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Application of SIS Framework on Information System and its Assessment

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Abstract*: A frame work SIS has been proposed to manage the risks possible in Information system. This Framework used both qualitative and quantitative approaches which has key processes like source code analysis, information acquirement, and SWOT. An information system developed is used for assessing that risk through this framework, results obtained were then compared with ENISA framework. The results have shown that risk assessed through both frameworks is not variant for the factors like technology, information and participants. However the high risk value is predicted by SIS framework for infrastructure.

Index Terms: ENISA framework, , Information Systems, Mixed method analysis, SIS framework, Source code analysis.

I. INTRODUCTION

Risk is a potential event that may negatively impact the ability on the project undertaken. There are THREE basic risks namely Scope Risk, Schedule Risk and Resource Risk , which adversely effect project. Managing risks is vital in software development.[1][2][3] Risk management is a continuous, forward-looking process that is an important part of business and technical management processes. Risk management should address issues that could endanger achievement of critical objectives. A continuous risk management approach is applied to effectively anticipate and mitigate the risks that have critical impact on the project.
There are several frameworks to assess and manage risks in software development. The comparison of these frameworks namely "AS/NZS Risk Management", NIST SP 800-30, ISO/IEC TR 13335-3,

Markov Analysis, ISRAM, CRAMM, EBIOS, KSM Model, Probabilistic Risk Assessment Model using Bayesian statistics has been carried out to understand the deficiencies. Based on which a simple structured non tool based and inexpensive framework namely SIS is proposed. It has been validated initially using expert judgment.
The Respondents have significantly shown support (92%) for the framework with a standard deviation of 1.6 and variance of 2.0.

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II. DEVELOPMENT OF INFORMATION SYSTEM

In order to test the proposed framework an information system (R&D IS) is developed [2]

Figure 1:R&D Application

Figure 2: Innovation and Incubation

Framework Validation through Application

In the Risk recognition phase of the framework the 3 modules SCARE, IA, and the SWOT were used with 60%, 30% and 10% weightage respectively In order to assess the overall risk of the Information system [4][5]

Hence Risk calculated using formula

$$Total\ Risk = \sum_{i=1}^{3} ai\ f(xi)$$

$= a1.f(x_1)+a2.f(x_2)+a3.f(x_3)$

Where a1, a2, and a3 denotes values of percentages with respect to SCARE, IA, SWOT

- **$f(x_1)$ represents the risk obtained through SCARE process**

- **$f(x_2)$ represents the risk obtained through IA process**
- **$f(x_3)$ represents the risk obtained through SWOT process**

Risk calculation through SCARE

SCARE means source code analysis and risk evaluation. The McCabe Labs proposed method of calculating Cyclomatic Complexity for evaluating risk is used to evaluate risk.[6]

Element	Risk Value Through Cyclomatic Complexity	Risk Type
Participants	18	Medium
Environment	28	High
Infrastructure	20	High
Technology	14	Medium
Information	17	Medium

Table:1 SCARE Table

Converted the risk values obtained through SCARE using Paul Garvey's Risk Evaluation as below

Element	Risk Value based on Paul Garvey	Risk Type
Participants	0.60	Moderate
Environment	0.77	High
Infrastructure	0.66	High
Technology	0.46	Moderate
Information	0.56	Moderate

Table:2 Paul Garvey's Table

Risk calculation through Information Acquirement

The information system and questionnaire related to all the five elements were sent to 178 users and obtained 103 responses

Element	Risk Value Through Information Acquirement	Risk Type
Participants	0.58	Moderate
Environment	0.87	High
Infrastructure	0.82	High
Technology	0.61	Moderate
Information	0.49	Moderate

Table:3 IA Table

The information system and questionnaires related to all the five elements were sent to 12 domain experts and obtained 5 responses

Element	Risk Value Through SWOT	Risk Type
Participants	**0.75**	**High**
Environment	**0.84**	**High**
Infrastructure	**0.76**	**High**
Technology	**0.56**	**Moderate**
Information	**0.43**	**Moderate**

Table:4 SWOT Table

Overall Risk of the Information system =0.526(Medium Risk)

Calculation

Element 1 (Participants) Risk Evaluation
= 0.6*0.6+0.58*0.3+0.75*0.1
= 0.609 (Medium Risk)
Element 2 (Environment) Risk Evaluation
=0.77*0.6+0.87*0.3+0.84*0.1
= 0.807(High Risk)
Element 3 (Infrastructure) Risk Evaluation
= 0.66*0.6+0.82*0.3+0.76*0.1
= 0.718(Medium Risk)
Though looks like medium risk it is very close to high risk
Element 4 (Technology) Risk Evaluation
=0.46*0.6+0.61*0.3+0.56*0.1
=0.515(Medium Risk)
Element 4 (Information) Risk Evaluation
=0.56*0.6+0.49*0.3+0.43*0.1

Comparison of Frameworks

The SIS framework compared with ENISA Framework and the results are as shown below

	Risk Value	
Element	SIS Model	ENISA Model
Participants	0.609	0.49
Environment	0.807	0.66
Infrastructure	0.718	0.54
Technology	0.515	0.54
Information	0.526	0.45

Table:5 Comparison Table

Figure3: Comparison

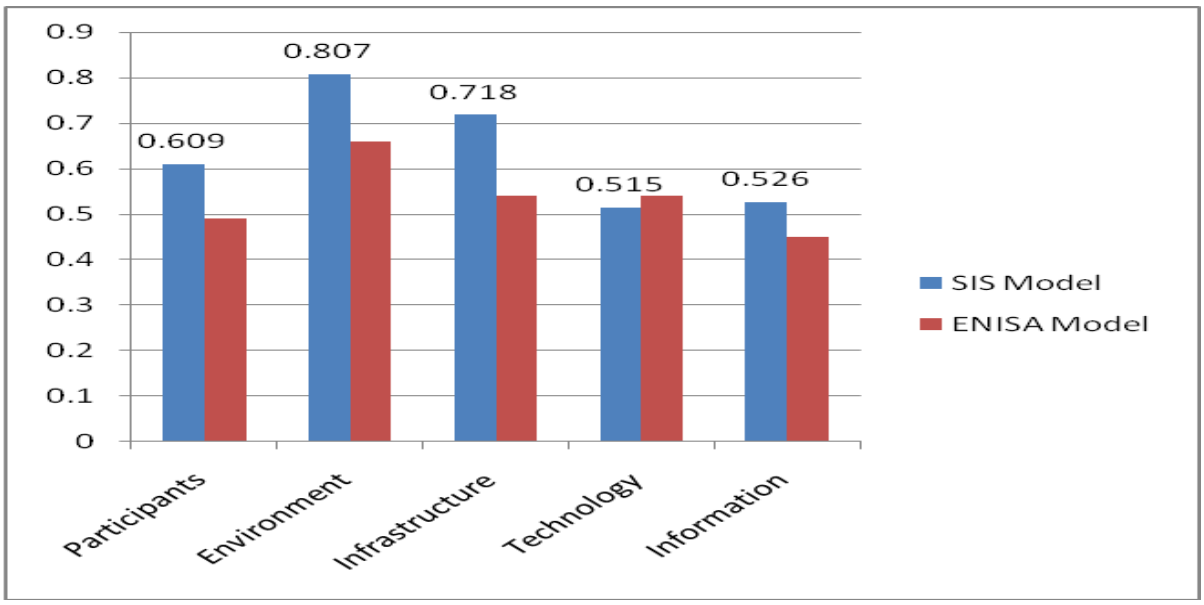
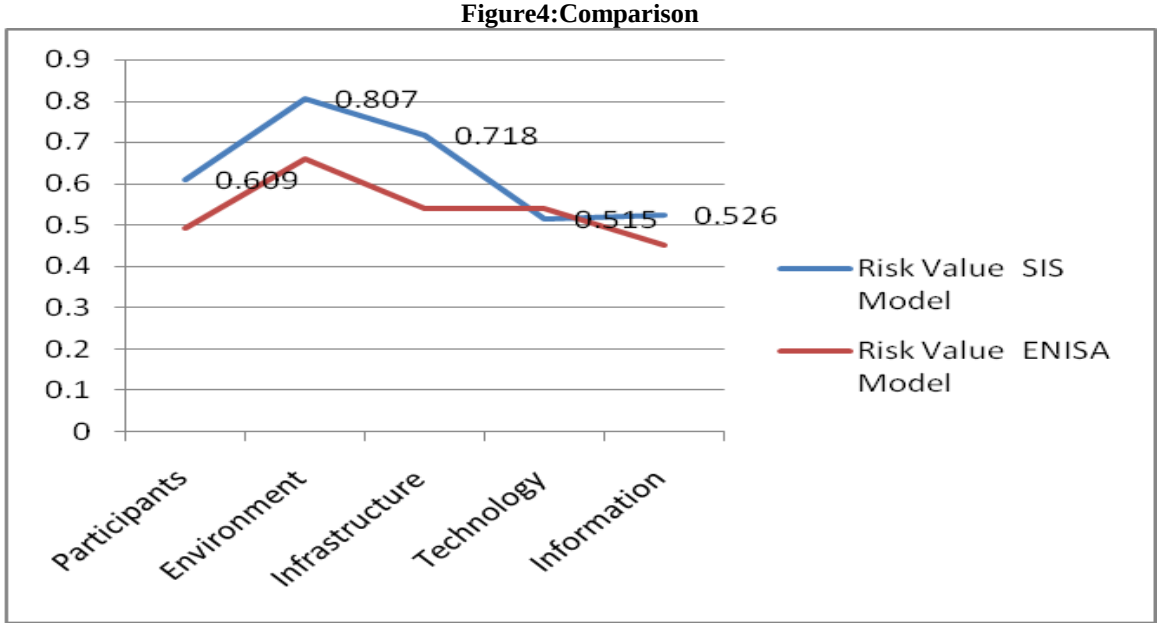


Figure4:Comparison



I. CONCLUSION

The risk assessed through ENISA and SIS framework has given similar values and risks for the factors participants, technology and information. There is a slight variance in the values for the factor Environment. However both frameworks have shown moderate risk only for this factor. The risk estimated by SIS framework is high compared to ENISA framework for the factor "infrastructure" .This signifies that infrastructure related risk can be assessed through SIS framework more effectively. Hence the authors recommend the usage of SIS framework and associated mitigation rules for assessing the risk of information systems where there is a significant role for infrastructure component.

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