Financial Risk Vs Safety & health risk; should be assessed in a same way?

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Abstract

There are so many risks around us and we know properly this point that in order to protect ourselves from them and mitigation their bad consequences, an appropriate identification and evaluation are needed. But there is an undeniable fact through this risk management process. If we accept that each riskcontains a potential loss this potential loss could be divided in two main groups; financial loss and damage to health.This paper intends to depict that the most of risk related concepts in terms of calculating the risk rank, risk assessment tools .etc have been spread in order to prevent of financial losses compared with damage to human health or environment negative consequences which has influence on human health directly.

This paper proposes a new risk assessment for those risks which are going to mitigate safety and health damages against those risks are concern about only financial losses.

Keywords: Risk assessment, Safety risks, financial risks, potential losses, heath losses, financial losses

I INTRODUCTION

Risk is an uncertain event which may happen in future and has a severity or lead to a loss as an undesirable outcome.

The Oxford English Dictionary cites the earliest use of the word in English (in the spelling of risqué) as from 1621, and the spelling as risk from 1655. It defines risk as:

It is defined as a possibility of loss, injury, or other adverse or unwelcome circumstance and a chance or situation involving such a possibility (Oxford English Dictionary).

The history of risk may be traced to around 3200 BC in the Tigris Euphrates valley where a group known as Asipu are said to have served as risk analysis consultants for people involved in making difficult, uncertain or risky decisions. (Heinrich, 1959)

Theinsurance is one of the oldest strategies for handling risks since about 4,000 years ago in Mesopotamia when the code of Hamorabi formulized bottomery contracts containing a risk premium for the chance of losing ships and their cargo (NIOSH, 2002). Around 750BC ancient Greek also practiced bottomery to a certain degree.

In the 4th century BC and 1st century BC, the Greeks and Romans successfully observed casual relationships between disease and exposure.In 1792, Pierre Laplace developed the basis of modern quantitative analysis by calculating the probability of death with and without smallpox vaccination. (B.S.Dhillon, 2003)

It appears that the modern term risk management was first used in the early 1950s (Hammer, 2001). One of the earliest publication specifically concerned with risk management appeared in Harvard Business review in 1956 (Dhillon, 1986).

II DEFINITION OF THE RISK

The ISO 31000 (2009) /ISO Guide 73 definition of risk is the 'effect of uncertainty on objectives'. In this definition, uncertainties include events (which may or not happen) and uncertainties caused by a lack of information or ambiguity. It also includes both negative and positive impacts on objectives. Many definitions of risk exist in common usage, however this definition was developed by an international committee representing over 30 countries and is based on the input of several thousand subject matter experts.

The many inconsistent and ambiguous meanings attached to "risk" lead to widespread confusion and also

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mean that very different approaches to risk management are taken in different fields. (Hubbard, 2009)For example:Risk can be seen as relating to the Probability of uncertain future events. ("An Introduction to Factor Analysis of Information Risk (FAIR)", Risk Management Insight LLC, November 2006) For example, according to Factor Analysis of Information Risk, risk is: the probable frequency and probable magnitude of future loss. In computer science this definition is used by The Open Group. (Technical Standard Risk Taxonomy ISBN 1-931624-77-1, 2009)

OHSAS (Occupational Health & Safety Advisory Services) defines risk as the product of the probability of a hazard resulting in an adverse event, times the severity of the event.

In information security risk is defined as "the potential that a given threat will exploit vulnerabilities of an asset or group of assets and thereby cause harm to the organization". (ISO/IEC 27005:2008)

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. References to negative risk below should be read as applying to positive impacts or opportunity (e.g., for "loss" read "loss or gain") unless the context precludes this interpretation.

The related terms "threat" and "hazard" are often used to mean something that could cause harm.

A.Potential losses

There are different kinds of risks in practice which include following items:

- Economic risk, (ER)
- Health, Safety and Environment, (HSE)
- Information Technology and Information Security, (IT)
- Insurance (In)
- Business and Management, (B&M)
- High Reliability Organizations (HRO)
- Finance
- Security
- Societal Risk, (SR)
- Human Factors, (HF)

All types of risks which has been mentioned above could be divided in two main category based on the target of potential losses. All of risks mentioned can

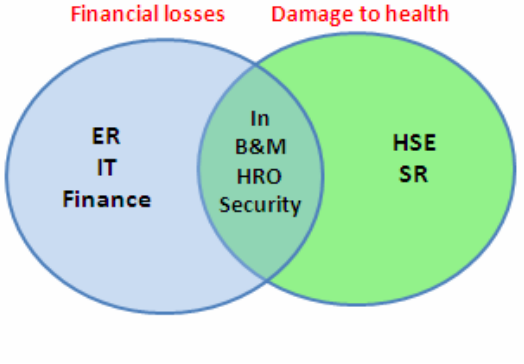

Figure 1: the categories of potential losses

threaten the financial assets or health assets thus each risks can have financial losses or health losses. Fig 1 shows the categorizing of potential losses.

B.Risk management process

Tummala (Tummala, 1994)have proposed a comprehensive and systematic approach consisting of five core elements as shown in Figure 2 and referred to as the risk management process (RMP). The RMP begins with identifying the potential risk of an organization of a project together with the associated project mission, aims, and objectives; these will of course form an integral part of the business strategy. The resulting strategy arising from the integration of all these elements, overall corporate, would constitute the driver of the RMP methodology. Risk identification, risk measurement, and risk assessment together constitute the basic set of tools required to facilitate the identification of potential risk factors, enumeration of the associated consequences and their severity, and the assessment of the likelihood of occurrence of theseconsequences, as a step towards developing the corresponding risk profiles that are necessary for the accomplishment of project objectives. In the risk evaluation phase, the project managers/decision makers should be able to evaluate several decision alternatives based on the risk profiles generated byusing risk identification, risk measurement and risk assessment phases and Choose the most appropriate course of action to contain and control theidentified risks. The final phase – risk control and monitoring – serves toenhance a review of project progress; also to facilitate a periodic communicationof pertinent information on project accomplishment status to seniormanagement and other personnel who are involved with the project execution.Furthermore, if any deviations relative to established targets are found,corrective actions can be considered in this phase.

Thus the RMP approach asshown in Figure 2 provides a comprehensive and coherent approach forManaging risks and uncertainties associated with a given project. Furthermore,it is a practitioner-oriented methodology which can be integrated into the riskmanagement modelingprocess to evaluate projects. (Tummala, 1994)

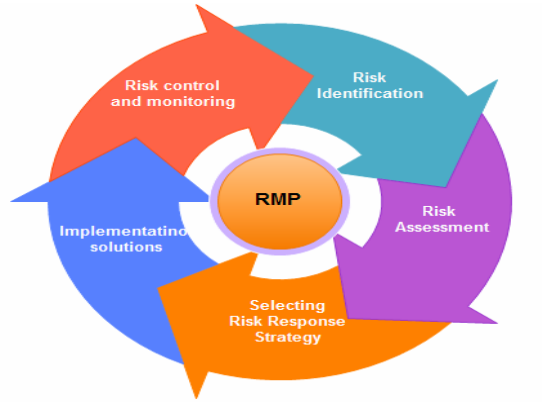

Figure 2- Risk Management Process

III FINANCIAL ASSETS VERSUS HEALTH ASSETS

Risk types indicate that all risks havepotential losses and these potential losses could be divided in two main categories; financial losses or health losses. Therefore the main purpose of risk management process is preventing ofhappening such losses, but how? The risk responses should be cost effective, means the cost of preventive actions should be less than cost of happening losses and for this purpose Risk assessment is needed. Risk assessment measures the probability of happening losses and then determining the severity of happening cost according to formula that has shown below:

Risk=Probability*Consequence

In other words we always ask ourselves howthe possibility of happening a bad event is, and if the answer was high we go to find a suitable solution for avoidance of its consequences, otherwise it our risk management is not cost-effective enough. But the big question is: this procedure is still true in case of safety risks which the heath assets are in danger?

Tummala (1995) proposed a pattern to determine the magnitude of safety risks whish has indicated in table 1 (A risk management model to assess safety and reliability risks , 1995)

Table 1- Hazard severity

Hazard consequences	Hazard severity	Category
Death, system loss, or severe environmental damage, etc.	Catastrophic	1
Severe injury, severe occupational illness, or major system or environmental damage, etc.	Critical	2
Minor injury, minor occupational illness, or minor system or environmental damage, etc.	Marginal	3
Less than minor injury, occupational illness, or less than minor system or environmental damage, etc.	Negligible	4

Some samples of manmade catastrophe

As indicated in the table of previous part, even one death in an event can cause a catastrophic consequences, here some of predictable manmade catastrophe has presented in fields of; aviation, Coal mines, explosions and industrials safety problems around the word.

A. Aviation accidents

This table shows the aviation accidents from 1974 until 2003 in the word and their casualties that reach even to 538

deaths in Tenerif in 1977. If existence of a death in an

incident maycausea catastrophe so what about 538 deaths in an event?(Annex13, 2007). Table 2 indicates the number of casualties in aviation accidents.

No	Description	Country	Year	Number of Casualties (death)
1	Tenerife airport disaster	Tenerife	1977	583
2	Japan Airlines Flight 123	Japan	1985	520
3	1996 CharkhiDadri mid-air collision	India	1996	349
4	Turkish Airlines Flight 981	France	1974	346
5	Air India Flight 182 bv	Ireland	1985	329
6	2003 Iran Ilyushin Il-76 crash	Iran	2003	302
7	Saudia Flight 163	Suadi Arabia	1980	301
8	American Airlines Flight 191	USA	1979	273
9	Korean Air Lines Flight 007	Korea	1983	269

Is this sort of incident absolutely unpredictable? Or the low percentage of likelihood causes ignorance the severity

of happening only because doing preventive action is not cost-effective with such a low probability? Is it fare that judging on probability more than consequence?

B. Coal mine Accidents

The statistics of worst coal mine accidents during last century around the word indicates that the number of casualties in this sort of events even reach to 1569 lives losses in china 1942. (Shangbao, 2010)

Table 2-Coal mine accidents

No	Description	Country	Year	Number of Casualties (death)
1	Benxihu Colliery explosion	China	1942	1549
2	Courrières mine disaster	France	1906	1099
3	coal mine (Mitsubishi Hōjō, Kyūshū, Japan, 15 December 1914)	Japan	1914	687
4	coal mine Laobaidong colliery coal dust explosion, (Datong)	China	1960	682
5	Mitsui Miike Coal Mine disaster- (Mitsui Miike, Ōmuta, Fukuoka,)	Japan	1963	458
6	Senghenydd Colliery Disaster (Senghenydd)	Wales	1913	439
7	coal mine (Coalbrook)	South Africa	1960	437
8	coal mine (New Yubari, Yūbari, Hokkaidō)	Japan	1914	422
9	coal mine (Bergkamen)	Germany	1946	405
10	Oaks Colliery, (Barnsley)	England	1866	388

C. Explosion accidents:

The Lagos armoury explosion was the accidental detonation of a large stock of military high explosives at a storage facility in the city of Lagos, Nigeria on 27 January 2002. The fires created by the debris from this explosion burnt down a large section of Northern Lagos, and created a panic that spread to other areas. As people fled the flames, many stumbled into a concealed canal and were drowned. The explosion and its aftermath are believed to have killed at least 1,100 people and displaced over 20,000, with many thousands injured or homeless. The government of Nigeria launched an enquiry, which blamed the Nigerian Army for failing to properly maintain the base, or to decommission it when instructed to do so in 2001. (BBC world, 2002). Now the big question is: Should the large stock of military high explosives store inside city?

Table 4-explosion accidents

No	Description	Country	Year	Number of Casualties (death)
1	Ammunition plant with facilities explode at Smederevo, outskirt of Belgrade	Serbia	1941	1500
2	Ammunition trucks explode near a train station (Cal)	Colombia	1956	1200
3	Japanese battleship Mutsu, at Hashirajima harbour	Japan	1943	1121
4	Lagos Armoury Explosion,	Nigeria	2002	1100
5	Bombay Docks Explosion (Bombay)	India	1944	800
6	Iraqi military plant with facilities explode at Al Hillah, Babil	Iraq	1988	700
7	Explosion of the Caterina Costa, port of Naples	Italy	1943	610
8	Ufa train disaster	Soviet Union	1989	575
9	Texas City Disaster	USA	1947	570
10	San Juanico Disaster	Mexico	1984	510
11	Port Chicago disaster (Port Chicago)	USA	1944	322
12	PetroChina Chuandongbei natural gas field explosion, Guoqiao, Kai County, Chongqing	China	2003	234

Similar cases have presented in below of following page;

D. Industrial accidents

The Deepwater Horizon drilling rig explosion refers to the April 20, 2010 explosion and subsequent fire on the Deepwater Horizon semi-submersible Mobile Offshore Drilling Unit (MODU), which was owned and operated by Transocean and drilling for BP in the Macondo Prospect oil field about 40 miles (60 km) southeast of the Louisiana coast. The explosion killed 11 workers and injured 16 others; another 99 people survived without serious physical injury. It caused the Deepwater Horizon to burn and sink, and started a massive offshore oil spill in the Gulf of Mexico; this environmental disaster is now considered the second

Table 5-Industrial accidents

No	Description	Country	Year	Number of Casualties (death)
1	Bhopal disaster	India	1984	16000
2	Benxihu Colliery explosion,	China	1942	1549
3	Texas City Disaster	USA	1947	570
4	San Juanico Disaster	Mexico	1984	510
5	Illegal Tashan mine collapsed with mud-rock flow at Xiangfen, Linfen, Shanxi	China	2008	254
6	PetroChina Chuandongbei natural gas field explosion, Guoqiao, Kai County, Chongqing	China	2003	234
7	El Cobretalling dam and cooper mine failure by earthquake	Chile	1965	220
8	Vila Socó oil spill fire (Cubatão, São Paulo)	Brazil	1984	210
9	General Mining Union Kinross gold mine fire, Transvaal	South Africa	1986	177
10	Piper Alpha oil rig disaster	North sea	1988	167
11	Aberfan landslide disaster	Wales	1966	144
12	Buffalo Creek Flood / Pittston Coal Company dam failure	USA	1972	125
13	Alexander Kielland wreck, oil platform destroyed by high wind, Ekofisk oil field	Norway	1980	123
14	Vaal Reef gold mine elevator failure, Orkney, Klerksdorp	South Africa	1995	105
15	Ocean Ranger oil platform sinking, Grand Banks of Newfoundland	Canada	1982	84
16	Kukje Rubber Manufacturing plant No.2 fire at Busan	South Korea	1960	68
17	KTS Composite Textile factory fire, at Chittagong	Bangeladesh	2006	65
18	St. Helena gold mine explosion by methane gas, Welkom, Free State	South Africa	1987	63
19	Shahe iron mine caught fire, Hebei	China	2004	60
20	Bright Sparkler fireworks factory explosion at Sungai Buloh	Malaysia	1991	56
21	Four-story Rosamor Furniture ameublements plant fire, Lissasfa, Casablanca	Morocco	2008	55
22	Lapua ammunition factory explosion	Finland	1976	40
23	West Gate Bridge collapse (during construction), Melbourne	Australia	1970	35
24	IndustriaMirafe Toy Factory blast, Ibi, Alicante	Spain	1968	31
25	AZF factory explosion (chemical), Toulouse	France	2001	29
26	Flixborough disaster	England	1974	28
27	Phillips Disaster (Pasadena, Texas)	USA	1989	23
28	Hindustan Petroleum Refinery fire	India	1997	22

largest in U.S. history, behind the Dust Bowl. (New York times, 2010)

Gas and oil leakage, explosion in refinery or petrochemical complex, and many other cases that are indicated below tell us the magnitude of those risks which directly dealing with human heaths are extremely more important that those risks which have a merely financial losses.

IV MONETARY VALUE OF DEATH IMPACTS

The National Safety Council makes estimates of the average costs of fatal and nonfatal unintentional injuries to illustrate their impact on the nation's economy. The costs are a measure of the dollars spent and income not received due to accidents, injuries, and fatalities. It is

another way to measure the importance of prevention work. (Nantional safety council of America)

In cost estimation of each accident categories has assumed that all accidents just had death toll and has been avoided of considering any other consequences.

Average Economic Cost per Death, Injury, or Crash, 2009	
Death	$1,290,000
Nonfatal Disabling Injury	$68,100
Property Damage Crash (including nondisabling injuries)	$8,20

The figures indicate that the costs of safety accidents are the range of $ 3,870,000 to $33,540,000,000.

Conclusion:

All risks have a potential loss and this potential loss can be divided in two main group; financial losses or health losses regarding financial assets and health assets. After dividing risks in two main categories we conclude the way of assessing of each category must be different with another. If in dealing with financial risk we ask the probability of happening first and then the consequence of risks, in case of safety risks we just only ask ourselves is such an event possible or not? And if the answer was YES, we must take the preventive actions because as it mentioned just 1 death in an event can cause a catastrophe.

Fig 3,4,5,6 show the cost estimation of accidents in each section of aviation, coal mine, explosion and industrial.

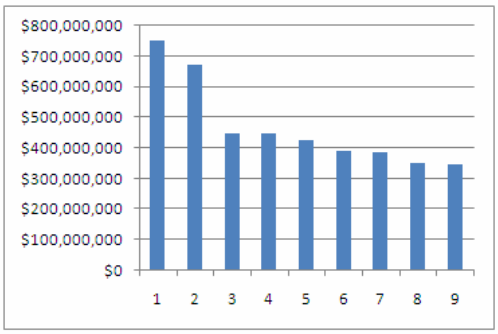

Figure 3- Cost estimation of aviation accidents

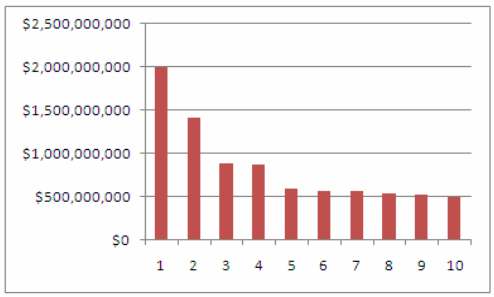

Figure 4- Cost estimation of coal mine accidents

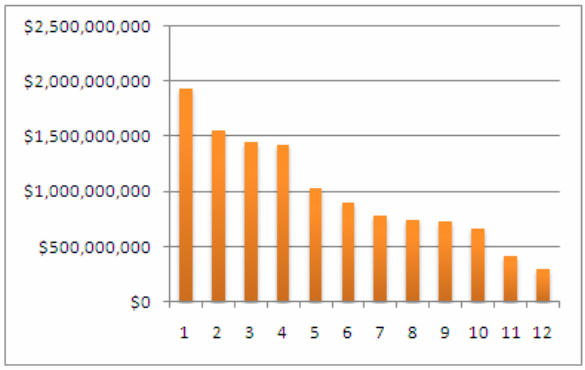

Figure 5- Cost estimation of explosion accidents

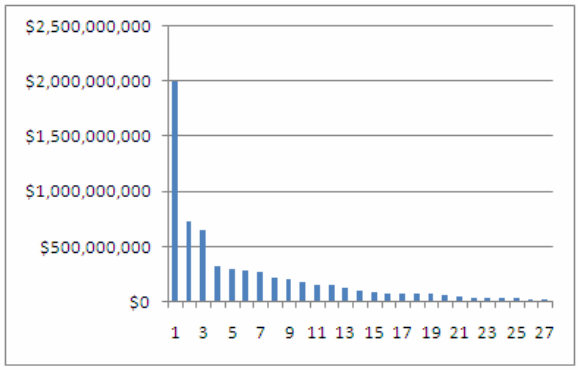

Figure 6- Cost estimation of industrial accidents

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