IOSR Journal of Engineering (IOSR JEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
PP 63-66

Importance of Usefulness, Usability And Integrity Model for Cost–Benefit Analysis

Dr. Kishor M. Dhole[1], Dr. Vinay Chavan[2], Dr.Parag R. Kaveri[3]
[1] *Assistant Professor, Department of Computer Science*
[2] *Associate Professor and Head, Department of Computer Science*
Seth Kesarimal Porwal College of Arts, Science & Commerce, Kamptee,
RTM Nagpur University Nagpur, Maharstra, India-441002
[3]*Department of Computer Science, Symbiosis International University, Pune, Maharastra, India*

Abstract: *This paper covers the Usefulness, Usability and Integrity (UUI) factor for information system. Which calculates Information Integrity (I*I) value in the context of Cost Benefit analysis for achieving high integrity of information in information system environment. This paper suggests reducing the high integrity risk value by calculating I*I index value. This paper imposes the usefulness, usability and integrity factor for competitive advantages in control environments. Its determinants are Accuracy, Correctness and Reliability of information improved the decision situation in Information System(IS).*

Keywords: *Usefulness, Usability and Integrity (UUI), Information Integrity (I*I) ,InformationSystem(IS),Cumulative Information Integrity Index (CIII).*

I. Introduction

In complex and changing environmentthere is a lot of uncertainty in IS. This uncertainty creates a lot of information error in it. This improves complexity of the system with loss of information. This information error maximizes integrity risk value[1]. Thus to overcome with loss of information and delay in information processing requires Information Integrity in IS[2].

1. IMPORTANCE OF INFORMATION INTEGRITY IN IS

Information Integrity (I*I) is dependability and trustworthiness of information and controlling it is a key factor for determining strategic advantage in IS. Its attributes are accuracy, consistency and reliability of IS and information there from[1][2][3]. Information systems have changed a great deal but it is the processes by which these systems are designed and implemented that have changed the most. The majority of them are still comparatively simple in their design[4]. But internal as well as external user aspirations are becoming increasingly local and instant.

2. USEFULNESS,USABILITY, AND INTEGRITY MODEL

Usefulness, Usability and Integrity model of information system used for proving the validity and reliability of Information integrity. Incorrect production of information, origination and processing of information leads to information errors and it embedded into the system difficulty in recognizing complex problems. It avoids the difficulty in recognizing complex goals, which are characterized by interrelated criteria. This UUI model supports to choose and achieve the goal selection on the basis of irrelevant criteria.

3. SIGNIFICANCE OF UUI MODEL

The information origination and processing of information using integrity attributes improves the effectiveness of information system by calculating cost of I*I value[4][5]. In this representation IS can be seen as comprising a number of core IS models having data origin stage, data transformation (comprising medium and people),and output stage.Figure1 shows information integrity system components.

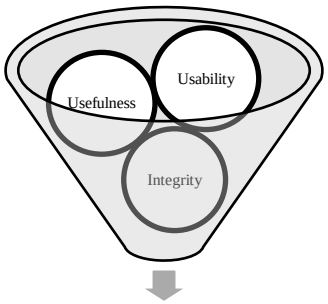

Figure1:Information Integrity System

These core IS models may be repeated, paralleled, and interrelated. Output from one core IS model may become input to another. It is recalled that core IS model to which data and information are integral is modeled as a decision process. To outline the cost-benefit analysis methodology of Information Integrity; different decision stages D0 to D22 designed with I*I Technology development in IS[5]. These decision stages improve the efficiency and effectiveness of information value. It gives more accuracy, consistency and reliability of information value in IS. The decision purpose considered to process and convert data as in core IS to deliver information decision stages (i.e. Do to D22) information so as to achieve better information use by calculating I*I attributes in IS. Thus the purpose of processing information through the core IS taken as "improvement in information use", which in turn gives the strategic or competitive advantage. This control the local and instant requirement of user by processing I*I value, which increases usefulness and usability of I*I index in IS[7].

4. COST – BENEFIT ANALYSIS (CBA)

It is understood that this "improvement" as a variable will be a function of theinformation (I) being processed under the stage (Si) and can be represented by[ΔIU(I)].

Let IUUB (I) denote the variable giving the upper bound of information use as function of "I".

Let "α(I)" denote usefulness factor and "β(I)" usability factor. Both factors, functions of "I" takes value between (0, 1] and seen as appropriately defined proportionality variables. The improvement in information use at Stage (S_i) is given by Equation1[8].

The I*I Benefit Equation is,

$$\Delta IU(I) \mid S_i = [\alpha(I) \times \beta(I) \times IUUB(I)] \mid S_i \quad \ldots\ldots (1)$$

II. Methodology

FORMULATION OF I*I

For calculating all benefit equations following notations and formulas used:

i. Cumulative I*I Value=CUM. I*I,
ii. Time unit=T=7 days,
iii. Accuracy Index with respect to time "t", A_t =A(I)/T,
iv. Improved Real Usefulness-IMPRU=I*I/A_t,
v. Usefulness Factor , α(I)=CUM .I*I/IMPR,
vi. APUI-Apparent Useful Information,
vii. CRUI-Cumulative Real Usability Information,
viii. CPUI-Cumulative Perceived Usability Information,
ix. No. of Observed Records=10,
x. CPUI=CRU/R,
xi. Usability Factor, β(I)=Cumulative Perceived Usability Information / Improved Real Usefulness (CPU/IMRR),
xii. CPUI=CRUI/R,
xiii. BETA β(I)=CPUI/IMRR.

In reality is different as core IS models are complex, open and impacted by **5 "C"** s and they have errors. As a result there is a question about the integrity of information "I". The accuracy of information considered "A (I)" denotes the concerned Integrity quotient, which takes values between (0, 1]. Then, the gross "benefit" or improvement in information use from processing at stage (S_i) would get modified to as in Equation 2[9].

The I*I Benefit Equation is

$\Delta IU(I) \mid S_i = \{ [\alpha(I) \times \beta(I) \times IUUB(I)] \mid_{Si} \} \times \{A(I) \mid S_i$ ……..…..(2)

This brings the question to that of costs. The correct assessment of benefit from the information processing at the core IS model under consideration could be completed only when, from the gross benefit, the costs of information processing are accounted for. Thus for calculating the gross benefit of I*I value the cost componentsderived[10]. These cost components are consistent with the individual information origination and processing nature of IS. It is suggested that these cost components are those of originating information "I"[denoted by $COST_{OI}$ (I)], of analyzing integrity quotient of A(I)[denoted by $COST_{ANAL}\{A(I)\}$],and the opportunity cost of analyzing A(I) [denoted by $COST_{OPPORT}\{A(I)\}$].

5. COST BENEFIT EQUATION OF I*I

Table 1: I*I Attributes and Weight Functions

Sr. No.	I*I Attributes		I*I Weight Functions	
1.	A	0.78	Wa	5
2.	C	0.83	Wc	3
3.	R	0.95	Wr	2

(Source: Compiled by Researcher)

Table 2: CIII Attributes Index Value Scale

Sr. No.	Attribute Index Value Range	Scale	Points
1.	[1-0.8]	H	5
2.	(0.8-0.6]	G	4
3.	(0.6-0.4]	F	3
4.	(0.4-0.2]	E	2
5.	(0.2-0]	D	1

(Source: Compiled by Researcher)

a. Integrity Profile for CBA

Consider an information system designed and developed for determining the originating cost in IS. It is appreciated that originating cost, consistent with information usage requirements, will have application area specific order of significance for integrity attributes.

Let Wa, Wc and Wr represent significant weight functions for the integrity attributes accuracy, consistency and reliability respectively, for cost under consideration. These weight functions considered values between (0-10]. Let the Information Integrity attribute indices and their respective weight functions as observed at the user end in this specific example is mentioned in the following table 1:

b. Cumulative Information Integrity Index (CIII)

Let Information Integrity attributes, depending on the range in which the attribute index value falls, be assigned a 5 point scale as shown in table 2:In this consideration, the Information Integrity attributes had scales and points asgiven in table 3.

Table 3: Attributes Scale Points

Sr. No.	Attribute Index Value Range	Scale	Points
1.	Accuracy Index (A)	G	4
2.	Consistency Index (C)	F	5
3.	Reliability Index (R)	H	5

(Source: Compiled by Researcher)

Then with a view to quantify the overall Information Integrity Index for this application CIII defined as:

$$CIII = \frac{4 * Wa + 5 * Wc + 5 * Wr}{Wa + Wc + Wr}$$

If the values of Wa= 5, Wc= 3 and Wr=2 then

$$CIII = \frac{4 * Wa + 5 * Wc + 5 * Wr}{Wa + Wc + Wr}$$

$$= 4.5$$

CIII = 4.5.

CIII takes a value between ranges [1-5]. In this situation; it has been observed that this value of CIII is 4.5. It means that the originating cost will be high at this stage. This CIII value for originating cost may be improved with additional requirement of consistency Index having minimum "G" scale.

Accordingly then the "net benefit" in the form of improvement in information use as occurring at theinformation processing stage ($\mathbf{S_i}$) is as given in Equation 3.

$$\Delta IU(I)\Delta S_i = \{(\alpha(I) \times \beta(I) \times IUUB(I)) \Delta S_i\} \times \{A(I) \Delta S_i\}] - [COST_{OI}(I)S_i + COST_{ANALY}\{A(I)\}S_i + COST_{OPPORT}\{A(I)\} Si] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

III. Performance Evaluation

IMPORTANCE OF USEFULNESS AND USABILITY FACTOR

Information management process is directly affects through usefulness and usability of information. In this context the decision situations and I*I rules improves the I*I value .These dynamic decision situations characterizing the information flow and considerable simplification of the uncertainty at hand will be resolved through it. Let us assume that usefulness factor,α(I) and usability factor, ß(I) to be given,Functions IUUB(I) and A(I) having their own respective first order transients with corresponding steady state (SS) values (here of upper bound value for IUUB(I) and value equal to numerical one for A(I)), and assume all cost functions to be exponentially increasing with time, then from equation 3 the variable ΔIU(I) at the stage (S_i) under consideration will have a maximum value at a given time and among other things, for a given value of integrity quotient "A". These equations solved and can be implemented by system dynamics model in further.

IV. Conclusion

In this case it has been observed that there is an optimum I*I at which:

- Net increase in information use benefit is maximum
- Achieving that I*I (implying accuracy, consistency, and reliability if they can be quantified) is a costly process.
- To meet the demands of competitive advantage, resource commitment for achieving improved I*I, optimum I*I is important.
- The usefulness, usability and integrity play a key role for achieving high integrity value.

References

[1]. Dhole K.M., Chavan Vinay, "Crime proofing techniques in ICT and I*I attributes" IJARCCE, 2013,volume 2,index 3(22), (print):2319-5940.

[2]. Dhole K.M.,Chavan Vinay, "Review of Information Integrity Problem" NCRAECS14,Shri. Shivaji Science College, National Conference,Nagpur, 2014, 978-81-906457-5-1 .

[3]. Anders Tallberg, "An Economic Framework for Information Integrity", Library, Swedish School of Economics and Business Administration, P.O. Box 479, 00101, Helsinki, Finland,2002.

[4]. Delone W.H., and McLean E.R., "Information Systems Success: The Quest for the Dependent Variable", Information Systems Research3 (1), 2007.

[5]. Mandke V. V. and Nayar M.K., "Information Integrity Imperative for Competitive Advantage in Business Environment characterized by Uncertainty", in InformationTechnology for Business Management, World Computer Congress, Beijing, China 2008, pp. 115-125.

[6]. Mandke Vijay V., "Research in Information Integrity: A Survey and Analysis", Proceedings of the JNCASR and SERC Discussion Meeting at IISC Campus, Bangalore on Information Integrity - Issues and Approaches, Edited by Rajaraman V. and Mandke Vijay V., published by Information Integrity Foundation, New Delhi, India, 2009.

[7]. Mandke Vijay V., and Nayar M.K. Implementing Information Integrity Technology - A Feedback Control System Approach, IFIP TC 11Working Group Conference on Integrity and InternalControl in Information Systems, Edited by Margaret E.vanBiene-Hershey andLeon A.M. Strous, Kluwer Academic Publishers, Boston, USA,2010.

[8]. Susanne Kelly and Mary Ann Allison, "The Complexity Advantage", a Business Week Book, McGraw Hill, 2010.

[9]. V. Rajaraman and Vijay V. Mandke., Information Integrity: Issues and Approaches- Proceedings of the Jawaharlal Nehru Center for Advanced Scientific Research and Supercomputer Education and Research Center, Indian Institute of Science Campus, Discussion Meeting held at Bangalore, India, on 22-23 June 2011.

[10]. Vijay V. Mandke and Natasha Kapoor "Information Integrity – A Structure for its definition ", in Conference on InformationQuality Proceedings edited by Diane M. Strong and Beverly K. Kahn, MIT, Cambridge, Massachusetts, USA, 24-26 October, 2011, pp. 314-338.