MEASURABILITY AND OBJECTIVITY OF CRISIS MANAGEMENT EFFECTIVENESS

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ABSTRACT

Measurability effectiveness of crisis management is a complicated matter. Its necessity is determined defense resources spent on prevention, education and rescue equipment components. Contribution indicates the direction and the way it could move in a serious effort and calculation efficiency systems and their comparison between countries. Paper is focused on objectivity of measurement in general as a result of own reflections towards this topic.

KEYWORDS

objectivity, crisis management, effectiveness

INTRODUCTION

The purpose of rescue profession is to save endangered human lives, animals, property and preventive action that can prevent incidents. Whether for emergencies natural character, or which causes a person to their activities. Specific natural events such as floods, earthquakes, forest fires, fires Peter Carey, hurricanes, tornadoes, tidal waves tsunamis, volcanic eruptions, landslides, etc.. Anthropogenic incidents related to the operation of industrial technology in the chemical industry, engineering industry, nuclear, thermal power plants or traffic accidents, in particular chain of car accidents, truck accidents or cars carrying hazardous materials [1], [2]. Rescue systems available to many specialized techniques for extinguishing, salvaging, transporting rescue, extinguishing agent and the like. Members of rescue teams are trained professionals or volunteers who specialize in carrying out different activities that are generally connected with saving human lives and material values. Rescue units are organized in various state or local voluntary structures which in the legislative environment is a crisis management system. Different countries have different names, and crisis management structure of each country differ. Have a common objective and functioning of many components that make up the backbone of the entire system. Besides rescue teams is a system formed by the central institution of the Ministry or institution which falls under the Ministry. The whole crisis management is legislatively anchored in the Constitution, laws, decrees regulations and other legal standards that the operation of these institutions directly or indirectly regulate.

Every state in its constitution declares the protection of human life as the highest priority and value. However, preventive measures for the implementation of activities that they can limit the occurrence of incidents or mitigate the devastating consequences of incidents are often difficult from a financial perspective. Governments are now highly indebted countries usually are not willing to invest in safety and prevention as much as your system requires. The problem resides provability system 's effectiveness and efficiency of the use of financial and material funds. Aim of this paper is to promote the importance of a functioning whole crisis management, including emergency services in order to propose a way of measuring the effectiveness of crisis management system in each country. The purpose is to find an objective criterion of comparability crisis management between different countries.

CRITERIA OBJECTIVITY REQUEST

1.1 Degree of subjectivity (objectivity)

Objectivity of any analytical outputs is determined by two major factors: the accuracy of entries and the number and severity of errors in the following procedure.

The risk assessment process consists of at least five phases. Each phase involves several steps that have different time and expertise needed. And at every step of the investigator or team of investigators can commit mistakes. These errors can result from inattention, fatigue, lack of training, time pressure or otherwise induced stress. Errors can also occur due to incorrect choice of the methods used or due to the failure of technical equipment. However, the most common is human fault-failing. Every individual is different, and each is subject to different influences social environment of the area, and its own mental processes. Therefore, the human factor is the most common cause of all the failures. On the risk assessment process usually involved a team of people who cannot be replaced by any machine. It is essential to avoid mistakes especially in the early stages. Outcomes of the preparation phase enter a phase of risk identification. Error in the phase of risk identification can have a big impact on total output and thus can fundamentally distort the result. Outcomes of identification then enter risk analysis, input output analysis is risk assessment etc. and to take measures.

Whatever incorrect input has impact on risk assessment and severity of further misconduct may

increase. If another error occurs in the following sequential steps or stages, there is a cumulative inaccuracies output. As long as the error is not removed it will affect then whole analysis results. Ultimately, then can be taken incorrectly or at least ineffective measures to eliminate the assessed risks.
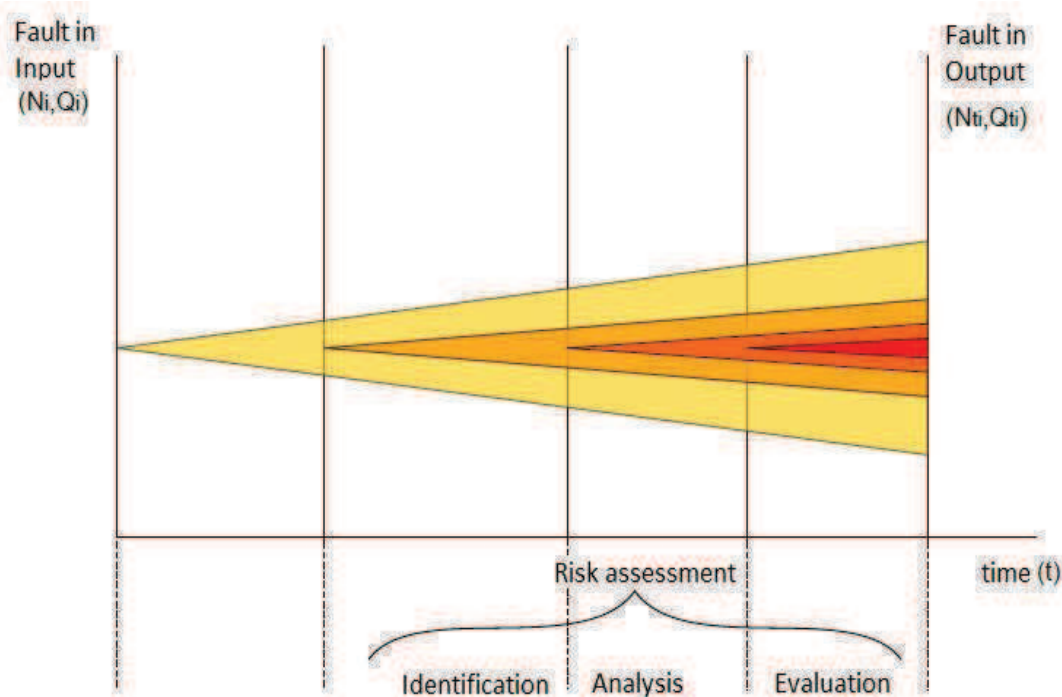

Fig.1 Input faults influence on output results [1]

Fig.1 Shows the accumulation of inaccuracies due to errors that occurred in the preparation or in various stages of risk assessment and their impact on outcomes. Each type of error is defined by its abundance (Ni), the severity of the error (Qi) and the time dimension.

Fig.1 says that any mistake can be seen as a force that spreads over time like a wave. This wave either extinguished or from it may turn into a tsunami. Minor error not have any effect on outcomes, a fatal error may grossly distort the results. This variant is expressed graphically in time expanding pulse. The chart resonates importance preparatory phase, where any error appear then difficulties in the risk assessment starts. The graph in Fig. 1 shows a serious error. At each stage one error will be added.

Degree of subjectivity is the exact proportion of estimates and measurable inputs. This Addiction is a simplified in Fig. 2.
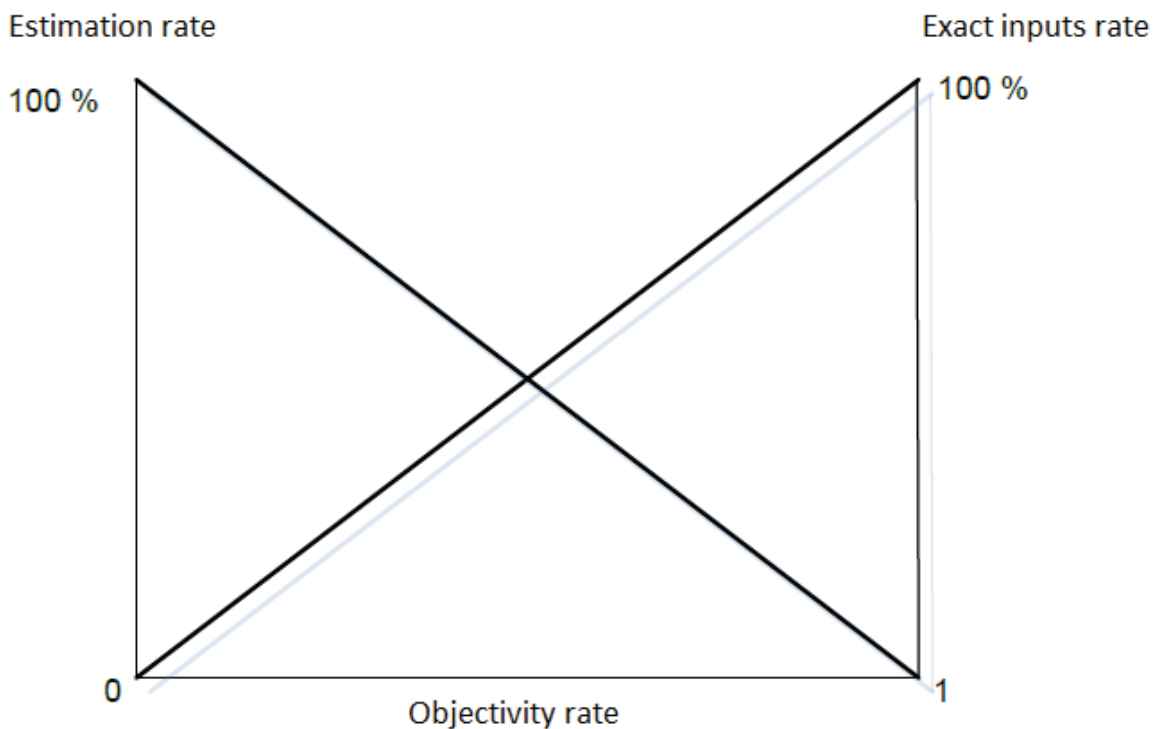

Fig. 2 Relation among estimations and exact inputs toward objectivity rate on input [1]

The figure above (Fig.2) shows, the greater the share expert estimates, the higher degree of objectivity.

Blue point in the picture is marked in the event that in the assessment process, the risk of 20% of exact inputs, expert estimates 30% and 50% lay estimates. Characteristic Blue Point is located on the front of square drive. This page will contain such points, which means that the input is represented by the exact inputs, expert and lay estimates at the same time. Final point Location should be in the interest of objectivity as closest to the basement as possible. Base square drive can be termed party objectivity. Ideally, the final point was located in the lower left corner, which features 100% share of exact inputs. Analogously rear wall square drive (0, y, z) is a partly subjective, whereas a neutral party estimates the proportion of exact inputs.

Objectivity estimation depends on the ratio of lay and expert estimates. Degree of objectivity to the growing share of expert estimates of the total number of estimates entering the process. But lay estimate may not be necessarily imprecise.

Estimate lay person can perform with good intuition and its estimate can be surprisingly accurate.

Subjective feeling of insecurity that estimate is correct, however, still remains and where lay the estimates is very significant. This uncertainty is reduced profession expert forensic expert or other specialist who should be able to gain the trust and dispel doubts about the accuracy of the estimate.

Objectivity input data is directly proportional to the share of exact inputs. Exact input can be particularly statistical data quantitative nature. As data have important qualitative in nature, they can be conveniently converted into numerical values, giving them semi-quantitative nature. These data regardless of whether they are expressed numerically or descriptively must have a real basis.
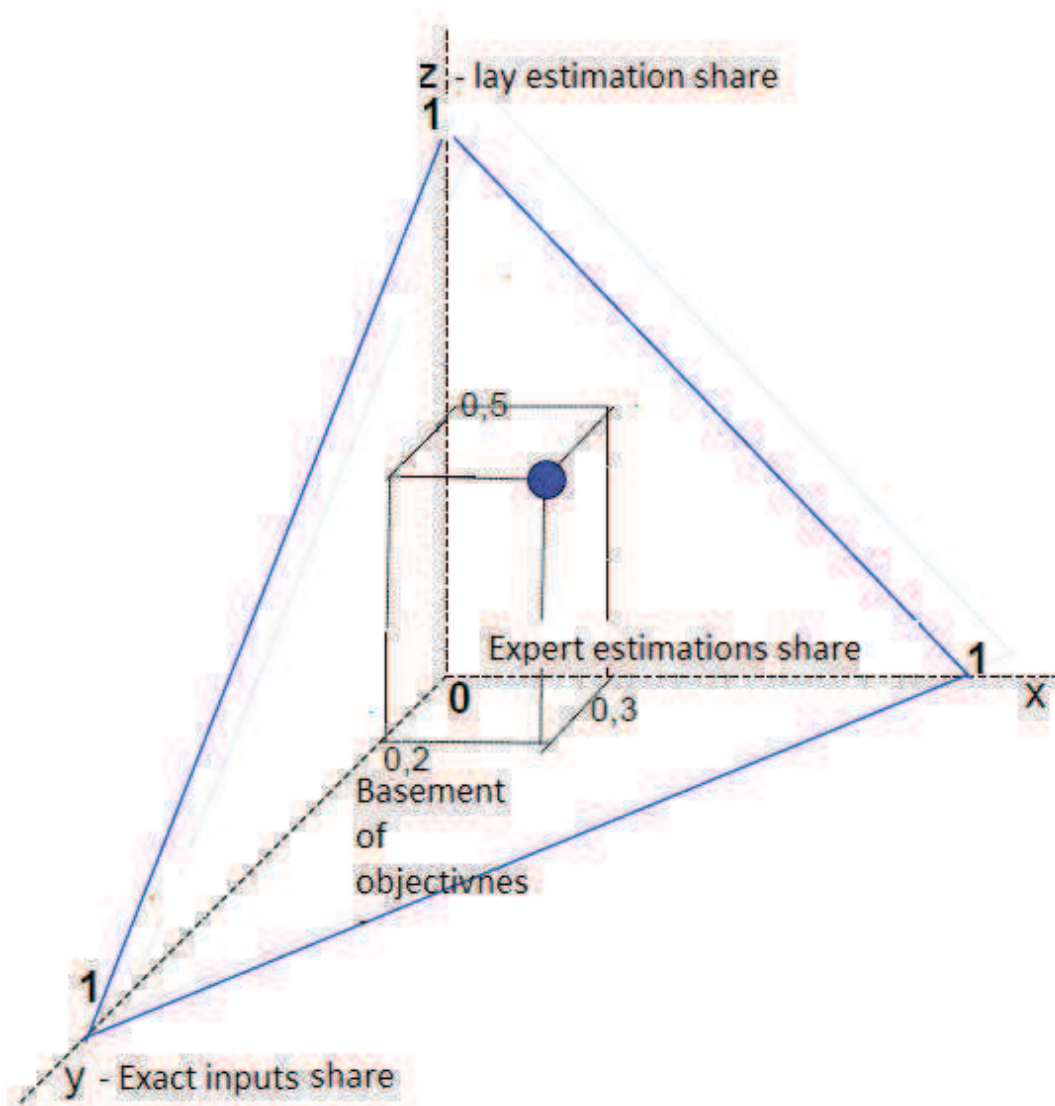

Fig. 3. Unit squaring of objectivity. 3D expression of the degree of objectivity inputs [1]

Fig. 3 gives to the relationship expert and lay estimates and exact input data in a standardized form. Exact sum of the inputs and estimates where 1 equals 100%. Each entry situation can be interpreted by just one point with three coordinates of expressing the proportions of the various types of input variables. All combinations of input vs. In this graphical interpretation may be located on the housing (walls) square drive unit defined by the points on the axes x, y, a zero is the beginning of the coordinate system. Point arises simply by plotting the coordinates to rectangular Cartesian coordinate system. There will be a point in three-dimensional space situated on the surface of the squaring on Fig.3.

The main problem of any comparison is its objectivity. Objectively compare the functionality of crisis management between countries is very difficult. There are numerous criteria and a number of considerations such as can be seen throughout the crisis management system in the country. The main aspect of crisis management functionality should be preparedness to intervene and rescue efficiency. Another measure would be the effectiveness of preventive activities. Since it is known that undertake specific financial amount in prevention can save you up to 10 times the damage caused by future incidents. This number appeared concerning the lack of warning systems before the tsunami, which in 2004 have killed around 320,000 people. The main objective of preventive measures has always been and will save lives and value of human life cannot be quantified. Yet globally, many people fall victim to an emergency because of the absence of preventive measures or due to failure of the system response to incidents.

CALCULATION OF EFFICIENCY

Effectiveness of preventive measures is difficult to measure and therefore determine the effectiveness of preventive measures is very difficult to calculate. [4], [5] Preventive measures are varied in nature. May be an investment in material resources, investment in staff training, the education in schools nationwide campaign or the like.

Calculate the effectiveness of preventive measures for the protection of property is theoretically possible as follows (1):

$$\mu_{PM} = \left(1 - \frac{\sum_i p_i}{\sum_i M_i}\right) . 100 [\%] (1)$$

Efficiency is expressed as a share of the amount of resources spent on preventive protection material valles and the total value of assets protected. The result is expressed as a percentage. An example might be criticized investment in flood wall in Prague, which cost about 70 000 CZK. This was already the following year, i.e. 2002 successfully installed in the floods. This barrier protects the entire old city of Prague. Quantifying the value of a substantial part of the historical center, however absurd this experiment works, it ranged in the hundreds of billions of crowns. In that case, the calculated value of the effectiveness of preventive measures rounded equal to 100 % (1). Criticism effectiveness expending funds are usually concerns of alternative preventive solutions. This issue will not be addressed, as rather to corruption and cronyism. Another common precautions include first aid courses. Their efficiency from a mathematical point of view can be easily counted again as follows:

$$\mu_{PP} = \frac{\sum Z_p}{\sum A_p} . 100 [\%] (2)$$

While it is possible to calculate the absolute number of graduates first aid courses (A_p) it is almost impossible to track down how many of them actually use these skills in practice by providing first aid saved a human life. Value Z_p i.e. saved human lives is hardly detectable. This relationship (2) does not take into account the financial aspects by the fact that many graduates take courses repeatedly. Moreover, opportunities to apply skills learned in first aid courses are not common, and the vast majority of people never. Hence the value of this indicator will be very low. This does not mean that the first aid courses are useless. Highlights the difficulty of measurable effectiveness of preventive and educational measures aimed at saving lives.

It sounds better more detailed approach to measuring the effectiveness outlined below in equation (3). If we put in the ratio of the number of trained people who were present at the scene of an emergency and are able to provide effective first aid (A_{pp}) and on the other hand, the number of rescued persons (Zp), which gave to save lives, we would get a completely different statistics. Although survey data would be extremely difficult again.

$$\mu_{PP} = \frac{\sum Z_p}{\sum A_{pp}} \cdot 100[\%] (3)$$

Force alone could rescue can be expressed as follows:

$$\mu_{ZA} = \frac{\sum Z_p}{\sum O_p} \cdot 100[\%] (4)$$

This ratio is again the number of rescued persons for rescue and denominator (4) the number of persons at risk for life at the moment of occurrence of an emergency. Even when it comes to saving lives, the overall statistics rescued and vulnerable people are quite rare. According to official information, the Ministry of the Russian Federation for civil defense, emergencies and elimination of consequences of natural disasters (abbreviated EMERCOM) State fire service has 220,000 firefighters, 13 600 buildings, 4,000 fire stations, 18,364 fire trucks, 49 fire motorboats. In addition, there are areas in Russia, general, trade unions and voluntary fire brigades with different levels of equipment. Total annual saving more than 90,000 lives and prevent damage of 120 billion. Rubles (2.8 billion EUR) [3]. Being endangered human lives in emergencies was about twice as high. So we can say that the indicator has μ_ZA for Russia 50%. The overall effectiveness of the crisis management system (5) would be formed by a summary of characteristics with appropriate weights, ie significance of these indicators.

$$\mu_{CM} = V_{ZA}\mu_{ZA} + V_{PM}\mu_{PM} + V_{PP}\mu_{PP} + \cdots (5)$$

Or generally expressed

$$\mu_{CM} = \sum_i V_i \mu_i \ (6)$$

Where Kde V_i is the weight of *i-th* efficiency and μ_i is the efficiency of the i-th indicator of the effectiveness of crisis management. Weights of individual indicators should indicate their significance and therefore determining the weights should reflect the greater importance of human life compared to material values. This simplified way, in my opinion it was possible to compare the effectiveness of crisis management system.

APPLICABILITY OF CALCULATIONS

Most important think in any measurement is its accuracy. Therefore most accurate statistical data are needed before starting any calculations and comparing. There are also another factors which need to be met to reach the goal of objective assessment and comparing of crisis management systems.
Conditions are following:
- Clear goal definition
- Objectivity of inputs
  - Statistic data accuracy
  - Expert estimation
  - Lay estimation
- Relevancy of inputs
- Good objective choice of criteria
- Choice of proper methods
- Correct application of methods / calculations
- Correct interpretation
- Correct and fair evaluation

When these conditions are followed the result should be objective and proper, even if the author don't like the results. The rates and indexis should be compared rather than absolute statistical numbers.

CONCLUSION

The main problem of objectively assessed the effectiveness of crisis management is the measurability of the effectiveness of invested funds, whereas values that are conserved are

often incalculable. Value of human life or historical value historical centers full of monuments can not be quantified. The biggest obstacle the proposed method is the availability of individual statistical data as well as the variety of measures that would have to be included in the equation (6). However, the high explanatory power attributed indicator (5), which I would assign much weight and thus efficiency indicator rescue can best testify to the effectiveness of the system. The main ambition of this article was to suggest a way how to arguabily and measure effectiveness rescue systems respectively crisis management systems. The focus is on objectivity of results which is given by objectivity of input data. This simple approach could help in defending the

money spent on prevention of saving human lives and material values in the process of approval from the state budget for this purpose. The rates and index should be compared rather than absolute statistical numbers.

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