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An ANP Approach for Prioritizing Risk in E-governance: An Appraisal

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Abstract

Projects have got risks of failure, no matter how we plan and proceed, and e-governance projects are no exceptions. These risks lead to failure or partial success, if not managed properly. So the identification and prioritizations of these risks related to e-governance projects are concern for academia and industry as a part of managing these projects. This prioritization helps the decision maker while managing decisions, results in decreasing in e-governance failure rates. In this paper an analysis has been done using Analytic Network Process (ANP) to find these risks and priorities those risks in order to manage with respect to a case analysis.

Keywords: Prioritizing, Risk, E-governance, ANP

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Introduction:

E-Governance is an application of Information and Communication Technology (ICT) to improve the effectiveness and communication between Government and citizens, which in tern improves effectiveness of overall governance system. Further, it can be defined as "*application of Information Technology (IT) to the process of government functioning to bring out Simple, Moral, Accountable, Responsive and Transparent governance (SMART)*" (Sarker, 2011,). Okot-Uma of the Commonwealth Secretariat in London thinks that, e-Governance seeks to realize processes and structures for harnessing the potentialities of information and communication technologies at various levels of government and the public sector and beyond (Sarker, 2011). In the opinion of Backus (2001) the formal mechanisms of e-governance should be more than the creation of an online presence. Government agencies are insisting heavily on e-governance projects with the hope to develop electronic systems that provide information, services and tools for the public, businesses and various levels of these systems (Choudhari et al., 2005). Even with widespread use of advanced tools, e-governance project development still suffers an alarmingly high failure rate (Meyer, 1998). Many large projects have been undertaken and there have been prominent failures. They are either total failures, in which the system is never implemented or is implemented but immediately abandoned; or they are partial failures (Heeks, 2006). Only a minority of the projects can be properly called successful. (Heeks and Bhantnagar, 2001, Fulton, 2003; UNDESA, 2003). The reasons for failure are many. Billions of dollars are lost on canceled projects, late delivery, over-budget delivery, and limited functionality. The Standish Groups' survey showed that 52.7% of software projects miss their schedule and financial targets, 31.1% of all projects are canceled, and only 16.2% of the projects are completed on time and within the budget (Hayes, 1997). According to Arnott (2003), the cost of cancelled or over-budget UK government IT projects has topped £1.5 billion in the last six years. For example, just a single cancelled e-Government project on smart cards resulted in a loss of £698 million to the British government. Most e-Governance projects inevitably involve various types and degrees of uncertainty and risks; hence, these projects can easily run out of control and consume significant additional resource leads to failure. These types of situations can be avoided or at least handled in a better way through appropriate risk assessment methodologies and Prioritizing these risks that able to enhance decision-making by turning failure into success.

Literature Survey:

The risk assessment provides feedback about uncertainties that can challenge the success of the project (Choudhari et al., 2005). To support a framework, categorization of various risk dimensions is needed that are surrounded by e-governance projects. The review of literature shows that some researchers have attempted to classify the risk dimensions. According to the Wallace et al (2004), risks are classified in six dimensions, namely: i) complexity, ii) organizational environment, iii) system requirement, iv) planning and control, v) users, and vi) development team. Evangelidis (2004) distinguished five areas in risk assessment : i) social, ii) technical, iii) economical, iv) political, and v) security. Further more, Tchankova (2002) proposed risk, namely: i) physical, ii) social, iii) political, iv) operational, v) economic, vi) legal, and vii) cognitive environment. Baccarini et al. (2004) categorized the risk dimensions into in seven classes: i) commercial and legal relationship,

ii) economic circumstances, iii) human behavior, iv) political circumstances, v) technology and technical issue, vi) management activities and control, and vii) individual activities.

In recent year various risk assessment methodology were used to identify and manage these risks. It is a multi criteria decision making process and various tools including Analytic Network Process (ANP), a comprehensive multi-purpose decision method, has been widely used in solving many complicated decision problems. Meade and Sarkis (1998, 1999) in two studies, used ANP as a methodology to evaluate logistic strategies and to improve production speed. Also in two separate studies performed by Lee and Kim (2001/a, 2001/b) ANP is used in an interdependent information system project selection process. Karsak et al. (2002) and Partovi and Corredoira (2002) used ANP in quality function deployment process. In addition to these studies Meade and Presley (2002), in evaluating alternative research and development projects; Bayazıt (2002), in determining the best production management system for a production company; Sarkis (2002/b), used ANP for the purpose of strategic supplier selection; Mikhailov and Singh (2003), used ANP in the development process of a decision support system; Yurdakul (2003), used ANP to built and evaluate long term performances of production systems; Momoh and Zhu (1998), used ANP in specifying optimal production schedules; Niemira and Saaty (2004), used ANP in financial crisis forecasting; Chung et al. (2006) used ANP for product mixture. Apart from this various application of ANP has been discussed in various conferences (http://www.isahp.org).Recently Seyhan Sipahi, Mehpare Timor, (2010) has detailed literature review of the recent applications of ANP in group decision-making methodologies. Lombardi and Torino (2011) has used ANP to find smart cities application. Recently Khademi et al 2012, discussed about better algorithm for ANP.

Methodology:

Analytic Network Process

The literature shows that AHP method is most suitable method for solving multi criteria decision making problem and the method was proposed by Saaty (1980). AHP was designed to handle qualitative aspect of decision making in multi-objective, multi-criterion, and multi-actor decisions with and without certainty of any number of alternatives. The basic assumptions of AHP are hierarchy based. Some decision problems cannot be structured in hierarchy, as it involves the interaction and dependence of higher level elements on a lower level element (Saaty, 1996). Structuring a problem involving functional dependence allows for feedback among clusters. Saaty (1996) has suggested using AHP to solve the problem of independence on alternatives or criteria, and ANP to solve the problem of dependence among alternatives or criteria. The ANP was also introduced by Saaty, and is a more generalization of the AHP (Saaty, 1996). ANP can be used to create interrelationships among decision levels and attributes. The ANP feedback approach replaces hierarchies with networks in which the relationships between levels are not easily represented as higher or lower, dominated or being dominated, directly or indirectly (Meade and Sarkis, 1999). Therefore, a hierarchical structure with a linear top-to-bottom form is not applicable for a complex system. A system with feedback can be represented by a network where nodes correspond to the levels or components (Saaty, 1980). The elements in a node (or level) may influence some or all the elements of any other node. In a network, there can be source nodes, intermediate nodes and sink nodes. Relationships in a network are represented by arcs, and the directions of arcs signify dependence (Saaty, 1996). Interdependency between two nodes, termed outer dependence, is represented by a two-way arrow, and inner dependencies among elements in a node are represented by a looped arc (Sarkis, 2002/a).

The process of ANP comprises four major steps (Chung et al, 2006):

Step 1: *Model construction and problem structuring*: Initially the problem/objective needs to be described and this needs to be subdivided various factors/sublevels by obtaining feedback from the decision makers.

Step 2: *Pairwise comparisons matrices and priority vectors*: With respect to the importance of the factors a pairwise comparison needs to be built up using a scale of 1-9 (Yurdakul, 2003; Cheng and Li, 2001). is required with respect to their importance towards their control criterion, and the components themselves are also compared pairwise with respect to their contribution to the goal based on the decision makers feedback (Meade and Sarkis, 1999) and for pairwise comparison a 1-9 scale can be used (Yurdakul, 2003; Cheng and Li, 2001). In addition, if there are interdependencies among elements of a component, pairwise comparisons also need to be created, and an eigenvector can be obtained for each element to show the influence of other elements on it. The relative importance values are determined with Saaty's 1-9 scale (Table 1), where a score of 1 represents equal importance between the two elements and a score of 9 indicates the extreme importance of one element (row component in the matrix) compared to the other one (column component in the matrix) (Meade and Sarkis, 1999).

Reciprocal of if activity i has one of the above non-zero numbers assigned to it when compared above non-zero with activity j, then j has the reciprocal value when compared with I Numbers. The reciprocal value is assigned; that is, aij=1/aji, where aij (aji) denotes the importance of the ith (jth) element. A pairwise comparison is made and a local priority vector is calculated as an estimate of relative importance associated with the elements (or components) and being compared by solving the following equation: $A \times w = \lambda max \times w$ (1)

Where A is the matrix of pairwise comparison, w is the eigenvector, and λmax is the largest eigenvalue of A. Several algorithms has have been proposed for approximating w Saaty (1980). In this paper, the following three-step procedure is used to synthesize priorities (Chung et al., 2006).

1. In the pair wise comparison matrix each column value summation is found out

2.In order to get normalized pairwise comparison matrix each element is divided by the sum of its respective column.

3. In order to get the Priority vector, the summation of the elements in each row of the normalized pairwise comparison matrix, and divide the sum by the n elements in the row. These final numbers provides an estimate of the relative priorities for the elements being compared with respect to its upper level criterion. Priority vectors must be derived for all comparison matrices.

Step 3: *Formation of Supermatrix*: The supermatrix is similar to the Markov chain process (Saaty, 1996). To obtained Global priorities with interdependent, the local priority vectors are entered in the appropriate columns of a matrix. This results a supermatrix, is a partitioned matrix, where each matrix segment represents a relationship between two nodes (components or clusters) in a system (Meade and Sarkis, 1999). If the components of a decision system be Ck, k=1,2,…,n, and each component k has mk elements, denoted by ek1, ek2,…,ekmk. The local priority vectors can be obtained in Step 2 are located and grouped in respective positions in a supermatrix based on the flow of influence from a component to component, or from a component to itself as in the loop in case of self depended . A standard form of a supermatrix is as in (2) (Saaty, 1996).

As an example, the supermatrix representation of a hierarchy with three levels is follows (Saaty, 1996). Where w21 is a vector that represent the impact of the goal on the criteria, W32 is a matrix that represents the impact of criteria on each of the alternatives, I is the identity matrix, and entries of zeros corresponding to those elements that have no influence.

Note that any zero in the supermatrix can be replaced by a matrix if there is an interrelationship of the elements in a component or between two components. Since there usually is interdependence among clusters in a network, the columns of a supermatrix usually sum to more than one. The supermatrix must be transformed first to make it stochastic, that is, each column of the matrix sums to unity. A recommended approach by Saaty (1996) is to determine the relative importance of the clusters in the supermatrix with the column cluster (block) as the controlling component (Meade and Sarkis, 1999). That is, the row components with nonzero entries for their blocks in that column block are compared according to their impact on the component of that column block (Saaty, 1996). With pairwise comparison matrix of the row components with respect to the column component, an eigenvector can be obtained. This process gives rise to an eigenvector for each column block. For each column block, the first entry of the respective eigenvector is multiplied by all the elements in the first block of that column, the second by all the elements in the second block of that column and so on. In this way, the blocks in each column of the supermatrix are weighted, and the result is known as the weighted supermatrix, which is stochastic. Raising a matrix to powers gives the long-term relative influences of the elements on each other. To achieve a convergence on the importance weights, the weighted supermatrix is raised to the power of 2k+1, where k is an arbitrarily large number, and this new matrix is called the limit supermatrix (Saaty, 1996). The limit supermatrix has the same form as the weighted supermatrix, but all the columns of the limit supermatrix are the same. By normalizing each block of this supermatrix, the final priorities of all the elements in the matrix can be obtained.

Step 4: *Selection of best alternatives*: The supermatrix developed in Step 3, covers the whole network, the priority weights of alternatives can be found in the column of alternatives in the normalized supermatrix. On the other hand, if a supermatrix only comprises of components that are interrelated, additional calculation must be made to obtain the overall priorities of the alternatives. The alternative with the largest overall priority should be the one selected.

A Model for Risk Prioritization

The following steps are being under taken for modeling the Risk Prioritization Problem using ANP.

Algorithm:

Step 1: Establishing a team of expert and finalizing the factors for risk

Step 2: Finalizing sub factors and grouping in to the designated factors

Step 3: Determining interdependencies between factors and sub factor

Step 4: Constituting the comparison matrices with respect to quantitative and qualitative factors, and creating priority vectors keeping in view the inter dependence

Step 5: Formation of initial supermatrix by priority vectors, and estimating the weights corresponding to quantitative and qualitative factors by taking this matrix as a starting point.

Step 6: Weighting the factors in 0-1 factor group.

Step 7: Determining global weights corresponding to all factors.

Step 8: Arranging evaluation scales relating to estimation of factors.

Step 9: Specifying applicants' adequacy ratings by utilizing global factor weights and evaluation scales.

Case Analysis: Case of XYZ University

University is generally a center of education, delivering the education needs of the society. Making a good linkage with the public is essential for the universities. According to Goddard et al. (2006), the universities have played a strategic role in the economic and social development of the country and of the regions where they are located. These universities are in due course trying their efficiency both academic and research, and felt the need for a improvement in the process by ICT application, leads to e-governance implementation in universities. E-governance can be implemented by four dimensions (i) adaptation and coordination of the public policies; (ii) participatory democracy (of the most representative players in what concerns to the services supply); (iii) creation of cooperative networks (for the implementation of public policies for development); and (iv) access to clear and open informative systems of governance (Leitner, 2003). In spite of large scale efforts e-governance envisaged problems of technological and of organizational nature (Heeks, 2003; Holliday, 2002; Pacific Council on International Policy, 2002; Strejeek & Theil, 2002; Wescott, 2001). These problems are related to People, Process, Culture, and Technology.

This paper considers a state owned university named XYZ which is operating in Orissa, providing higher education to its citizens. The university has implemented an e-Governance system to improve efficiency and effectiveness. This implementation of e-governance also carries a risk along with it, which is spread across the implementation cycle. In this paper the risk prioritization has been done using multi-criteria decision making. The whole of the e-governance project has been broadly divided in to three phase namely ‘planning’ (i.e. before implementation), ‘implementation’ (i.e. during implementation) and ‘maintenance’ (i.e post implementation). In this analysis, we have also tried to find out which is the most risk prone area among the three phases. According to the literature the risk in e-governance can be broadly categories as given below and we have further categories the risks in to three sub risk as mentioned below.

- Technology Risk (TR)
    - Security and Virus treat (SR)
    - Hardware failure(HF)
    - Software Failure (SF)
- Specification Risk
    - GAP in Requirement (GR)
    - User friendliness (UF)
    - Convenience (CN)
- Planning Risk
    - Cost (CO)
    - Time (TI)
    - Change (CH)
- Organization Risk
    - People participation (PP)
    - Citizen Participation (CP)
    - Organization Culture (OC)
- Structure Risk
    - Process Rigidity (PR)
    - Fear of losing Power (FP)
    - More Accountability (MA)

Analysis:

As per ANP paired comparisons of homogeneous elements is required, using 1 to 9 fundamental scale of absolute numbers to compare two alterative with respect to attribute, with the smaller or lesser alterative as the unit of for that attribute. To estimate the larger one as a multiple of that unit, one assigns to it an absolute number from the fundamental scale. This process is done for every pair. Rather then assigning two numbers wi and wj and forming wi/wj, we assign a single number 1 to 9 represented the ratio. A basic questionnaire has been prepared and feedback has been taken from a Group of three experts from the University, to find out the relative importance of the risks, mentions above. As stated earlier the whole e-governance has been divided in to three phase i.e Before Implementation, During Implementation and Post implementation. The Before Implementation steps mainly deals with planning phase of e-governance implementation. The consensus feedback on different risks in e-governance with respect others in different phases are represented in below tables and the result of ANP analysis, using ANP software i.e Super decision making software develop by Satty, are represented below from Table 1 to Table 32.

Before Implementation

Table1.

Technology Risk	Security and Virus Threat (SR)	Hardware failure	Software Failure
Security and Virus treat	1	5	7
Hardware failure	1/5	1	1
Software Failure	1/7	1	1

Table 2.

Security and Virus treat	.747038
Hardware failure	.133588
Software Failure	.119373

Inconsistency: .0063

Table 3.

Specification Risk	GAP in Requirement	User friendliness	Convenience
GAP in Requirement	1	2	1
User friendliness	½	1	3
Convenience	1	1/3	1

Table 4.

GAP in Requirement	.371492
User friendliness	.207342
Convenience	.421166

Inconsistency: 00

Table 5.

Planning Risk	Cost	Time	Change
Cost	1	3	3
Time	1/3	1	3
Change	1/3	1/3	1

Table 6.

Cost	.428571
Time	.428571
Change	.142857

Inconsistency: .000

Table 7.

Organization Risk	People participation	Citizen Participation	Organization Culture

People participation	1	6	5
Citizen Participation	1/6	1	2
Organization Culture	1/5	½	1

Table 8.

People participation	.731028
Citizen Participation	.151012
Organization Culture	.117960

Inconsistency: .0445

Table 9.

Structure Risk	Process Rigidity	Fear of losing Power	More Accountability
Process Rigidity	1	1/5	1/7
Fear of losing Power	5	1	1/3
More Accountability	7	3	1

Table 10.

Process Rigidity	.071928
Fear of losing Power	.278954
More Accountability	.649118

Inconsistency: .0624

Table 11

	Technology Risk	Specification Risk	Planning Risk	Structure Risk	Organization Risk
Technology Risk	1	1/3	1/5	1/7	1/9
Specification Risk	3	1	1/3	1/5	1/7
Planning Risk	5	3	1	1/3	1/5
Structure Risk	7	5	3	1	1/3
Organization Risk	9	7	5	3	1

Before Implementation

Table 12.

Technology Risk	Security and Virus treat	Hardware	Software

	(SR)	failure	Failure
Security and Virus treat	1	2	6
Hardware failure	½	1	3
Software Failure	1/6	1/3	1

Table 13.

Security and Virus treat	.612705
Hardware failure	.282787
Software Failure	.104508

Inconsistency: 00

Table 14.

Specification Risk	GAP in Requirement	User friendliness	Convenience
GAP in Requirement	1	4	3
User friendliness	¼	1	1
Convenience	1/3	1	1

Table 15.

GAP in Requirement	.633700
User friendliness	.174359
Convenience	.191941

Inconsistency: .0064

Table 16.

Planning Risk	Cost	Time	Change
Cost	1	1/5	1/9
Time	5	1	1/3
Change	9	3	1

Table 17.

Cost	.683341
Time	.116850
Change	.199810

Inconsistency: .0237

Table 18.

Organization Risk	People participation	Citizen Participation	Organization Culture
People participation	1	2	5
Citizen Participation	½	1	2
Organization Culture	1/5	½	1

Table 19.

People participation	.683341
Citizen Participation	.116850
Organization Culture	.19810

Inconsistency: .0237

Table 20.

Structure Risk	Process Rigidity	Fear of losing Power	More Accountability
Process Rigidity	1	1/5	1/9
Fear of losing Power	5	1	¼
More Accountability	9	4	1

Table 21.

Process Rigidity	.673811
Fear of losing Power	.100654
More Accountability	.225535

Inconsistency: .0824

After Implementation

Table 22.

Technology Risk	Security and Virus treat (SR)	Hardware failure	Software Failure
Security and Virus treat	1	4	5
Hardware failure	¼	1	3
Software Failure	1/5	1/3	1

Table 23.

Security and Virus treat	.673811
Hardware failure	.255535
Software Failure	.100654

Inconsistency: .0824

Table 24.

Specification Risk	GAP in Requirement	User friendliness	Convenience
GAP in Requirement	1	1/7	1/5
User friendliness	7	1	3
Convenience	5	1/3	1

Table 25.

GAP in Requirement	.071927
User friendliness	.649118
Convenience	.278954

Inconsistency: .0624

Table 26.

Planning Risk	Cost	Time	Change
Cost	1	1/5	1/9
Time	5	1	1/3
Change	9	3	1

Table 27.

Cost	.062941
Time	.265433
Change	.671626

Inconsistency: .0280

Table 28.

Organization Risk	People participation	Citizen Participation	Organization Culture
People participation	1	3	5
Citizen Participation	1/3	1	3
Organization Culture	1/5	1/3	1

Table 29.

People participation	.636986
Citizen Participation	.104729
Organization Culture	.258285

Inconsistency: .0370

Table 30.

Structure Risk	Process Rigidity	Fear of losing Power	More Accountability
Process Rigidity	1	1/5	1/9
Fear of losing Power	5	1	¼
More Accountability	9	4	1

Table 31.

Process Rigidity	.666868
Fear of losing Power	.101482
More Accountability	.231650

Inconsistency: .072

In all the cases as per the rule of inconsistency, which is less than .1 is acceptable, which shows that the results are having very little inconsistency. Since the alternative cluster is inner dependent and also self connected, so one of the six clusters are compared pair wise with respect to alternatives. In this case Cluster matrix is required due to inner dependant nature. As the nodes in Alternatives cluster are connected to other nodes in that cluster, it must influence itself. If all the clusters are equally important it is not necessary to make cluster comparisons, and the cluster weights are set to 1/n in the cluster matrix (Saaty, 2012). Then they need to be compared to establish the weights in the cluster matrix represented in Table-32.

Table 32. Cluster Weight with respect to Risk Criterion of the Hamburger Model

	Alternative	Technology	Specification	Planning	Structure	Organization
Alternative	0.200106	0.259742	0.181709	0.287565	0.280092	0.303249
Technology	0.214546	0	0.216606	0.287565	0.196849	0.303249
Specification	0.172300	0.235064	0.194946	0.260363	0.176603	0.262335
Planning	0.123837	0.146753	0.116717	0.164551	0	0
Structure	0.201801	0.211688	0.204573	0	0.247469	0
Organization	0.087410	0.146753	0.085493	0	0.098988	0.131167

Inconsistency: .0536

The Unweighted, Weighted and Limit Super Matrices

There are three super matrices associated with each network: the unweighted super matrix, the weighted super matrix and the limit super matrix. The priorities derived from the pairwise comparisons are entered in the software and the unweighted super matrix is obtained, represented in the Appendix-1. And the weighted super matrix is obtained after taking in put from the cluster weight represented in Table 32. Raising the to powers yields the limit matrix from which the final answers are extracted represented in Table-33. The final priorities for the 'alternatives' are in the column under the 'goal' is represented in Table 33.

Table. 33.

1 Alternative (Before Implementation)	0.148892
2 Alternative (During After Implementation)	0.056015
3 Alternative (Post Implementation)	0.039694
Technology Risk(Security and Virus treat	0.089373
Technology Risk (Hardware failure)	0.051314
Technology Risk (Software Failure)	0.052572
Specification risk (GAP in Requirement)	0.068827
Specification risk User friendliness)	0.097246
Specification risk (Convenience)	0.066555
Planning Risk (Cost)	0.045393
Planning Risk (Time)	0.022098
Planning Risk (Change)	0.016974
Organizational Risk (People participation)	0.078338
Organizational Risk (Citizen Participation)	0.047429
Organizational Risk (Organization Culture)	0.033021
Structural Risk Process Rigidity	0.03448
Structural Risk Fear of losing Power	0.018691
Structural Risk (More Accountability)	0.033089

Discussion

The following risks have been considered during the analysis:

Specification risk User friendliness

Technology Risk(Security and Virus treat

Organizational Risk (People participation)

Specification risk (GAP in Requirement)

Specification risk (Convenience)

Technology Risk (Software Failure)

Technology Risk (Hardware failure)

Organizational Risk (Citizen Participation)

Planning Risk (Cost)

Structural Risk Process Rigidity

Structural Risk (More Accountability)

Organizational Risk (Organization Culture)

Planning Risk (Time))

Structural Risk Fear of losing Power

Planning Risk (Change))

As per the analysis, "specification risk" is more vital compared to the other risks, so specification risks, which deals with specifically enough care must be taken towards the 'user friendliness' in order to reduce the risk of failure. It deals with user friendliness of both software and Hardware, so that the user will be motivated to work, which will enhance the rate of success and reduce failure rate. Next risk is technological risk, which deals with security aspect of the system, enough care should be taken to make the system safe and secure enough, which also reduce the risk of failure. The other risks are also important, which also needs to be carefully examine, which definitely reduce risk and increase rate of success. As per the analysis the planning phase is more risk prone than the other two phases, so enough care if taken at the early stage i.e. the planning stage then the rate of failure or the risk failure can be marginalize and a better performance from the e-governance will be achieved. This will enhance the usability and efficiency in the e-governance system.

Conclusion

E-governance projects risks identification and its Prioritization results in better management of projects results in increase in reducing failure rates. As this gives a better picture of risks involve which helps the manager to manage the project in a better way, reduces the failure and focuses more on better utilization of resources towards better management of e-governance.

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Appendix 1

Un weighted Super Matrix:

	1	2	3	4	5	6	7	8	9
1 Alternative	0	0.166667	0.832999	0.756	0.735	0.735	0.696	0.705	0.705
2 Alternative	0.5	0	0.167001	0.188	0.207	0.207	0.229	0.211	0.211
3 Alternative	0.5	0.833333	0	0.056	0.058	0.058	0.075	0.084	0.084
Technology Risk	0.747038	0.612707	0.673811	0	0	0	0.118822	0.468124	0.1959
Technology Risk	0.133588	0.282785	0.225535	0	0	0	0.207921	0.360656	0.361048
Technology Risk	0.119373	0.104508	0.100654	0	0	0	0.673267	0.17122	0.443053
Specification risk	0.371492	0.6337	0.071939	0.244924	0.523179	0.421569	0	1	0
Specification risk	0.207342	0.174359	0.649091	0.573604	0.302428	0.207843	0.5	0	0
Specification risk	0.42116	0.191941	0.27897	0.181472	0.174393	0.370588	0.5	0	0
Planning Risk	0.428571	0.683341	0.06294	0.729977	0.623751	0.536667	0.333333	0.333333	1
Planning Risk	0.428571	0.20623	0.265421	0.196796	0.220866	0.306667	0.333333	0.333333	0
Planning Risk	0.142857	0.069817	0.671639	0.073227	0.155833	0.156667	0.333333	0.333333	0
Organizational Risk	0.701028	0.527823	0.683341	0.493	0.487636	0.527473	0.333333	0.268	0
Organizational Risk	0.151012	0.332223	0.104725	0.311	0.318497	0.332667	0.333333	0.615	0
Organizational Risk	0.11796	0.139954	0.258292	0.196	0.193867	0.13986	0.333333	0.117	0
Structural Risk	0.071927	0.594	0.666865	0.533639	0.606142	0.554264	0.333333	1	0
Structural Risk	0.278941	0.249	0.101479	0.250765	0.272663	0.333333	0.333333	0	0
Structural Risk	0.649113	0.157	0.231656	0.21156	0.121495	0.112403	0.333333	0	1

Unweighted Super Matrix (Contd..)

	10	11	12	13	14	15	16	17	18
1 Alternative	0.717	0.77	0.731	0.742	0.731	0.667	0.625626	0	0
2 Alternative	0.205	0.162	0.188	0.183	0.188	0.222	0.238238	0	0
3 Alternative	0.078	0.068	0.081	0.075	0.081	0.111	0.136136	0	0
Technology Risk	0.362121	0.220762	0.25	0.539072	0.539072	0.609148	0.5	0	0
Technology Risk	0.425875	0.260184	0.25	0.230694	0.230694	0.195426	0.25	0	0
Technology Risk	0.212121	0.519054	0.5	0.230694	0.230694	0.195426	0.25	0	0
Specification risk	0.667	0.75	0.75	0	0	0	0	0	0
Specification risk	0.333	0.25	0.25	1	1	1	1	0.2	0.25
Specification risk	0	0	0	0	0	0	0	0.8	0.75
Planning Risk	0	1	0	0	0	0	0	0	0
Planning Risk	0	0	1	0	0	0	0	0	0
Planning Risk	0	0	0	0	0	0	0	0	0
Organizational Risk	0	0	0	0	1	0	0	0	0
Organizational Risk	0	0	0	0.5	0	0	0	0	0
Organizational Risk	0	0	0	0.5	0	0	0	0	0
Structural Risk	0	0	0	0	0	0	0	0.292469	0
Structural Risk	0	0	0	0	0	1	0	0	0
Structural Risk	0	0	0	0	0	0	0	0.707531	0