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Supplier's' Selection in Supply Chain with Combined QFD and ANP Approaches *(Case study)*

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Abstract

Supplier decisions are one of the most important aspects that firms must incorporate into their strategic processes. Buyer-supplier relationships play a key role in the success and effectiveness of a supply chain. The aim of this study was to develop an integrated analytical approach, combining quality function deployment (QFD) and analytic network process (ANP) approach, to evaluate the performance of suppliers. The effectiveness of the proposed approach is demonstrated by applying it to water industrial (East Azerbaijan Regional Water Company), questionnaires had been distributed to gather data for this study among experts in East Azerbaijan Regional Water Company. The findings indicated that supplier P.A.S with a 0.3010 weight score, is the first choice for the supply of strategic Items, supplier "Generator Dynamic" with a 0.2456 weight score, is the first choice for the supply of leverage Items supplier "Color Pars" with a 0.3338 weight score, is the first choice for the supply of average Items, Criterion "Quality" with a 0.2113 weight score, is the most important criterion in the selection of a supplier's offer. Sub-Criterion "Innovation and technical skills" with a 0.15096 weight score, is the most important Sub-criterion in the selection of a supplier's offer.Finally suggestions presented.

Keywords: Supply chain management, supplier selection, quality function deployment, analytic hierarchy process (AHP), analytic network process (ANP).

Introduction

Today's competitive world According to Sophisticated customer expectations, organizations are faced with customers who want to see an increase in product variety, lower costs, better quality and more fast access to product[1]. Supply chain management (SCM) is a favorite topic today. Firms are using effective SCM to support their multiple manufacturing goals such as flexibility, cost, quality and delivery[2]. With the increasing significance of the purchasing function, purchasing decisions become more important. As organizations become more dependent on suppliers the direct and indirect consequences of poor decision making become critical. For example, in industrial companies, purchasing's share in the total turnover typically ranges between 50-90%[3]. In most industries, the cost of raw materials and component products is a major portion of the cost of the product . In such circumstances, the procurement can play a key role in the efficiency and Effectiveness organization, and which has a direct influence on reducing costs, benefits and flexibility of a company[4]. In fact, a right selection of suppliers to work with them on something is very important and vital to the success of a company, has being focused on supplier selection during many years[5]. More recently the concept of supply chain management, researchers, scientists and managers have realized that choosing a suitable supplier and it is the means by which it can be used to increase the competitiveness of the supply chain. So the important issue of selecting supplier in supply chain is an important and strategic decision[6]. Supplier decisions are one of the most important aspects that firms must incorporate into their strategic processes[7]. Buyer-supplier relationships play a key role in the success and effectiveness of a supply chain[8]. However, organizations often face the problem of choosing appropriate suppliers[9,10]. The importance of the selection of suppliers for an organization has been stressed in the literature[11]. The supplier selection problem requires the consideration of multiple objectives, and hence can be viewed as a multi-criteria decision-making (MCDM) problem. many more methods and procedures, including simple weighted rating, AHP, multi-attribute utility theory, mathematical programming, game theory, principal components analysis and neural networks, have also been suggested in the literature[12,13]. Choosing the right suppliers involves consideration of many quantitative and qualitative factors other than price alone. Several approaches have been proposed for supplier selection, which also consider multiple and conflicting criteria. However, they have not considered the impact of business objectives and requirements of company stakeholders in identifying criteria for supplier selection. This paper develops an integrated analytical approach for selecting suppliers strategically using a combined QFD and ANP approach. During the QFD implement process, the Analytic Hierarchy Process (AHP) has been used to determine the relative importance weights between criteria or the intensity of the relationship between the row and column variables of each matrix[14,15]. Like many mu1tiple criteria decision-making (MCDM) methods, the AHP is based on the independence assumption, but each individual criterion is not always completely independent[16]. For solving the interactions among elements, the ANP (Analytic Network Process) as a new MCDM method was proposed by saaty. The ANP is the mathematical theory that can deal with all kinds of dependences systematically[17]. In the approach, multiple evaluating criteria are derived from the requirements of company stakeholders using a series of house of quality (HOQ). The importance of evaluating criteria is prioritized with respect to the degree of achieving the stakeholder requirements by using ANP, which can be the Innovation of this paper. Based on the ranked criteria, potential suppliers are evaluated using ANP again to make an optimal selection. The aim of this study was to evaluate the performance of suppliers to satisfy company needs, determine the needs and desires of the stakeholders, select the best suppliers and obtain the evaluation criteria of the stakeholders needs.

Quality Function Deployment (QFD): Quality function deployment (QFD) is a key tool for application of (contemporary) concurrent engineering and implementing total quality management (TQM). The concept of QFD was created by Akao in Japan in the late 1960s. QFD was initially developed and implemented in Japan at the Kobe Shipyards of Mitsubishi Heavy Industries in 1972. Japanese companies used to copy and imitate product development; nevertheless, they decided to move their approach to one based on originality. It was observed that Toyota was able to reduce start up pre-production costs by 60% from 1977 to 1984 and to decrease the time required for its development by one-third through the use of QFD[18]. The QFD was offered to collect and analyze the voice of the customer for improving products or developing new products with higher quality to meet customer's needs. The QFD is an integrated planning method that can assure and improve the alignment of elements of design processes with the requirements of customers, as well as it is a managerial philosophy that can help Promotion the organizational and managing effects. Especially, QFD employs a cross functional team to plan and design new or improved products through a structured and well-documented framework[19]. In Comparison with traditional requirements of engineering methodologies, benefits of using QFD are such as: Transfer the voice of the customer into the process; waste disposal and creates flexibility; supports customer-oriented decisions of design process; determines objectives and focus on the essential; takes interests of various groups into account; systematizes communication and provides for continuity and responsiveness; creates transparency and makes coordination processes easier in the organizations; and speeds up development process. According to the results of a large research of literature review it represents that functional areas of QFD are extensively wide such as customer needs analysis, product development, quality management, product design, planning, decision making, engineering, management, teamwork, timing, and costing. In addition, QFD has been applied in various industries such as transportation, communication, electronics, electrical utilities, software systems, manufacturing, services, education, and research. In practical, QFD consists hierarchically of several[20]. In the QFD process the house of quality (HOQ) matrix Indicative the relationship between the voice of the customers (WHATs) and the quality characteristics (HOWs). The essence of QFD is the employment of the two-dimension HOQ which converts the WHATs into the HOWs. There are seven elements of the HOQ[21]. as shown in figure 1. These seven elements include: i. WHATs are the initial inputs for the HOQ, which are obtained from the information by business research and analysis; ii. HOWs denotes the means for WHATs; iii. Relationship Matrix implies relationships between WHATs and HOWs, which expresses how much each HOW affects each WHAT; iv. Correlation Matrix of WHATs indicates inner dependence among the WHATs; v. Relative Importance of WHATs denotes relative weights of the WHATs; vi. Correlation Matrix of HOWs indicates inner dependence among the HOWs; and vii. Overall Priorities of HOWs denotes the synthesized importance of the HOWs.

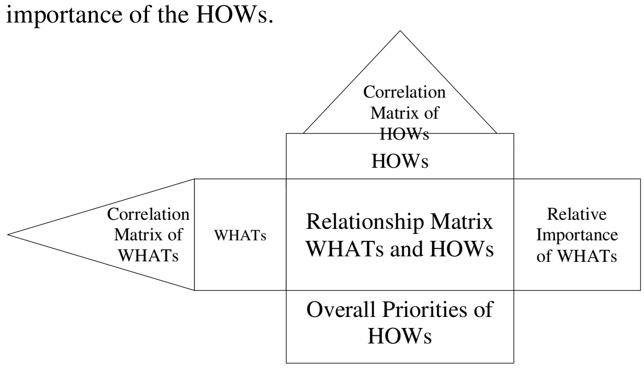

Figure-1
The Components of HOQ

Analytic Network Process (ANP): The ANP is the most comprehensive approach for the analysis of corporate decisions. In analysis Network process model, is possible both interaction and feedback within clusters of elements (inner dependence) and between clusters (outer dependence), and provides a general framework to deal with decisions without making assumptions about the independence of higher level elements from lower level elements or the independence of the elements within a level as in a hierarchy. In fact, the ANP uses a network of elements without need to particularly levels[22]. When faced with situations that require multiple-criteria decision-making have, it is useful to utilize MCDM method to solve this complex problem. There are many MCDM methods that have been developed such as ELECTRE, TOPSIS, AHP, etc., but these approaches do not consider the interdependence among criteria and alternatives. For dealing with the interdependence among elements, the ANP as a new MCDM method was introduced by saaty. The ANP is a generalization of the Analytic Hierarchy Process (AHP). As is well-known, AHP is a beneficial approach which is developed to cope with the problems in dealing with human judgments, when we're dealing with multi-criteria and group decision making with respect to a set of options. For using the AHP, elements of a decision-making problem are structured into a multiple-level hierarchy. Then the AHP uses ratio scales to derive relative priorities for a set of elements by making paired comparisons. There are some limitations of the

AHP which need to be cleared up. Particularly important is that the AHP includes an assumption about the independence among elements under a hierarchical structure. To solve the independence assumption of the AHP, the ANP was proposed by Saaty. Particularly, the ANP is a new theory that extends the AHP to deal with dependence in feedback, and utilizes the super matrix approach. Despite both the AHP and the ANP derive ratio scale priorities by making paired comparisons, there are some differences between them including[17]: i. AHP is a special case of the ANP, because the ANP handles dependence within a cluster (inner dependence) and among different clusters (outer dependence). ii. ANP is a nonlinear structure, while the AHP is hierarchical and linear with a goal at the top level and the criteria and alternatives in the bottom level[23]. ANP be differentiated into two kinds of models, namely, the Feedback System model and the Series System model. When the structure of the decision, there is inner dependence between the elements, the Series System model can be expressed as the way that the goal controls a series of clusters with their own loops.

The steps analytical procedure for the ANP, including: i. model construction and problem structuring; ii. pairwise comparison; iii. super matrix formation; and iv. selection of best alternatives.

Combination of Quality Function Deployment (QFD) and Analytic Network Process (ANP): Given that, the use of the AHP technique to determine the representation of the voice of the customer in the HOQ is consolidated[19]. The use of ANP model in the HOQ is still quite limited. Quality function deployment approach and Analytic Network Process, have been used together to estimate non-market net. In formulating goal programming models that include multiple qualitative goals, a method based on pairwise comparison such as AHP and ANP looks to be an effective means for assessing relative weights[24]. In the ANP method the stakeholders Needs and evaluating Factors are the network nodes, and ANP was used to estimate the importance of these nodes. The ANP outcomes were used to complete the HOQ. Moreover, it has to be underlined that the use of ANP in the HOQ is particularly rare in the evaluation and supplier selection. The ANP network most commonly used in combination with the HOQ is shown in figure 2 and figure 3. Its structure consists of four clusters: the cluster of the goal, the cluster of the stakeholders Needs, the cluster of the evaluating Factors, and the cluster of the Alternatives. This structure is hierarchical with inner dependence within components and no feedback. The stakeholders needs correspond to the criteria, whereas the evaluating Factors correspond to the Sub- Criteria. Both of which have inner dependence within themselves. Evaluating Factors must beevaluated according to their contribution to satisfy each stakeholder need; however, there is no feedback, so the stakeholders Needs are not dependent on the evaluating Factors. The HOQ matrix forms the basis for putting the network model ANP. With little change in the super-matrix and diagram ANP model, super-matrix and diagram QFD model as follows:

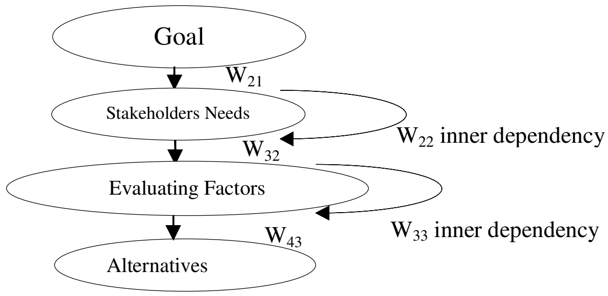

Figure-2
Show Network Model HOQ

$$W_n = \begin{array}{l c} & \begin{array}{cccc} G & SNs & EFs & A \end{array} \\ \begin{array}{l} \text{Goal (G)} \\ \text{Stakeholder Needs (SNs)} \\ \text{Evaluating Factors (EF}_s\text{)} \\ \text{Alternatives (A)} \end{array} & \begin{bmatrix} & 0 & 0 & 0 \\ W_{21} & W_{22} & 0 & 0 \\ 0 & W_{32} & W_{33}\ 0 & 0 \\ W_{43} 0 & & & \end{bmatrix} \end{array}$$

Figure-3
The unweighted super matrix HOQ

where W_{21} is a vector that represents the impact of the goal on the stakeholders needs, W_{22} is a vector that represents the impact of the stakeholders needs of each other, W_{32} is a matrix that represents the impact of the stakeholders needs on each of the evaluating Factors, W_{33} is a matrix that represents the impact of the evaluating Factors of each other, W_{43} is a matrix that represents the impact of the Alternatives on each of the evaluating Factors, and I is the identity matrix.

Some research has also by AHP been used to determine the degree of importance of customer needs[25,26]. Partovi and Corredoira[27] offered a QFD model based on ANP for prioritizing and designing rule changes for the game of soccer with the aim of making it more attractive to soccer enthusiasts. Partovi[15] presents an analytical method for quantifying Heskett ''Strategic service vision''. In this model, The AHP is used to determine the degree of importance the relationship between the row and column variables of each matrix, while ANP is used to determine the intensity of synergy effects among column variables. More recently, Karsak[9] using a combined ANP and goal programming approach for realize the product planning in QFD. Partovi[14] has used the combination of AHP and QFD technique, known as AHP-QFD approach, to assist inevaluting and project selection. Partovi usesAHP as a tool for quantifying the intensity of the relationships between CRs and design specifications. In a study by Lam and Zhao[28], the combination of AHP and QFD was used to identify the appropriate teaching techniques.

Research Methodology

The proposed approach is applied to evaluate supplier in East Azarbaijan Regional Water Company. East Azarbaijan Regional Water Company is an engineering company which works in the field of water supply and demand management, industry and agriculture. Given that the key tool of QFD is the matrix, we focus on the series of interactive matrices and therefore apply the supermatrix of the ANP in order to perform our proposed method. In the proposed method, it incorporates several QFD matrices into a supermatrix based on the Series System model (figure 2). The proposed method is mainly divided into two phases as follows. Phase 1) Using QFD to develop decision structure and Obtain the evaluation criteria, in this phase, it begins with define the decision goal and the way to identification stakeholders needs obtained through interviews. Next, it is necessary to collect relevant information, evaluation criteria, and the alternatives. Then, these decision elements are structured into a two dimension HOQ (figure 6) through the QFD methodology. Where the first HOQ translates the stakeholder needs into evaluating factors, and then the second HOQ converts the evaluating factors into the alternatives. It is more convenient for the calculations with the super matrix of the ANP. Phase 2) Using ANP to prioritize alternative, it is required to employ Saaty's nine-point scale for making all paired comparisons of decision elements, and then to incorporate all sub-matrices into the super matrix (figure 5) which is a hierarchy structure with two levels including inner dependences. Through performing calculations with the super matrix of the ANP, finally the overall priorities of alternatives obtained. For the calculations of the super matrix, we have solved it with the using the professional software named "Super Decisions" provided by the Creative Decisions Foundation. Super decisions" software is able to calculate the inconsistency ratio for each comparison matrix. The inconsistency measure is useful for identifying possible errors in judgments as well as actual inconsistencies in the judgments themselves. In general, the inconsistency ratio should be less than 0.1 29. In this study, the rate of inconsistency all comparison matrix is less than 0.1.

Results and Discussion

Method application: The company requires to 3 types of items, including: strategic items, leverage items and average items. Each of these items has 5 suppliers. The first, to evaluate and select the best supplier, the company stakeholders who have a say in supplier selection were identified. In this case, there were four categories or departments: finance, procurement, operational and implementation of projects, and the improvement of managerial and organizational. To determine the needs and desires of the stakeholders, in the QFD model, the interview method was used. According to research, through interviews with about 20 people, about 80 percent of customers' needs can be identified. In this study, during a meeting with experts of concerned departments, their needs and aspirations collected and analyzed, and were used as HOQ matrix input. The questionnaire is the tool of data collection. Questionnaires were broadcasted among 15 experts of relevant departments to determine the weights of (Stakeholders needs, the evaluation factors and options). Inconsistency rates, all paired comparisons matrices are 3 levels (stakeholder needs, evaluation factors, options) is less than 0.1, indicates that the questionnaire is reliability. Stakeholder needs have been presented, in table 1.

In their modified QFD model, we employ the way of traditional two-dimension HOQ. That is, the first HOQ translates the stakeholder's needs into the evaluating factors; the second HOQ converts the evaluating Factors into the Alternatives. After review by QFD team the needs and aspirations of stakeholders (experts and academic professors) were translated based on scientific and the evaluation factors in this way were extracted. Evaluating factors translated from stakeholder needs have been presented, in table 2.

After obtaining the evaluation criteria, in second HOQ, be attempted to select the most suitable suppliers according to criteria to be achieved. Super Decision software is used for data analysis and extracts the results ANP model. In the first phase, it is a good way to extend and incorporate ANP and QFD approaches into a two-dimension HOQ (figure. 6). In the second phase, those two supermatrices can be combined into just one super matrix to calculate the overall priorities of alternatives. Hence, all the estimations about criteria, sub-criteria, and alternatives, that are arranged into an integrated form (table 6) of the unweighted supermatrix. Then, by raising the unweighted supermatrix to the power until the columns stabilize and become identical in each block of sub-matrixes, the same result (table 6).

Table-1
Descriptions of company stakeholder requirements

Stakeholder requirements	Description
Modern Technology(c_1)	Suppliers providing products and services are asked to have the capability to utilize Modern Technology.
Established business and financial stability(c_2)	Suppliers must be financially sound and credit worthy. Prospective suppliers should be in business for a period of time.
3 - Reliability of order fulfillment(c_3)	Reliability of order fulfillment consists of the accuracy of quantity fulfillment, the accuracy of due date fulfillment, and reliability of delivery time.
4 - Price(c_4)	The amount of money paid to obtain anything.
5 - Risk management(c_5)	Suppliers should have a process for identification and management of potential risks to the continual supply of products. They should be able to handle unexpected situations.
6 - Quality(c6)	Suppliers are accountable for the quality and reliability of products and services.

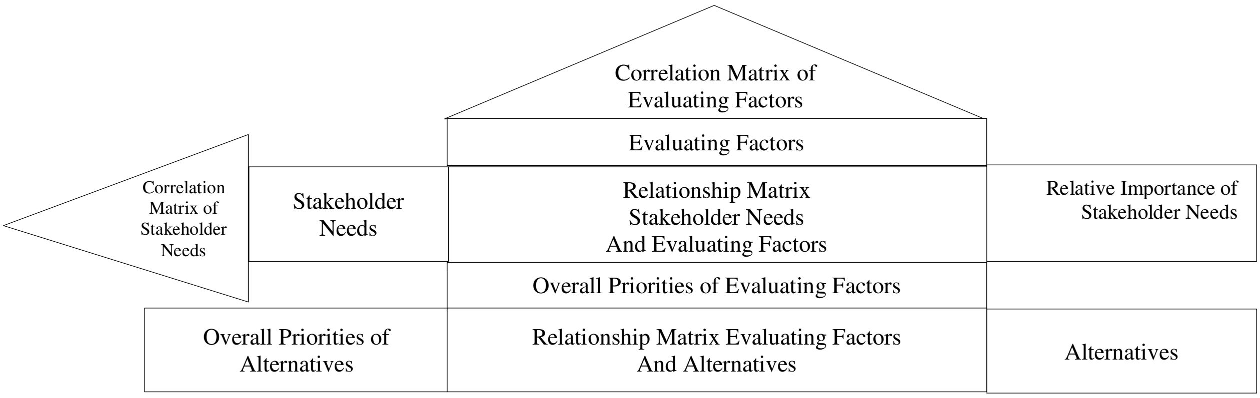

Figure-4
Two-dimensional matrix of HOQ

Table-2
A list of criteria to evaluate suppliers, translated from stakeholder needs

Stakeholder requirements	Evaluating Factors
1 - Modern Technology(c_1)	(S13)Comprehensive information system - Innovation and technical skills - (S18) Human Resources Specialist - (S8) Can be managed.
2 - Established business and financial stability(c_2)	(S12) Favorable market - (S15) Evidence of tax payments and insurance - (S22) Good turnover - Comprehensive information system - (S17) Innovation and technical skills
3 - Reliability of order Fulfillment (c_3)	Capacity and inventory management - (S6) Timely delivery - Flexibility in adapting to changes - Approved packaging - (S11)Has a good reputation
4 - Price(c_4)	(S21) Reduce the cost - (S1) Discounts offered
5 - Risk management(c_5)	(S20) Reduction in customer complaints (stakeholders) - (S3) Flexibility - in adapting to changes - (S9) The ability to predict future changes - (S19) Reduce delays - Innovation and technical skills - (S16) Capacity and inventory management
6 - Quality(c_6)	(S2) Product reliability - (S14) Quality assurance system - (S5) Approved packaging - (S7) Compliance with the standards set - (S4) Compliance with safety and environmental - (S10) Services

Tabel-3
Prioritizing suppliers of strategic items

Graphic	Alternatives(strategic Items)		Total	Normal	Ideal	Ranking
	A4	P.A.S	0.0501	0.3010	1.0000	1
	A5	Industry KosarEspadana	0.0355	0.2133	0.7087	2
	A1	spiral Iran	0.0326	0.1959	0.6509	3
	A2	PE pipe	0.0241	0.1451	0.4822	4
	A3	PE Kosar	0.0240	0.1444	0.4797	5

Tabel-4
Prioritizing, suppliers leverage items

Graphic	Alternatives (leverage Items)		Total	Normal	Ideal	Ranking
	A4	PE Semnan	0.041	0.2456	1.0000	1
	A5	GeneratorDynamic	0.038	0.2335	0.9507	2
	A2	Forging	0.036	0.2295	0.9342	3
	A1	Jmkv	0.030	0.1759	0.7160	4
	A3	Rakhsh Kurdish forc	0.019	0.1153	0.4694	5

Tabel-5
Prioritizing suppliers of average items

Graphic	Alternatives(Average Items)		Total	Normal	Ideal	Ranking
	A4	Color Pars	0.0583	0.3338	1.0000	1
	A5	Kianpershia	0.047	0.2888	0.8649	2
	A1	araz	0.023	0.1514	0.4537	3
	A3	mirab	0.019	0.1167	0.3497	4
	A2	Farnambespar	0.017	0.1090	0.3256	5

Table-6
The UNwieghted Super matrix

		Goal 1	Criteria 2						Sub-criteria 3										
		n	C1	C2	C3	C4	C5	C6	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
Goal 1	Selection supplier	00	00	00	00	00	00	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Criteria 2	C1	0.171	00	0.082	0.183	0.151	0.094	0.377	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C2	0.061	0.213	00	0.121	0.251	0.146	0.105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C3	0.096	0.212	0.162	00	0.088	0.211	0.174	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C4	0.143	0.299	0.230	0.071	00	0.184	0.251	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C5	0.104	0.124	0.262	0.546	0.059	00	0.091	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C6	0.423	0.150	0.262	0.077	0.448	0.362	00	00	00	00	00	00	00	00	00	00	00	00
Sub-criteria 3	S1	00	00	00	00	0.249	00	00	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.121	0.13
	S2	0.0	0.0	0.0	0.0	0.0	0.0	0.094	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S3	0.0	0.0	0.0	0.138	0.0	0.175	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S4	0.0	0.0	0.0	0.0	0.0	0.0	0.177	0	0.166	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S5	0.0	0.0	0.0	0.0	0.0	0.0	0.044	00	0.0	0.0	0.10	0.0	0.0	0.0	0.0	0.0	0.0	0.07
	S6	0.0	0.0	0.0	0.573	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.13
	S7	0.0	0.0	0.0	0.0	0.0	0.0	0.177	00	0.333	0	0.358	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S8	0.0	0.074	0.0	0.0	0.0	0.0	0.0	00	0.0	0.169	0.0	0.0	0.0	0.0	0.0	0.285	0.0	0.07
	S9	0.0	0.0	0.0	0.0	0.0	0.056	0.0	00	0.0	0.338	0.0	0.224	0.0	0.0	0.0	0.0	0.0	0.1
	S10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.12
	S11	0.0	0.0	0.0	0.128	0.0	0.0	0.0	0.259	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S12	0.0	0.069	0.0	0.0	0.0	0.0	0.0	0.412	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.18
	S13	0.0	0.272	0.272	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.151	0.239	0.0	0.0	0.285	0.0	0.0
	S14	0.0	0.0	0.0	0.0	0.0	0.0	0.414	0.0	0.333	0.204	0.301	0.228	0.0	0.0	0.0	0.0	0.0	0.0
	S15	0.0	0.0	0.074	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S16	0.0	0.0	0.0	0.159	0.0	0.056	0.0	0.0	0.0	0.0	0.0	0.0	0.395	0.0	0.0	0.0	0.0	0.0
	S17	0.0	0.358	0.427	0.0	0.0	0.412	0.0	0.0	0.166	0.287	0.230	0.0	0.0	0.0	0.0	0.142	0.0	0.0
	S18	0.0	0.293	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.224	0.168	0.0	0.0	0.285	0.0	0.06
	S19	0.0	0.0	0.0	0.0	0.0	0129	0.0	0.0	0.0	0.0	0.0	0.0	0.197	0.0	0.0	0.0	0.0	0.0
	S20	0.0	0.0	0.0	0.0	0.0	0.169	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.12
	S21	0.0	0.0	0.0	0.0	0.750	0.0	0.0	0.0	0.0	0.0	0.0	0.172	0.0	0.0	0.0	0.0	0.0	0.0
	S22	0.0	0.0	0.156	0.0	0.0	0.0	0.0	0.327	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alternatives 4-1	A1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.297	0.239	0.217	0.208	0.124	0.175	0.117	0.196	0.150	0.200	0.26
	A2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.157	0.127	0.122	0.128	0.079	0.235	0.080	0.083	0.261	0.408	0.11
	A3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.297	0.078	0.377	0.110	0.124	0.055	0.052	0.179	0.090	0.106	0.10
	A4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.157	0.134	0.081	0.183	0.218	0.235	0.350	0.359	0.460	0.063	0.48
	A5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.088	0.420	0.201	0.369	0.452	0.298	0.399	0.179	0.037	0.222	0.10
Alternatives 4-2	A1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.300	0.164	0.192	0.236	0.173	0.081	0.109	0.274	0.164	0.137	0.14
	A2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.159	0.093	0.465	0.100	0.042	0.148	0.280	0.262	0.096	0.137	0.42
	A3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.098	0.266	0.058	0.063	0.112	0.250	0.109	0.142	0.065	0.037	0.24
	A4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.280	0.052	0.103	0.204	0.528	0.081	0.065	0.058	0.523	0.245	0.13
	A5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.159	0.422	0.180	0.395	0.143	0.438	0.435	0.262	0.151	0.441	0.05
Alternatives 4 -3	A1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.171	0.210	0.162	0.184	0.154	0.146	0.111	0.123	0.118	0.085	0.13
	A2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.088	0.195	0.059	0.184	0.087	0.086	0.066	0.123	0.056	0.085	0.08
	A3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.171	0.405	0.094	0.097	0.320	0.135	0.111	0.072	0.203	0.053	0.04
	A4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.479	0.075	0.162	0.184	0.144	0.059	0.383	0.449	0.406	0.387	0.46
	A5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.088	0.112	0.521	0.349	0.292	0.572	0.326	0.231	0.214	0.387	0.28

Table-7
The Unwieghted Super matrix

		Sub-criteria 3											Alternatives 4-1 (strategic Items)					Alternatives 4-2 (Leverage Items)					Alternatives4-3 (average Item)				
		S12	**S13**	**S14**	**S15**	**S16**	**S17**	**S18**	**S19**	**S20**	**S21**	**S22**	**A 1**	**A 2**	**A 3**	**A 4**	**A 5**	**A 1**	**A 2**	**A 3**	**A 4**	**A 5**	**A 1**	**A 2**	**A 3**	**A 4**	**A 5**
Goal 1	Selection supplier	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Criteria 2	C1	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C2	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C3	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C4	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C5	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C6	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-criteria 3	S1	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.40	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S2	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.077	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S3	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S4	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.096	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S5	0.078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.084	0.2	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S6	0.155	0.0	0.0	0.0	0.0	0.0	0.0	0.428	0.169	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S9	0.120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.106	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S10	0.131	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.134	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S11	0.171	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.40	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S13	0.070	0.0	0.0	0.0	0.0	0.0	0.0	0.142	0.0	0.0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.134	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.428	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.119	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S21	0.140	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.078	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternatives 4-1	A1	0.186	0.217	0.211	0.136	0.164	0.147	0.165	0.218	0.128	0.320	0.081	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A2	0.108	0.122	0.081	0.086	0.266	0.064	0.089	0.060	0.225	0.277	0.225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A3	0.072	0.377	0.121	0.241	0.052	0.039	0.085	0.128	0.056	0.182	0.386	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A4	0.460	0.201	0.479	0.119	0.422	0.349	0.533	0.192	0.520	0.110	0.225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A5	0.172	0.081	0.105	0.415	0.093	0.399	0.126	0.400	0.069	0.110	0.081	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternatives 4-2	A1	0.164	0.188	0.197	0.188	0.231	0.217	0.212	0.193	0.213	0.090	0.108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A2	0.066	0.487	0.174	0.478	0.080	0.191	0.189	0.078	0.197	0.296	0.060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A3	0.302	0.106	0.048	0.177	0.114	0.115	0.071	0.177	0.080	0.089	0.108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A4	0.151	0.171	0.391	0.097	0.197	0.412	0.479	0.177	0.114	0.089	0.209	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A5	0.315	0.045	0.187	0.058	0.394	0.063	0.047	0.371	0.394	0.434	0.513	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternatives 4-3	A1	0.092	0.121	0.114	0.093	0.094	0.179	0.047	0.075	0.272	0.184	0.069	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A2	0.059	0.056	0.078	0.201	0.094	0.104	0.143	0.225	0.076	0.184	0.132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A3	0.092	0.069	0.105	0.283	0.060	0.097	0.100	0.157	0.136	0.097	0.215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A4	0.448	0.468	0.369	0.177	0.394	0.438	0.289	0.315	0.257	0.349	0.215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A5	0.307	0.283	0.331	0.244	0.356	0.179	0.342	0.225	0.257	0.184	0.365	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table-8
The Final Super matrix

		Goal 1	Criteria 2						Sub-criteria 3										
		Selection supplier	C1	C2	C3	C4	C5	C6	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
Goal 1	Selection supplier	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Criteria 2	C1	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C2	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C3	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C4	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C5	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	C6	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subcriteria 3	S1	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S2	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S3	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S4	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S5	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S6	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S7	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S8	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S9	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S10	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S11	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S12	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S13	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S14	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S15	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S16	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S17	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S18	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S19	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S20	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S21	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S22	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alternatives 4-1	A1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032
	A2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
	A3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
	A4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050
	A5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Alternatives 4-2	A1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
	A2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
	A3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
	A4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
	A5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
Alternatives 4-3	A1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023
	A2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
	A3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
	A4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
	A5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047

Table-9
The Final Super matrix

		Sub-criteria 3											Alternatives 4-1 (strategic Items)					Alternatives 4-2 (Leverage Items)					Alternatives 4-3 (average Item)				
		S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	A 1	A 2	A 3	A 4	A 5	A 1	A 2	A 3	A 4	A 5	A 1	A 2	A 3	A 4	A5
Goal 1	Selection supplier	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Criteria 2	C1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subcriteria 3	S1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	S22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternatives 4-1	A1	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A2	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A3	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A4	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A5	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternatives 4-2	A1	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A2	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A3	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A4	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A5	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternatives 4-3	A1	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A2	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A3	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A4	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A5	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Discussion: The QFD is a Profitable approach that serves as a powerful tool for rationally assuring and improving the alignment of design processes to the customer Needs through a structured and well documented framework. Although many issues will need to use QFD model, however there are problems to calculate the overall priorities and interdependent elements of decision elements. In order to improve those problems, some papers have applied the ANP combined with the QFD, but they do not thoroughly utilize the ANP in their models 30. For example, the AHP model, used to determine the intensity of the relationship between the row and column variables of each matrix. While using the ANP to determine the of synergy effects among column variables. In fact, it is not necessary to use the AHP in those cases. Because the ANP do the same way as the AHP to gain priorities by making paired comparisons of elements, and the AHP is a special component of the ANP. That is, the ANP is more comprehensive than the AHP and free to use for Complex issues and MCDM problems. At least, the super matrix of ANP is enough to deal with both the relationship between the row and column variables and synergy effects among column variables. The ANP has well integrated with the QFD, but it only employs once deployment translation through the super matrix of a hierarchy structure with three levels including inner dependences 24. For enabling ones to tackle the situation with highly complicated issues, in our integrated approach completely utilizes all natures of the ANP through the ways to make all paired comparisons, and to incorporate several deployment translations into the super matrix of a hierarchy structure with four levels including inner dependences. If necessary, the super matrix of a four-level hierarchy structure and the tow dimension HOQ can also be extended to use. Therefore, our integrated approach is more adequate than those above existing methods to cope with complex MCDM matters in the real world. The results indicate that P.A.S supplier with a 0.3010 weight score, is the first choice for the supply of strategic Items (Tabel.3), "Generator Dynamic" supplier with a 0.2456 weight score, is the first choice for the supply of leverage Items (Tabel.4), "Color Pars" supplier with a 0.3338 weight score, is the first choice for the supply of average Items(tabel.5), "Quality" Criterion with a 0.2113 weight score, is the most important criterion in the selection of a supplier's offer. Sub-Criterion "Innovation and technical skills" with a 0.15096 weight score is the most important Sub-criterion in the selection of a supplier's offer.

Conclusion

This paper develops a combined QFD and ANP approach to measure the performance of alternative suppliers. The effectiveness of approach has been demonstrated using a case study of East Azerbaijan Regional Water Company. In the approach, QFD has been used to translate the company stakeholder needs into multiple evaluating factors to select suitable suppliers. ANP was used to determine the importance of evaluating factors and preference of each supplier with respect to each selection criterion. There are many advantages of this integrated approach. First, multiple qualitative and quantitative factors can be considered to evaluate the performance of alternative suppliers. This will ensure that the selected supplier is optimal in terms of lowest cost, highest quality, fastest delivery, greatest flexibility. Second, the evaluating factors are related to the stakeholder requirements of company through the involvement of concerned stakeholders. This ensures the stakeholders Satisfaction. Third, the integrated approach involves a team of people representing various functional departments (finance, procurement, Operational and implementation of projects, and the improvement of managerial and organizational) for supplier selection. The active involvement of these departments can lead to a balanced consideration of the requirements or "what's" at each stage of this translation process. Besides internal stakeholders, this research can also take external stakeholders, such as customers, publics, and government, into consideration. Fourth, sensitivity analysis utility of ANP could be applied here in order to check the effect of changes in the importance levels of various factors on final outcome.The major limitation or drawback of proposed integrated approach is due to ANP. It may take a long time to reach consensus. Decision makers have to compare each cluster in the same level in a pairwise fashion based on their own experience and knowledge. For instance, every two criteria in the second level are compared at each time According to the goal, whereas every two sub-factors of the same criteria in the third level are compared at a time According to the criteria the corresponding criterion. If the consistency ratio exceeds the limit, Decision makers have need to re-evaluate and the pairwise comparisons again. In this study, we have used the ANP combined with the QFD to promote effective decisions regarding the selection of suppliers. Especially, in our integrated approach, the super matrix of a four-level hierarchy structure and the two-dimension HOQ are demonstrated for cope with greatly complicated practical problems. Other similar approaches can be used in other decision-making for effective management of supply chain. Future researches can utilize several other techniques for the evaluation of suppliers in supply chains, including: Fuzzy ANP and QFD integrated approaches, Fuzzy ANP and Fuzzy QFD integrated approaches.

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