Study and Application of CBR Analysis in various security evaluations

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ABSTRACT

This paper portrays a compound cost/advantage/chance (CBR) examination approach and its application in a Computing System for evaluating the security dangers, vulnerabilities and recommends restorative activities. These variables are broke down, assessed and exhibited in a pragmatic significant point of view. The Decision Making Factor which legitimizes the determination of restorative activity as for related hazard is additionally computed. The need positioning of hazard is characterized as far as the feasible Consequences of the risk, the Frequency of Exposure of danger and the Probability of risk grouping finish and the Correction Value is characterized on the adequacy and cost of connected counter measures. The philosophy utilizes a scientific strategy that consolidates both goal and subjective ways to deal with established hazard examination.

I.INTRODUCTION

A decent administration hone requests that while assessing the security of a data framework (IS) upheld with a registering situation, utilization of given assets ought to be made admirably for most extreme viability or benefit since PCs and peripherals is ordinarily an exorbitant set-up and is indispensable to economy of an IS. The evaluation of hazard ought to take after a set rules to keep up consistency and exactness and it ought not be one-sided based on past episodes to foresee what may occur in future as generally done in target chance appraisal [1]. This inclination may occur because of absence of accessibility of extensive information on PC related dangers the same number of cases typically is not answered to authorities. Subjective hazard appraisal in light of the strategy for best theories of dangers relying upon the predetermined highlights of the framework is frequently condemned for the outcomes to the least extent liable to happen. Expected estimations of yearly misfortune seem unreasonable and not suit to the associations each time and advocates to this examination time and again credit levels of precision that the technique cannot bolster.

The past Cost/advantage Analysis and Risk Analysis have assumed significant part in First Generation of data framework outline and tend to decrease in Second and Third Generations [2,3]. While, a great consideration now has begun in investigating the elements like hazard, dangers and weakness influencing to Operating Systems [5].

This paper introduces a joined examination of goal and subjective techniques for a data framework and working frameworks. A working framework supporting a data framework assumes a noteworthy part in general fruitful working, thus we should call both these frameworks in a single term named as Computing System.

In our study, we chiefly concentrate on the initial five components of hazard administration as detailed in [12], i.e. recognizable proof of hazard factor, evaluation of hazard consequences for processing framework, advancement of methodologies to go out on a limb remedial activities checking of hazard factors and summoning alternate courses of action by plainly characterizing their criteria of determination. We relate the hazard with three elements (I) Consequences (ii) Exposure and (iii) Probability of fruition of danger grouping and countermeasures with three components (I) Cost factor of proposed counter measure (ii) Degree of revision and (iii) Time taken in actualizing counter measure and break down them as far as Risk Value and Correction Value separately. At long last, a basic leadership Factor is ascertained based on Risk [14].

Esteem and Correction Value which legitimizes the choice of proposed countermeasure as for related Risk Value. Our study in this paper seems to offer most significant and down to business comes about which give appraisal of misfortunes utilizing the learning of different dangers and their countermeasures [8].

II.COST BENEFIT RISK (CBR) ANALYSIS

The Cost / Benefit / Risk (CBR) examination fuses strategies to assess Risk Value, Correction Value of countermeasure and a Decision Making Factor which legitimizes the choice of proposed countermeasure against comparing hazard. These qualities are assessed numerically [15].

1.1 Assessment of Risk : We asses the risk as the Risk Value (RV), denoted α, which is given by a function $f(\alpha_1, \alpha_2, \alpha_3)$, where α_i, for $i \in \{1, 2, 3\}$ are defined as follows:

α_1 : The value Consequences of a possible event due to a potential threat,

α_2 : The value of Exposure or Occurrence Frequency of threat,

α_3 : The value of Probability of threat sequence completion,

We assume that the function f satisfies the following condition :

C1 : $f(\alpha_1, \alpha_2, \alpha_3) = 0$, if any $\alpha_i = 0$,

Where, $0 <= \alpha_1 <= \eta$ (η' are positive integer) ;

$0 <= \alpha_2 <= \eta$ ⌙ ,

$0 <= \alpha_3 <= \eta\ 3$;

Satisfying condition C1, we consider the linear form of function f in α_1, α_2 and α_3, that is in our case, the Risk Value ; α , is given by :

$$\alpha = \alpha_1 \times \alpha_2 \times \alpha_3, \quad (2.1)$$

We shall divide the values of α thus obtained from equation (2.1) into five ranges denoted as VH (Very High Value), H (High Value), M(Medium Value), L (Low Value) and VL (Very Low Value) for reference in calculation of Decision Making Factor (section 2.3)

We assume a high value of α bears more risk as compared to a low value of α.

1.2 Assessment of Countermeasure : We assess the value of counter measure as Correction Value (CV), denoted β, which is represented by a function $g(\beta_1, \beta_2, \beta_3)$, where β_i for $i \in \{1, 2, 3\}$ are defined as follows:

β_1 : The value of Cost of proposed countermeasures,

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β_2 : The value of Degree of correction provided by the proposed countermeasure,

β_3 : The value of time taken in implementing counter measure,

We assume that the function f satisfies the following conditions :

T1 : $g(\beta_1, \beta_2, \beta_3), = 0$ if any $\beta_i = 0$ $i \in \{1, 2, 3\}$

Where, $0 <= \beta_1 <= \varphi$ (φ' are positive integers) ;

$0 <= \beta_2 <= \varphi 2$;

$0 <= \beta_3 <= \varphi 3$;

Satisfying condition T1, we consider the linear form of function f in β_1, β_2 and β_3, that is in our case, the Correction Value ; β , is given by :

$\alpha = \beta_1 \text{ x } \beta_2 \text{ x } \beta_3,$ (2.2)

We might separate the estimations of β acquired from condition (2.2) into five comparative ranges as improved the situation α (area 2.1), for reference in figuring of Decision Making Factor (segment 2.3).

We accept that a lower estimation of β relates to a superior countermeasure.

Decision Making Factor: Given a Risk Value; α, and a Correction Value; β, for a speculative countermeasure comparing to Risk Value, we expect the Decision Making Factor; γ, to be given by work h(α, β) fulfilling following conditions:

M1 : $h(\alpha, \beta) = 0$ if $\alpha = 0$,

M2 : $h(\alpha, \beta) = 0$ if $\beta = 0$,

Satisfying conditions M1 and M2, we consider the form of function h as α divided by β, that is in our case, the Decision Making Factor, $\gamma = \alpha/\beta$, (2.3)

In view of our five territories each for RV and CV [sec 2.1, sec 2.2], we assess different estimations of Y and speak to these qualities into five territories meant from VH (Very High) to VL (Very Low) same with respect to RV or CV and show them in γ - Matrix (Table 1). We should utilize these reaches to recommend proper arrangement of activity as cure of danger. The proposed paradigm of determination of this arrangement is given in Table2.

Table 1 : γ -matrix

		RV				
		VH	H	M	L	VL
PV	VL	VH	H	M	L	L
	L	L	L	VL	VL	VL
	M	VL	VL	VL	VL	VL
	H	VL	VL	VL	VL	VL
	VH	VL	VL	VL	VL	VL

Remark 1 : In the circumstance where there is less probability of making the scopes of qualities from VH to VL, three territories can made by blending VH into H to make H and VL into L to make L, in this manner making H, M and L scopes of qualities [16].

Table 2 : Action Plans

γ -values	Proposed plan
VH	• Situation is critical, requires immediate action
H	• Situation is urgent, requires attention within two days
M	• Situation is Poor, requires attention within a week
L	• Situation is Poor, requires attention within two weeks
VL	• Threat is not very harming, but it should be eliminated

We now explain the procedure of rating of the main components of Correction Value based on above factors.

Cost of Countermeasure ; β1 : The Cost factor proposed countermeasure is an estimation of cost in dollar and we consider the appraisals of this factor equivalent to the rate estimation of framework. Cost. These appraisals change from most noteworthy esteem 20 to least esteem 1 (Table 3). Truth be told, by this standard more appraisals can be appointed to this factor than given in Table 10, contingent upon the rate estimation of the cost of countermeasure.

Degree of correction ; β2 : We evaluate the Degree of amendment as far as diminishment of danger and its results in rate. We dole out a most reduced rating 2 under most great circumstance when Consequences of risk is nearly wiped out and a most noteworthy rating 10 in the most horrible circumstance when outcomes of danger are to the least extent liable to be disposed of (Table 4).

Table 3 : Cost Factor β_1	
Cost of Proposed Counter Measure	Rating
• 20% of system cost	20
• 15% of system cost	15
• 10% of system cost	10
• 5% of system cost	5
• 1% of system cost	1

Table 4: Cost Factor β_2	
Degree of Correction	Rating
• Threat positively eliminated by 100%	2 4
• Threat reduced to 75%	6
• Threat reduced to 50%	8
• Threat reduced to 25%	10
• Threat is least likely to be eliminated	

Time of correction ; β_3: The season of amendment, we consider in days/weeks taken in remedying the danger and its outcomes by a proposed countermeasure. We dole out a least evaluating 2 to this factor under most positive circumstances when the risk results are remedied in one day. A high evaluating 10 is relegated in a poor circumstance when the danger outcomes are rectified about in 10 weeks (Table 5).

The Correction Value in this manner ascertained, in light of the appraisals of different components from Table 10-12, shift from 4 to 2000 forward.

Comment 2 : The most extreme estimation of Correction Value can likewise be more noteworthy than 2000 since we are keeping an arrangement to allot extra appraisals to β1.

We separate these scopes of Correction Value into five territories in Table 6.

Table 5: Correction time of a problem ; β_3	
Time of correction	Rating
• One day	2
• One week	4
• Two weeks	6
• Four weeks	8

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• Four to Ten weeks	10

Table 6	
Degree of Correction	Rating
VL	4-100
L	100-250
M	250-500
H	500-1000
VH	1000 onwards

We might utilize these scopes of qualities for figuring of Decision Making Factor.

Basic leadership Factor; γ : Once we examine a danger and its results and settle on a conditional countermeasure, at that point we utilize the Decision Making Factor; γ, to decide if the assessed Correction Value of proposed countermeasure is supported to relating Risk Value. We figure the estimations of γ for five scopes of α and β each (Table 7).

Any γ esteem more prominent than 100 infers that the danger has high hazard and its countermeasure is effectively moderate. Subsequently in this circumstance it is prescribed to remedy this danger and its outcomes promptly. Moreover a γ esteem between 50 to 100 it infers that the danger and its results have caused a disturbing circumstance and its countermeasure might be embraced, accordingly it is prescribed to make a sooner move. A γ esteem under 50 demonstrates that there exists a non genuine risk with its outcomes to the framework yet it ought to be redressed [17].

Table 7: Decision making factor γ	
γ – value	Action
• Greater than 100	• Situation is Critical, Requires immediate action,
• 50-100	• Situation is Urgent, requires sooner action within a week.
• Less than 50	• Situation is not very harming, but threat should be eliminated.

III.CONCLUSION AND DISCUSSION

The present work includes an analysis of Cost / Benefit / Risk assessment for a computing system. The previous analytical methods are normally based on subjective or objective approach. The previous studies have not stressed on the time taken in correcting the threats and its consequences, which has been introduced by us in the calculation of the Correction value of countermeasure. By Introduction of this factor the CBR analysis gains a wider perspective.

One may argue in picking up values of Exposure of threat on the basis Frequency of Occurrence of threat or the possible period of time after which a threat can hit the system. We explain this with a case when a threat may affect the system many a times in a day and as a Consequence the system denies its services for two days. We handle such discrepancies by recommending the plans of action for the ranges of γ values.

The accuracy of assessment of various factors in this method will depend upon the judgment and experience of the analyst making the calculations, therefore the ratings of different factors may vary from analyst to analyst and system to system.

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