 5 weeks*", or "*this task could cost anywhere from $30,000 to $40,000, with a most likely cost of $33,000*". If you want to be more realistic and take into consideration the fact that unexpected problems sometimes occur, you might want to say such things as "*this task will most probably take 4 weeks, but it could take as long as 5 weeks, and there is a 5% chance that it could take even longer*".
In a Monte Carlo simulation of a project you assign ranges and probabilities such as these to individual tasks [6, 10, 9]. The computer then 'runs' the project by assigning a randomly selected value to each cost or duration, based on your ranges and probabilities, and thereby arrives at an overall cost or duration for the project. By doing this a large number of times - typically several thousand - the computer builds up a statistical picture of the range of costs or durations that can be expected for the project as a whole. From this data you can then answer questions such as "*what is the most likely cost or duration for this project*", or more usefully, "*what budget or schedule do I need to ensure a 90% (or any other percentage) probability of success?*".

## V. Conclusion

The given method is addressed to the managers of project as well as to the economic unit's managers and assures I.T. evaluation method. The system offers through its flexibility the following advantages:
- it responds to the need of evaluation in keeping with a standard;
- the graphical interface offers facility in the use of this system as a work tool in the evaluation of the I.S. processes, although the pattern is complex;
- offers the administration the possibility to attribute resources in relation with the results of evaluation process;
- it provides a summary in regard with the individualization of the unit and its status in comparison with other units having the same profile;
- the way to establish the priorities of the projects;
- the possibility to evaluate a risk;
- the identification of the targets of the business and to determine the ones which are prior tar;
- the evaluation and the administration of the domains of high risk in the processes of the

business;
 the development of the action's plans in order to prevent and control the risks;
 it adds value in the design of an I.S. and in the maintenance of that control in order to make corrections;
 it evidentiates in a correct, transparent and easy to understand method, the sensitive areas in the maintenance and exploitation of I.S.;
 It evaluates the current status of the implemented Informatics systems.

Studies in this paper and experiences showed only 60 cm flood depth was enough in some cases to remove the cars and 15 cm for persons.

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