Intelligent Decision Support for Evaluating and Selecting Information Systems Projects

Hepu Deng and Santoso Wibowo

Abstract—**This paper presents an intelligent decision support system (DSS) for facilitating the adoption of the most appropriate multicriteria analysis (MA) method in solving the information systems (IS) project evaluation and selection problem. A knowledge base consisting of IF-THEN production rules is developed for assisting with a systematic adoption of the most appropriate MA method through considering the decision maker's requirements in project selection with the efficient use of the powerful reasoning and explanation capabilities of DSS. The idea of letting the problem to be solved determines the method to be used is incorporated into the DSS development. As a result, effective decisions can be made for solving the IS project evaluation and selection problem. An example is presented to demonstrate the applicability of the proposed DSS for solving the problem of evaluating and selecting IS projects in real world situations.**

Index Terms—**Decision Analysis, Decision Support Systems, Information Systems Project Selection, Multicriteria Analysis.**

I. Introduction

Evaluating and selecting information systems (IS) projects to develop and implement is of critical importance to every organization. This is because industrial production, service provisioning, and business administration are all heavily dependent on the smooth operations of IS which are expensive to develop, complex to use, and difficult to maintain. The availability of numerous IS projects, the increasing complexities of these projects, and the pressure to make timely decisions in a dynamic environment further complicate the IS project evaluation and selection process [8].

Evaluating and selecting IS projects in an organization is fundamentally a multicriteria analysis (MA) problem. This is because MA refers to selecting or ranking alternative(s) from available alternatives with respect to multiple, usually conflicting criteria [3, 13, 14, 24]. With the characteristics of the IS project evaluation and selection problem, the MA methodology is well suited for evaluating the overall suitability of individual IS projects in an organization.

Tremendous efforts have been spent and significant advances have been made in MA, resulting in the development of numerous methods for solving various MA problems. These methods are often difficult to classify, evaluate, and compare, because they are developed on various assumptions about the decision maker's preferences with the use of different types of preference information in the problem solving process. Several methods may often appear to be useful for a particular problem. However, different methods usually represent radically different philosophies in problem solving, and choosing an appropriate method for addressing a specific IS project evaluation and selection problem may be complex and challenging due to the nature of a particular problem under consideration and the decision maker's requirements and preference in the decision making process [11, 25]. A decision support system (DSS) capable of facilitating the process of selecting the appropriate MA method in a specific IS project evaluation and selection situation is obviously desirable.

The application of DSS for solving structured and semi-structured problems has become increasingly popular nowadays due to its flexibility and adaptability for tackling various decision situations in an effective and efficient manner [15, 20, 25]. The attractiveness of the DSS in real world settings is more enhanced with the provision of a convenient user interfaces and a direct control of the problem solving process by the decision maker with the availability of various decision making methods.

With the multi-dimensional nature of the IS project evaluation and selection problem and the availability of various MA methods for addressing this problem, the development of DSS capable of integrating existing MA methods into a DSS is obviously an effective means to help the decision maker select specific MA methods in solving a given IS project selection problem. The application of such a DSS would greatly reduce the difficulty and the complexity in the process of selecting specific MA methods for solving the IS project evaluation and selection problem.

Much research has been devoted to the development and application of DSS for solving various decision problems. Archer and Hasemzadeh [1], for example, develop a DSS for solving the project portfolio selection problem. Bastos et al [2] apply an intelligent DSS for helping the decision maker solve their resource allocation problem. Chtourou et al [4] utilize an intelligent DSS to assist managers in machine selection decisions. Lin and Hsieh [15] apply a DSS that incorporates fuzzy theory to deal with uncertainties in strategic portfolio selection. Ozbayrak and Bell [16] utilize a rule based DSS for managing manufacturing parts and tools in a production line. Wen et al [22] apply an intelligent DSS in analyzing a decision situation for enterprise mergers and acquisitions that shows promising results. All these efforts demonstrate that the development and adoption of DSS for addressing various decision problems is of great benefits to organizations in real world settings.

The application of DSS for solving the IS project evaluation and selection problem, however, is not a straightforward solution. This is due to the limitations of the

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existing DSS including (a) the inadequacy in addressing both the characteristics of the problem and the requirements of the decision maker, (b) the lack of flexibility and interactivity required by the decision maker to address a wide range of decision making situations, and (c) the lack of capability to match the most appropriate MA method with the problem involved [5, 7]. To address these limitations, it is desirable to have an intelligent DSS capable of (a) matching the nature of the problem with the requirements of the decision maker, (b) facilitating the adoption of the most appropriate MA method for a specific IS project selection situation, and (c) giving the control of the method selection process to the DSS.

This paper presents an intelligent DSS for facilitating the adoption of the most appropriate MA methods in solving IS project evaluation and selection problems. A knowledge base consisting of IF-THEN production rules is developed for assisting with a systematic adoption of the most appropriate MA method through considering the decision maker's requirements in solving the IS project selection problem with the efficient use of the powerful reasoning and explanation capabilities of DSS. The idea of letting the problem to be solved determines the method to be used is incorporated into the development of the DSS framework. As a result, effective decisions can be made in real world situations for solving the IS project evaluation and selection problem.

In what follows, we first present the general IS project evaluation and selection problem. We then discuss the DSS framework for IS projects selection. A knowledge base consisting of IF-THEN production rules is developed for assisting with a systematic selection of the most appropriate MA methods in a specific IS project evaluation and selection situation. Finally, an example is presented for demonstrating the applicability of the proposed DSS for solving the real IS project evaluation and section problem.

II. The General IS Projects Selection Problem

Organizations frequently faces the IS project evaluation and selection problem [5]. Numerous studies have shown that modern organizations are not able to function effectively and efficiently without appropriate development and implementation of IS projects for satisfying the increasing expectation of the stakeholders for organizational performance. As a result, making the right decision on which IS projects to develop and implement is of critical importance in every modern organization for their profitability and even survivability in today's dynamic environment.

To select the most appropriate IS project for development, the decision maker usually needs to (a) evaluate the performance of all the available IS projects, (b) assess the relative importance of the selection criteria, (c) aggregate the assessments for producing an overall performance index value for each available IS project alternative across all criteria on which a final decision can be made [5, 6].

Numerous MA methods have been developed for solving the IS project evaluation and selection problem. However, it is common in real situations that the decision maker simply applies the method that they are familiar with, not the one that is the most appropriate one giving the nature of the problem and the expectation and requirement of the decision maker. This practice often results in an ad hoc decision being made. To make effective and efficient decisions, the decision maker must carefully choose the method appropriate for the particular problem [3]. In this regard, a systematic framework is required for solving the IS project selection problem.

A specific IS project evaluation and selection problem is usually characterised by (a) the specific expectation and requirements of the decision maker involved, (b) the characteristics of the problem under consideration, and (c) the characteristics of different MA methods available for solving the problem. The requirements of the decision maker vary in form and depth as the decision maker may express their preferences on criteria importance or alternative performance in specific style. The decision maker's judgement skills also vary as different decision makers may use different ways of expressing their preference information. In solving an IS project evaluation and selection problem, the use of different formats is desirable in presenting individual preferences. Multiple preference formats in decision-making help to increase satisfaction levels for both the decision-making process and the decision outcome.

Different MA methods often have different characteristics [7]. The process of matching specific MA methods with the decision maker's requirements in the problem solving process is complex and challenging. Usually only experts in the field are capable of taking full advantage of the MA methods available for solving the general IS project evaluation and selection problem. This is because sophisticated analytical skills are required for the decision maker to identify the problems in regard to their preferences and to match the IS project evaluation and selection problem with an appropriate MA method. To help address this complex and challenging issue in the adoption of appropriate MA methods, it is therefore desirable to develop an intelligent DSS capable of guiding the decision makers to select and use the most suitable MA method for effectively and efficiently solving the IS project evaluation and selection problem.

III. The DSS Framework

Applying DSS for effectively tackling the IS project evaluation and selection problem is not only desirable, but also important. The DSS provides the decision maker with effective mechanisms to better understand the decision problem and the implications of their decision behaviors to the organization by allowing them to interactively exchange information between the system and themselves [5]. Due to the diversity and complexity of the selection criteria, their inter-relationships, and the volume of information, the DSS has to be efficient, effective and flexible for effectively solving the general IS project selection problem.

This section presents a DSS for solving the IS project selection problem. The DSS is designed to help the decision maker choose the appropriate IS project in a flexible and user-friendly manner by allowing the decision maker to input values to express his/her requirements and to fully explore the relationships between the criteria, the alternatives, the methods available and the outcome of the selection process. Through interactive exchange of information between the decision maker and the DSS, the DSS helps the decision maker adopt a problem-oriented approach in the problem solving process in which the DSS lets the problem that it is trying to solve determines the appropriate method it is going to apply [7, 18]. This problem-oriented approach is vital for effectively and efficiently solving the IS project evaluation and selection problem in an organization.

The DSS consists of three major subsystems, namely, (a) the dialogue subsystem, (b) the input management subsystem and (c) the knowledge management subsystem which is consistent with the general architecture of DSS [20]. The dialogue subsystem serves to integrate various other subsystems as well as to be responsible for user-friendly communications between the DSS and the decision maker. The subsystem coordinates all functions or commands selected by the decision maker. The interface allows the decision maker not just to apply one of the available MA methods, but also to edit or visualize the data. To provide flexibility for customizing the system by the decision maker, the interface is designed so that the decision maker can create, modify or eliminate criteria, or even define which criteria he/she intends to inquire about. A decision maker utilizes the database through the dialogue subsystem for analyzing different project alternatives using the knowledge management subsystem.

The input management subsystem organizes and manages all the inputs for solving the IS project evaluation and selection problem. The type and the quantity of data inputs for solving the problem vary typically from one problem to another. These input data can be classified into primary and secondary types. The primary input data include the alternatives, the criteria, the decision matrix, and the pairwise comparison matrices. The secondary data include the criteria weightings. The input data are entered into the system for processing and they can also be edited after they have been entered into the system. It should be noted that the system is flexible to allow new data types to be added to the system due to the possible addition of new MA methods in the DSS.

The knowledge management subsystem manages all the MA methods available in the DSS. For the sake of describing the proposed DSS, six MA methods have been included in the proposed DSS for helping assist the decision maker select the most appropriate MA method in solving a specific IS project evaluation and selection problem. These six methods include the simple additive weighting (SAW) method [12], the technique for order preference by similarity to ideal solution (TOPSIS) method [24], the elimination et choice translation reality (ELECTRE) method [12], the analytical hierarchy process (AHP) method [6], and the fuzzy MA method [9]. One of these MA methods can be invoked directly by the decision maker or selected automatically by the proposed DSS through the knowledge management subsystem.

The proposed DSS consists of six phases, including (a) identification of the decision maker's requirements, (b) determination of criteria weights, (c) determination of performance ratings of alternative IS projects with respect to each criterion, (d) selection of the most appropriate MA method, (e) evaluation of the IS project, and (f) selection of the appropriate IS project alternative. Figure 1 shows the overall DSS framework for solving the IS project evaluation and selection problem.

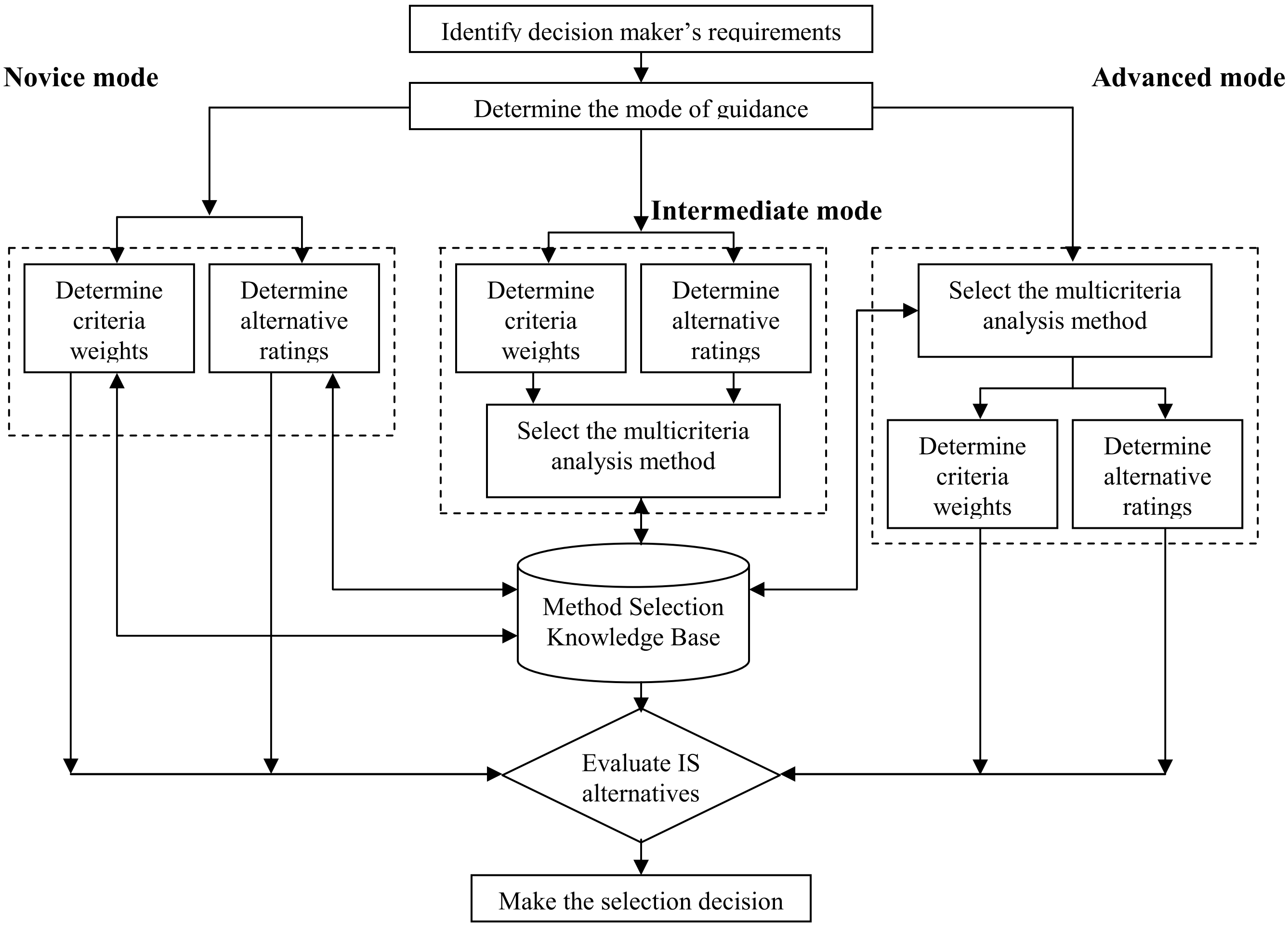

Figure 1 The DSS framework for selecting IS projects

The first phase starts with the identification of the decision maker's requirements in an IS projects evaluation and selection problem. Some of these requirements include (a) the decision maker's preference of a specific MA method, (b) the availability of time of the decision maker, (c) the decision maker's desire to interact with the system, and (d) the desire to allow the system to select one satisfactory solution or for the decision maker to select the best solution [19].

The DSS presents two modes of guidance for the decision maker, namely: (a) a novice mode, (b) an intermediate mode, and (b) an advanced mode. The novice mode is designed for decision maker who is totally unfamiliar with the MA methodology. In the novice mode, the knowledge management subsystem first questions the decision maker on the characteristics of his/her problem and the type of solution he/she expects to receive. Based on the information given by the decision maker, the system then recommends the most suitable method for application. The intermediate mode is used when the decision maker has the knowledge of the various inputs and data and would like to know the available methods that could make use of these inputs. The intermediate mode is activated after all the available inputs were entered and the knowledge management subsystem will search for the methods that match these inputs. The advanced mode is used when the decision maker is highly familiar with various MA methods and he/she is capable of selecting a specific method.

The second phase continues with the determination of basic criteria weights in a specific decision situation. To establish the basic criteria weights, the user interface in the DSS allows the decision maker to experiment with different values of the weights for the criteria and observe the respective effects on the outcome obtained. In practical applications, all the assessments with respect to criteria importance and alternative performance are not always fuzzy. Both crisp and fuzzy data are often present simultaneously in a specific MA problem [4, 10, 23, 24]. Each criteria weight can be assigned as crisp numbers or linguistic terms depending on the preference of the decision maker. To maintain the effectiveness of data evaluated, crisp numbers in the range of 1 to 9 can be used to represent the decision maker's quantitative assessments. Linguistic terms are available for use to the decision maker with a need to know their corresponding fuzzy representations. In case the decision maker is not sure which linguistic values to choose, a defaulted linguistic value scale is presented. If the terms used in the scale are different from the terms the decision maker wants for criteria weighting, the proposed DSS tries to match the scale the decision maker wants with the existing scale in the knowledge base according to the number of terms used in the scale. Therefore, even the verbal terms used in our knowledge base are in the universe U = {excellent, very high, high to very high, high, fairly high, medium, fairly low, low, low to very low, very low, none} [24], it can easily be adjusted to accommodate the nature of the criteria in the decision making process.

The performance ratings of alternative IS projects with respect to each criterion are to be determined next. In practical situations, the criteria may include both quantitative and qualitative measures that satisfy the requirements of the decision maker. To reduce the cognitive burden on the decision maker, a knowledge base consisting of IF-THEN production rules is used for assisting with a systematic selection of the most appropriate MA methods in a specific IS project evaluation and selection situation. These IF-THEN rules explicitly reflect the effect of the requirements of the decision maker, and the characteristics of the IS project evaluation and selection problem on the most suitable MA method for handling the IS project evaluation and selection problem. Each rule takes the form of: IF <*requirement*> THEN <*outcome*> where *requirement* describes the requirements of the decision makers and the characteristics of the IS project evaluation and selection problem, and *outcome* represents the most suitable MA method. The MA methods have different characteristics, different requirements for information and information type as well as different required stages [12, 25]. All these characteristics and requirements are coded in the IF–THEN statements for execution in the DSS. They will be suitable for different types of applications and different requirements and knowledge levels of the decision maker. Table I shows the characteristics of the MA methods available with the requirements of specific IS project evaluation and selection problems. It provides a basis for the decision maker to choose the appropriate MA method for a specific IS project evaluation and selection problem. With the development of the knowledge base, the DSS becomes intelligent in the process of selecting the MA method.

TABLE I PROBLEM REQUIREMENTS AND CHARACTERISTICS OF DIFFERENT METHODS

	SAW	TOPSIS	ELECTRE	AHP	Fuzzy method	Fuzzy MA method
Criteria Weight	Crisp	Crisp	Crisp	Fuzzy	Fuzzy	Fuzzy
Alternative Rating	Crisp	Crisp	Crisp	Fuzzy	Fuzzy	Fuzzy
Criteria information processing	Compensatory	Compensatory	Compensatory	Non-compensatory	Compensatory	Compensatory
Feature	Scoring	Ideal solution	Outranking	Pairwise comparison	Ideal solution	Pairwise comparison
Solution aimed to	Evaluate, prioritize and select	Evaluate, prioritize and select	Evaluate, prioritize and select	Evaluate, prioritize and select	Evaluate, prioritize and select	Evaluate, prioritize and select
Transformation of values to	Common scale	Normalized scale	Normalized scale	Normalized scale	Normalized scale	Normalized scale

For example, a MA method such as the SAW method requires transforming the various performance assessments of alternatives on individual criteria to a common scale for comparison. MA methods such as the ELECTRE method and the TOPSIS method, on the other hand, require only a normalized scale. Another example is that the TOPSIS method deals with crisp criteria weights and alternative rating while a fuzzy method handles both fuzzy data and crisp data. Example of the rules used to match the specific MA method to the requirements of the decision maker is shown in Table II. These rules form the knowledge base for the proposed DSS in solving the IS project evaluation and selection problem.

Once the most appropriate MA method is selected, the next phase in the proposed DSS performs the evaluation of the input values given by the decision maker. The overall performance of each IS project alternative is usually determined by effectively and efficiently aggregating the criteria weights and alternative performance ratings using a specific MA method. The most suitable IS project alternative that fulfils the requirements of the decision maker in a specific problem situation will then be recommended to the decision maker. This leads to effective decisions being made based on the recommendation by the DSS supported by valuable explanation from the DSS.

TABLE II EXAMPLES OF THE RULES

Rules	Conditions
Rule 1:	IF Mode of guidance = "Novice" AND Criteria weight = "1" AND Alternative rating = "3" AND Criteria information processing = "Compensatory" AND Feature = "Scoring" AND Transformation of values = "Common scale" THEN Method = "SAW"
Rule 2:	IF Mode of guidance = "Novice" AND Criteria weight = "3" AND Alternative rating = "2" AND Criteria information processing = "Compensatory" AND Feature = "Ideal Solution" AND Transformation of values = "Normalized scale" THEN Method = "TOPSIS"
Rule 3:	IF Mode of guidance = "Novice" AND Criteria weight = "Very high" AND Alternative rating = "Low" AND Criteria information processing = "Non-compensatory" AND Feature = "Pairwise comparison" AND Transformation of values = "Normalized scale" THEN Method = "AHP"
Rule 4:	IF Mode of guidance = "Novice" AND Criteria weight = "High" AND Alternative rating = "High" AND Criteria information processing = "Compensatory" AND Feature = "Ideal solution" AND Transformation of values = "Normalized scale" THEN Method = "Fuzzy"
Rule 5:	IF Mode of guidance = "Intermediate" AND Criteria weight = "1" AND Alternative rating = "3" THEN Present SAW, TOPSIS, and ELECTRE methods for selection
Rule 6:	IF Mode of guidance = "Intermediate" AND Criteria weight = "High" AND Alternative rating = "High" THEN Present AHP, Fuzzy, and Fuzzy MA methods for selection
Rule 7:	IF Mode of guidance = "Advanced" THEN Present all MA methods for selection

IV. AN EXAMPLE

To demonstrate the applicability of the proposed DSS, the problem of evaluating and selecting a supply chain management (SCM) IS project at a steel mill in Taiwan is presented. This integrated steel mill produces plates, bars, wire rods, semi-finished products, and other steel products. Severe market competition has dramatically transformed the business environment that the mill is in. To be competitive, the mill has to reduce its total costs, maximize its return on investment, shorten the lead times and be more responsive to customer demands [21]. Highly dynamic markets call for effective enterprise IS to enhance its competitive advantage. A SCM system can improve the business effectiveness by collaborating different stages of a supply chain and providing real-time analytical capabilities in production planning. As a result, the top management has made a decision to implement a SCM system to enhance the effectiveness of its global supply chain [17].

The SCM project starts with the formation of a project team involving seven senior managers. Representatives of user departments, information experts and consultants are invited to participate in the team. The team gathered information about the problems of the existing supply chain, industry characteristics, changes of the business environment, and client demands for determining the scope of this project. Based on their findings, four criteria are determined including Strategic Capability, Project Characteristics, IS Project Capability, and Vendor Characteristics [21]. Figure 2 shows the hierarchical structure of the SCM project selection problem in the mill.

Strategic Capability (C_1) refers to the degree of alignment of an IS project with the business strategy of an organization. It includes customer demand support (C_{11}), supply chain capability (C_{12}), domain knowledge support (C_{13}), and supply chain model design (C_{14}).

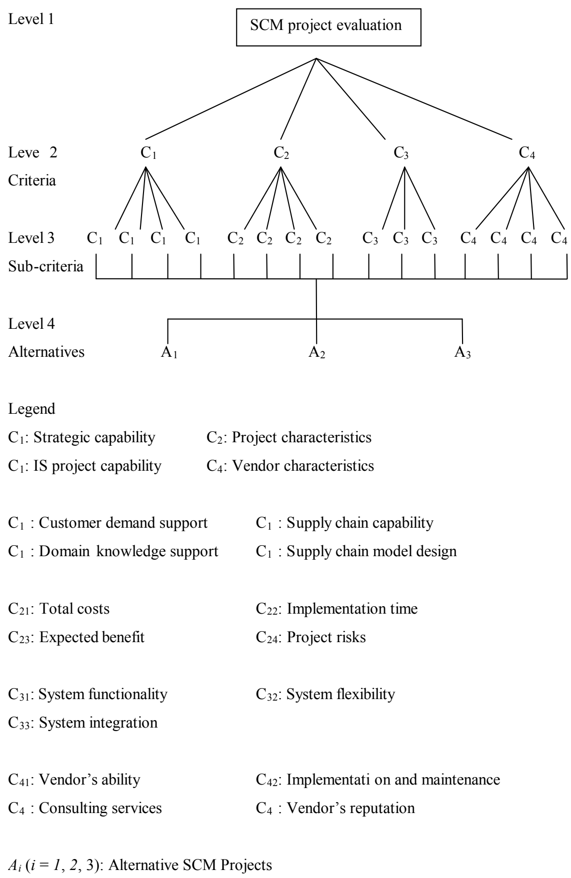

Figure 2 The hierarchical structure of the SCM project selection

Project Characteristics (C_2) concern about the project management skills in an organization. This is in particular importance for the successful development and implementation of IS projects nowadays. It is measured by the total project costs (C_{21}), project implementation time (C_{22}), expected benefit (C_{23}), and project risks (C_{24}).

IS Project Capability concerns with features and functionalities of the SCM project. This is measured by the project system functionality (C_{31}), the system flexibility (C_{32}), and the system integration (C_{33}).

Vendor Characteristics refer to the qualities pertaining to vendors. This is measured by the vendor's ability (C_{41}), the implementation and maintenance ability (C_{42}), the consulting services (C_{43}), and the vendor's reputation (C_{44}).

To facilitate the making of subjective assessments, the decision maker assigned linguistic variables for the criteria variables, consisting of {Very Poor (VP), Poor (P), Fair (F), Good (G), and Very Good (VG)} to effectively handle uncertainty and subjectiveness. Table III shows the linguistic variables used to describe the values of ratings.

TABLE III LINGUISTIC VARIABLES USED TO DESCRIBE THE VALUES OF RATINGS

Linguistic variable	Very Poor	Poor	Fair	Good	Very Good
Fuzzy Numbers	(1,1,3)	(1,3,5)	(3,5,7)	(5,7,9)	(7,9,9)

The weights assigned to each criterion can be adjusted according to the specific concerns of the decision maker. Each criteria weight is also determined by directly assigning linguistic expressions. Decision makers use a set of five linguistic terms in a weighting set, W, to describe the weight of each criteria, W = {Very Low (VL), Low (L), Medium (M), High (H), and Very High (VH)} [26, 27]. Table IV shows the linguistic variables used to describe weights of criteria. If a decision maker does not agree with the assumed numerical approximation system, he/she can define his/her own ratings and the corresponding fuzzy numbers to express their subjective assessments.

TABLE IV LINGUISTIC TERMS USED TO DESCRIBE WEIGHTS OF CRITERIA

Linguistic variable	Very Low	Low	Medium	High	Very High
Fuzzy Numbers	(1,1,3)	(1,3,5)	(3,5,7)	(5,7,9)	(7,9,9)

The DSS evaluation process starts with instructing the decision maker to enter the set of alternatives and criteria to be used for the SCM project selection problem. The decision maker enters the required alternatives and criteria then selects either he/she prefers a novice mode or advanced mode. If the decision maker selects a novice mode, the decision maker goes through a series of dialogue boxes which raises questions such as the criteria weight, the alternative rating, and type of solution expected, and the use of transformation for criteria. As a result, the system will recommend a specific method for dealing with the selection problem. If the decision maker accepts the recommended method, the specific module for the method will be invoked automatically. The required inputs for the problem are then prompted from the decision maker and the best alternative is determined.

If the decision maker selects an intermediate mode, the decision maker will be provided with suitable methods based on the inputs specified by the decision maker. Alternatively, if the decision maker selects an advanced mode, the decision maker can directly select the preferred method for selecting the IS project alternative. The system will then automatically activate the corresponding input modules to acquire the necessary data required by the selected MA method. Three alternatives are available and entered the subjective performance assessments of each alternative with respect to each criterion in this specific problem as shown in Table V.

TABLE V THE PERFORMANCE ASSESSMENTS OF ALTERNATIVES SCM PROJECTS

	A_1	A_2	A_3
Customer demand support (C_{11})	G	VG	VG
Supply chain capability (C_{12})	VG	VG	VG
Domain knowledge support (C_{13})	G	VG	VG
Supply chain model design (C_{14})	VG	G	VG
Total costs (C_{21})	G	G	G
Implementation time (C_{22})	G	VG	G
Expected benefit (C_{23})	VG	VG	VG
Project risks (C_{24})	G	VG	G
System functionality (C_{31})	G	VG	G
System flexibility (C_{32})	G	VG	VG
System integration (C_{33})	G	VG	G
Vendor's ability (C_{41})	G	VG	G
Implementation and maintenance (C_{42})	VG	VG	VG
Consulting services (C_{43})	G	VG	G
Vendor's reputation (C_{44})	VG	VG	VG

Based on the linguistics variables used by the weighting vectors, the criteria weights for selecting the SCM project is also obtained directly from the decision maker. Table VI shows the criteria weights for the criteria.

The decision maker then chose the novice mode for guidance. This causes the DSS system to request for more requirements including (a) the decision maker's preference of a specific MA method, (b) the time availability of the decision maker, (c) the decision maker's desire to interact with the system, and (d) the desire to allow the system to select one satisfactory solution or for the decision maker to select a solution.

TABLE VI CRITERIA WEIGHTS FOR SCM PROJECTS SELECTION

	A_1	A_2	A_3
Customer demand support (C_{11})	VH	VH	VH
Supply chain capability (C_{12})	VH	VH	VH
Domain knowledge support (C_{13})	VH	VH	H
Supply chain model design (C_{14})	VH	VH	VH
Total costs (C_{21})	VH	H	VH
Implementation time (C_{22})	VH	H	VH
Expected benefit (C_{23})	VH	VH	VH
Project risks (C_{24})	VH	VH	H
System functionality (C_{31})	VH	VH	VH
System flexibility (C_{32})	VH	VH	H
System integration (C_{33})	H	VH	VH
Vendor's ability (C_{41})	VH	VH	VH
Implementation and maintenance (C_{42})	H	VH	VH
Consulting services (C_{43})	H	H	VH
Vendor's reputation (C_{44})	H	H	VH

Based on the information provided by the decision maker, the IF-THEN rules explicitly match the specific method to the requirements of the decision maker. In this case, the DSS has selected the fuzzy method [5] based on the information given by the decision maker to handle this specific SCM project selection problem. As a result, an overall performance index for each alternative across all the criteria can be determined. Based on Table VII, A_2 is the most suitable project alternative.

TABLE VII THE OVERALL PERFORMANCE INDEX AND RANKING OF SCM PROJECTS ALTERNATIVES

SCM Projects	Performance Index	Ranking
A_1	0.77	3
A_2	0.92	1
A_3	0.81	2

V. CONCLUSION

This paper presents an intelligent DSS for facilitating the selection of appropriate MA methods in solving IS project evaluation and selection problem in organizations. A knowledge base consisting of IF-THEN production rules is developed for assisting with a systematic selection of the most appropriate MA method in a specific IS project evaluation and selection situation. Effective decision support is provided with the development of a flexile MA method selection procedure capable of considering both the characteristics of the problem and the requirements of the decision maker and the provision of interactive user interfaces between the decision maker and the DSS.

A SCM project evaluation and selection example at a steel mill in Taiwan is presented for demonstrating the applicability of the proposed intelligent DSS framework for facilitating the selection of the most appropriate MA method in solving the IS project evaluation and selection problem. The example shows that the proposed DSS framework has a number of advantages for solving the IS project evaluation and selection problems include the flexibility to respond quickly to the decision maker's questions, the ability to help the decision maker better understand the decision problem and the implications of their decision behaviors, and the capability to accommodate various requirements of the decision problem and the decision maker.

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