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Closing the Skill Gap of Cloud CRM Application Services in Cloud Computing for Evaluating Big Data Solutions

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Abstract: Information systems (IS) continually motivate various improvements in the state-of-the-art of issues and solutions for advanced geo-information technologies in cloud computing. Reducing IS project risks and improving organizational performance has become an important issue. This study proposes a research framework, constructed from the Stimulus-Organism-Response (S-O-R) framework, in order to address the issues comprising the stimulus of project risk, the organism of project management, and the response of organizational performance for cloud service solutions. Cloud customer relationship management (cloud CRM) experts, based on cloud computing, with many years of project management experience, were selected for the interview sample in this study. Decision Making Trial and Evaluation Laboratory–based analytical network process (DEMATEL based-ANP, DANP) is a multiple-criteria decision-making (MCDM) analysis tool that does not have prior assumptions and it was used to experience the dynamic relationships among project risk, project management, and organizational performance. The study results include three directions: (a) Improving the internal business process performance can improve the efficiency of cloud CRM project processes and activities; (b) The emphasis on financial performance management can reduce the cost of a cloud CRM project so that the project can be completed within the approved budget; (c) Meeting user needs can improve user risk and reduce negative cloud CRM user experience. The scientific value of this study can be extended in order to study different projects, through research methods and frameworks, in order to explore project risk management and corporate performance improvements.

Keywords: DEMATEL based-ANP (DANP); cloud CRM service; big data; organizational performance; cloud computing

1. Introduction

Data collected from various services can be used by big data technology through different communication systems which are utilized for heterogeneous network environments. Particularly, information systems (IS) provide such data communications in big data features and utilizations. Furthermore, the IS projects are inherently associated with various types of data and risks, including those stemming from information technology (IT) [1], human resources, usability, the project team, the project, and organization, as well as strategic and political risks [2]. Thus, IS continually motivates various improvements in the state-of-the-art of issues and solutions for advanced geo-information technologies in the cloud computing environment. By way of this motivation, IS will play a key role in cloud application services in the near future.

Our research focuses on improving the risk management of cloud customer relationship management (cloud CRM) projects and performance management. Particularly, bridging the knowledge gap of cloud CRM application services in the cloud-computing environment in order to evaluate big data solutions is a valuable issue. However, the implementation of IS projects entails a high degree of risk. Cloud CRM applies to any CRM technology where CRM software, CRM tools, and the organization's customer data together reside in the cloud context and are delivered to end-users through Internet services. In this study, we investigated the dynamic relationships among project risk, project management, and organizational performance goals of cloud CRM projects of application issues.

In summary, the research objectives of this study can be listed as follows: (1) Investigate the variables of the effects on cloud CRM projects of project risk, project management, and organizational performance from cloud application services; (2) Explore the relationship among project risk, project management, and organizational performance in cloud CRM projects; (3) Establish and improve cloud CRM projects in terms of risk management, project management, and organizational performance modes, and, thus, make specific recommendations to interested parties for evaluating big data solutions in Internet services.

Because cloud CRM plays a large role in big data analytics in enterprises, there are many risk factors and performance considerations that apply to the successful implementation of a cloud CRM project. Most past IS project studies focused on the key success factors. Our research studied the interaction between the dimensions and criteria of project risk, project management, and organizational performance. Research contributions can provide recommendations for improving the risk of cloud CRM projects and overall management performance.

The scientific value of this study is that it understands that the cloud CRM project introduction process, research methods, and research framework extend to studying different topics of the project, including the assessment of human resources, equipment, machinery, materials, and other resources. Good cost management can not only improve the performance of project implementation, but it can also provide project quality, safety, and other implementation results, which are closely related. This study also finds that stakeholders have a significant impact on project management. If there are undetected stakeholders, it can result in additional work on a project, resulting in potential delays or increases to cost.

The remainder of this paper is organized as follows: Section 2 presents a relevant literature review of cloud CRM projects. Section 3 describes the study framework and methods of the Stimulus-Organism-Response model. Section 4 implements the experiment and data analysis from the experts' questionnaires. Section 5 presents study findings and managerial implications from the point of view of empirical results, and Section 6 concludes the paper.

2. Literature Review

This section introduces relevant literature on areas including project risks, project management, organizational performance measurement, risks of cloud computing services, and cloud customer relationship management.

2.1. Project Risks

Risk and uncertainty are different concepts [3], with Knight [4] being the first economist to propose the difference between risk and uncertainty. Risk [5,6] means that although we do not know the outcome of events, we have the means to understand the results of the many different possible events and the likelihood of their occurrence. Project risk is an uncertain event that has a negative effect on project objectives [2]. Risks can be categorized as technical, external, human resource, cost, sponsor, and schedule-related.

For the project risk dimension, we integrate research on the project risk criteria through a discussion of the related literature [7,8]. Wallace et al. [8] proposed six representative project risk criteria, as shown in Table 1.

Table 1. Explanation of project risk criteria.

Criteria	Explain
User risk	Users hold a negative attitude to the project and therefore do not participate in project development, thus increasing the risk of project failure.
Requirements risk	Many uncertainty factors about system requirements have an adverse effect on the project performance.
Project complexity risk	Uncertainty factors inherent in software projects will increase the difficulty of project development.
Planning and control risk	Software development process planning and unsuitable control will lead to impractical schedules, budgets, and project evaluation milestones.
Team risk	Characteristics of team members can increase the uncertainty of project results.
Organizational environment risk	Uncertainty factors of the organizational environment will seriously impact project performance.

2.2. Project Management

Project management is the flexible and effective application and coordination of various resources in order to meet project objectives and demands. Kerzner [9] asserted that project management involves planning, organizing, and instruction in the use of controllable resources in order to attain concrete goals. In addition, system path management is applied to assign specific project tasks to the functional employees in a department. Project management is widely used as a project success factor [10], and in organizational change management [11], project portfolio management [12], business strategies [13], and knowledge management [14]. In the project management dimension, through a discussion of the literature on project management criteria [15,16], we identify four project management criteria, as shown in Table 2.

Table 2. Explanation of project management criteria.

Criteria	Explain
Top management support	Executives emphasize "IS" professionals and provide related resources.
Project planning and control	To record a formal project plan and oversee a project will be management tools.
Internal integration	Used to ensure that the project team operates in a consistent manner with project management technology.
User participation	Used to integrate all the project teams and organize users at each level for project management technology.

2.3. Organizational Performance Measurement: A Balanced Scorecard

The balanced scorecard, or BSC, is a strategic management tool used to establish strategic indicators that facilitate the implementation of strategies in order to attain organizational goals. Kaplan and Norton [17] maintained that financial experts are responsible for overseeing performance measurement systems, without the involvement of senior managers. Developing a BSC can help managers to transcend traditional views, thereby converting strategies into measurable goals that are related to financial goals, customer satisfaction, internal business processes, and learning and growth, while examining the performances of various domains. In the organizational performance dimension, we integrate research into the organizational performance criteria through a discussion of the literature [7,15]. Wu and Chang [18] proposed four representative organizational performance criteria, as shown in Table 3.

Table 3. Explanation of organizational performance criteria.

Criteria	Explain
Customer performance	The special project outcomes meet the needs of the users.
Internal business process performance	The special project development process is efficient.
Financial performance	The special project has a favorable investment for learning and growth opportunities.
Learning and growth performance	The project provides personal or organizational learning and growth opportunities.

2.4. Risks of Cloud Computing Service

Cloud providers usually recommended performing security checks for enterprise cloud services in order to prevent malicious users from obtaining unauthorized access to data. Special attention should be paid in order to ensure that the clarity of cloud contract definitions and protocol services meet customer needs [19]. The cloud CRM Software as a Service (SaaS) service model is one of the applications with which a user needs only a computer, smart phone, or tablet PC web browser in order to use SaaS CRM.

2.5. Cloud Customer Relationship Management

Carr [20] asserted that cloud computing represents a transformation of the ways in which corporations perform computing, as evidenced by the shift in business computing from private data centers to "the cloud".

Cloud [21] technology has been gradually applied to a variety of areas. Current information services have changed the amount of hardware and software, the network bandwidth size, and the amount of billing. Cloud computing uses distributed computing in order to allow customers to access a service from anywhere, and at any time, on the Internet. CRM business software, using the cloud computing service model, has become the trend today, especially in small and medium enterprise market opportunities. Cloud CRM has been widely studied in relation to the use of cloud technology to allow taxi companies to handle customers in a responsible way [22] and they have developed their own cloud-based logistic management information systems [23].

2.6. The Decision Making Trial and Evaluation Laboratory-Based Analytical Network Process (DANP) Method

The Decision Making Trial and Evaluation Laboratory (DEMATEL)-based analytical network process (ANP) model is used to determine the relationships among, and weights of, criteria. This is done because the hybrid model can be used across a number of fields, such as outsourcing [24], Internet stores [25], and smart phones [26]. Figure 1 illustrates the DANP model, which organizes six procedures in two parts. Procedures 1 to 3 of Part 1 mainly use the DEMATEL technique to build an impact relationship map (IRM), and Procedures 4 to 6 of Part 2, accordingly, use the ANP technique to discover influential weights. The DANP method can use DEMATEL to establish the total impact relationship matrix through the ANP model, in order to calculate the importance of the degree of the property, which is called the impact of weight. Empirical analysis using the DANP method is used to conform to real social situations. Therefore, this study uses the DANP method in order to provide the true risk and performance that occurs in a cloud CRM project, and is an in-depth exploration. These procedures are addressed in detail in Figure 1.

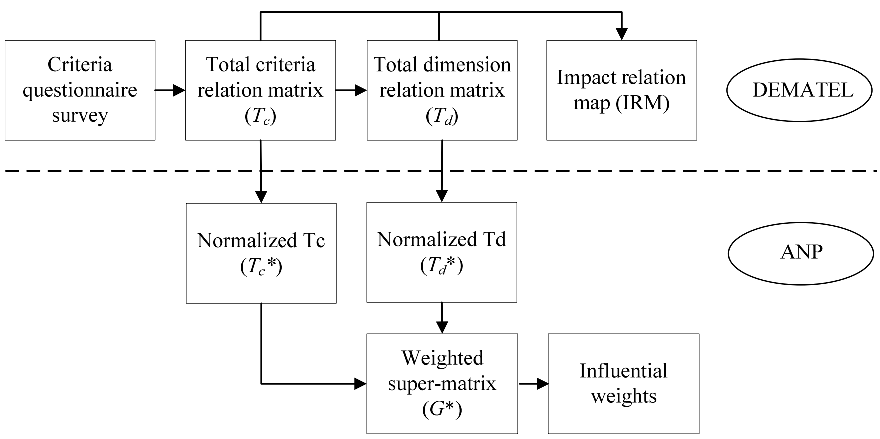

Figure 1. Process flow of the Decision Making Trial and Evaluation Laboratory–based analytical network process (DANP) model.

2.6.1. The Decision Making Trail and Evaluation Laboratory Method

Decision laboratory analysis (Decision Making Trail and Evaluation Laboratory, DEMATEL) is a method used to solve scientific problems and is also used in human affairs [27,28]. It is possible to integrate expert knowledge that is based on the matrix in order to clarify elements between cause-effect relationships.

Due to its practical benefits, DEMATEL has been widely applied in various fields, such as in marketing [29], supply chain management [30], and sustainable ecotourism [31]. In Part 1, Procedures 1 to 3, the hybrid DANP model employed in building an IRM, using the DEMATEL technique combined with ANP, is summarized as follows:

Part 1:

Procedure 1: Building a direct relation matrix. Experts transform experiences from the real world into the degree of mutual influence of the attributes using the Likert scale (1: very low influence; 2: low influence; 3: high influence; 4: very high influence). The establishment of $n \times n$ becomes the direct relation matrix, B. Then b_{ij} is the influence degree of the ith element over the jth element.

Procedure 2: Building a normalized direct-influence matrix in order to gain a total influence-relation matrix. Using Equations (1) and (2), one can build an influence-relation matrix boundary; the influence-relation matrix influence value is between 0 and 1. The sum of the row and column values is at least 0 and at most 1.

$$m = max_{ij}\left[\max_{1\le i\le n}\sum_{j=1}^{n} b_{ij}, \max_{1\le j\le n}\sum_{i=1}^{n} b_{ij}\right] \tag{1}$$

$$Y = \frac{1}{m}B \tag{2}$$

Normalized direct-influence matrix Y, through Equations (3) and (4), can calculate the multiple impact of elements and the indirect influence value of elements, which is the total influence value of an element. T is the total influence-relation matrix and I is the unit matrix.

$$T = R + R^2 + \cdots + R^p = R \times (I - R)^{-1} = \left[R_{ij}\right]_{n\times n},\ p \to \infty \tag{3}$$

$$T = \left[t_{ij}\right]_{n\times n}, i,\ j = 1, 2, \cdots, n \tag{4}$$

The T_c (total criteria matrix) of Equation (5) is a super-matrix, and the dimensions and criteria are listed on the left side and at the top of the matrix, illustrating the relationship and strength between the criteria. D_m represents the mth dimension which contains s n_m criteria ($C_{m1}, C_{m2}, \ldots, C_{mn_m}$). Therefore, C_{mn_m} represents the n_m criteria in the mth dimensions. T_c^{ij} represents the principal eigenvector of the importance effect between the ith dimensions and the jth criteria. In Equation (6), according to T_c, the total dimensions relation matrix T_d can be generated from the total criteria matrix, where t_d^{ij} is the mean value of criterion T_c^{ij}.

$$\begin{array}{ccccccccccc} & D_1 & & & & D_j & & & & D_m & \\ c_{11} & \cdots & c_{1n_1} & \cdots & c_{j1} & \cdots & c_{jn_j} & \cdots & c_{m1} & \cdots & c_{mn_m} \end{array}$$

$$T_C = \begin{array}{c} \\ D_1 \\ \\ \\ D_i \\ \\ \\ D_m \\ \\ \end{array} \begin{array}{c} C_{11} \\ C_{12} \\ \vdots \\ C_{1n_1} \\ \vdots \\ C_{i1} \\ C_{i2} \\ \vdots \\ C_{in_i} \\ \vdots \\ C_{m1} \\ C_{m2} \\ \vdots \\ C_{mn_m} \end{array} \begin{bmatrix} T_c^{11} & \cdots & T_c^{1j} & \cdots & T_c^{1m} \\ \vdots & & \vdots & & \vdots \\ T_c^{i1} & \cdots & T_c^{ij} & \cdots & T_c^{im} \\ \vdots & & \vdots & & \vdots \\ T_c^{m1} & \cdots & T_c^{mj} & \cdots & T_c^{mm} \end{bmatrix} \quad (5)$$

$$T_d = \begin{bmatrix} t_d^{11} & \cdots & t_d^{1j} & \cdots & t_d^{1m} \\ \vdots & & \vdots & & \vdots \\ t_d^{i1} & \cdots & t_d^{ij} & \cdots & t_d^{im} \\ \vdots & & \vdots & & \vdots \\ t_d^{m1} & \cdots & t_d^{mj} & \cdots & t_d^{mm} \end{bmatrix} \quad (6)$$

Procedure 3: Building the impact relationship map (IRM). In Equation (7), r denotes the sum of the rows. In Equation (8), s denotes the sum of the columns. The r_i criteria i (or dimensions) affects the sum of the other criteria (or dimensions). The s_j criteria j (or dimensions) is affected by the sum of the other criteria (or dimensions).

$$r = [r_i]_{n\times 1} = \left[\sum_{j=1}^{n} t_{ij}\right]_{n\times 1} \quad (7)$$

$$s = [s_j]_{n\times 1} = \left[\sum_{i=1}^{n} t_{ij}\right]_{1\times n} \quad (8)$$

The IRM can be labeled in two-dimensional coordinates via $(r_i + s_j)$ and $(r_i - s_j)$. The horizontal x-axis is $(r_i + s_j)$, which is called the prominence. The vertical y-axis is $(r_i - s_j)$, which is called the relation. If $(r_i + s_j)$ is positive, that criteria will affect other criteria and is classified as "cause". If $(r_i - s_j)$ is negative, that criteria will be affected by other criteria and is classified as "effect" [32].

According to calculations $(r_i + s_j)$ and $(r_i - s_j)$, the obtained IRM can be divided into four quadrants: (1) quadrant I represents high prominence and relation; (2) quadrant II represents low prominence and high relation; (3) quadrant III represents low prominence and relation; and (4) quadrant IV represents high prominence and low relation [33].

2.6.2. The Analytical Network Process Method

Saaty [34] proposed the analytical network process (ANP) for the study of complex, nonlinear network relationship problems.

Part 2:

Procedure 4: Building the normalized total criteria relationship matrix. Through Equation (5), T_c can be normalized by the total degrees of effect and influence of the dimensions to calculate the T_c^* value of Equation (9).

$$t_{ci}^{11} = \sum_{j=1}^{m_1} t_{ij}^{11}, i = 1, 2, \ldots, m_1,$$

$$T_{c*}^{11} = \begin{bmatrix} t_{c11}^{11}/d_{c1}^{11} & \cdots & t_{c1j}^{11}/d_{c1}^{11} & \cdots & t_{c1n_1}^{11}/d_{c1}^{11} \\ \vdots & & & & \vdots \\ t_{ci1}^{11}/d_{ci}^{11} & \cdots & t_{cij}^{11}/d_{ci}^{11} & \cdots & t_{cin_1}^{11}/d_{ci}^{11} \\ \vdots & & & & \vdots \\ t_{cn_11}^{11}/d_{cn_1}^{11} & \cdots & t_{cn_1j}^{11}/d_{cn_1}^{11} & \cdots & t_{cn_1n_1}^{11}/d_{cn_1}^{11} \end{bmatrix} = \begin{bmatrix} t_{c11*}^{11} & \cdots & t_{c1j*}^{11} & \cdots & t_{c1n_1*}^{11} \\ \vdots & & \vdots & & \vdots \\ t_{ci1*}^{11} & \cdots & t_{cij*}^{11} & \cdots & t_{cin_1*}^{11} \\ \vdots & & \vdots & & \vdots \\ t_{cn_11*}^{11} & \cdots & t_{cn_11*}^{11} & \cdots & t_{cn_1n_1*}^{11} \end{bmatrix} \text{ and } T_c^* = \begin{bmatrix} T_{c*}^{11} & \cdots & T_{c*}^{1j} & \cdots & T_{c*}^{1m} \\ \vdots & & \vdots & & \vdots \\ T_{c*}^{i1} & \cdots & T_{c*}^{ij} & \cdots & T_{c*}^{im} \\ \vdots & & \vdots & & \vdots \\ T_{c*}^{m1} & \cdots & T_{c*}^{mj} & \cdots & T_{c*}^{mm} \end{bmatrix} \quad (9)$$

Procedure 5: Building the normalized total dimension relationship matrix. In Equation (6), T_d can be normalized using Equation (10) in order to determine T_d^*. T_d^* represents the weights of dimensions.

$$t_d^i = \sum_{j=1}^{m} t_d^{ij},$$

$$T_d^* = \begin{bmatrix} t_d^{11}/t_d^1 & \cdots & t_d^{1j}/t_d^1 & \cdots & t_d^{1m}/t_d^1 \\ \vdots & & \vdots & & \vdots \\ t_d^{i1}/t_d^i & \cdots & t_d^{ij}/t_d^i & \cdots & t_d^{im}/t_d^i \\ \vdots & & \vdots & & \vdots \\ t_d^{m1}/t_d^m & \cdots & t_d^{mj}/t_d^m & \cdots & t_d^{mm}/t_d^m \end{bmatrix} = \begin{bmatrix} T_{d*}^{11} & \cdots & T_{d*}^{1j} & \cdots & T_{d*}^{1m} \\ \vdots & & \vdots & & \vdots \\ T_{d*}^{i1} & \cdots & T_{d*}^{ij} & \cdots & T_{d*}^{im} \\ \vdots & & \vdots & & \vdots \\ T_{d*}^{m1} & \cdots & T_{d*}^{mj} & \cdots & T_{d*}^{mm} \end{bmatrix} \quad (10)$$

Procedure 6: Building the weighted super-matrix and obtaining influential weights of elements. Through Equation (11), the T_c^* of normalization and the multiplied T_d^* can determine the original weighted super-matrix.

$$G = \begin{bmatrix} T_{c*}^{11} \times T_{d*}^{11} & \cdots & T_{c*}^{1j} \times T_{d*}^{1j} & \cdots & T_{c*}^{1m} \times T_{d*}^{1m} \\ \vdots & & \vdots & & \vdots \\ T_{c*}^{i1} \times T_{d*}^{i1} & \cdots & T_{c*}^{ij} \times T_{d}^{ij} & \cdots & T_{c*}^{im} \times T_{d*}^{im} \\ \vdots & & \vdots & & \vdots \\ T_{c*}^{m1} \times T_{d*}^{m1} & \cdots & T_{c*}^{mj} \times T_{d*}^{mj} & \cdots & T_{c*}^{mm} \times T_{d*}^{mm} \end{bmatrix} \quad (11)$$

Equation (12) means that G is further transposed in order to obtain column-stochastic super-matrix G^*.

$$G^* = \begin{bmatrix} T_{c*}^{11} \times T_{d*}^{11} & \cdots & T_{c*}^{i1} \times T_{d*}^{i1} & \cdots & T_{c*}^{m1} \times T_{d*}^{m1} \\ \vdots & & \vdots & & \vdots \\ T_{c*}^{1j} \times T_{d*}^{1j} & \cdots & T_{c*}^{ij} \times T_{d}^{ij} & \cdots & T_{c*}^{mj} \times T_{d*}^{mj} \\ \vdots & & \vdots & & \vdots \\ T_{c*}^{1m} \times T_{d*}^{1m} & \cdots & T_{c*}^{im} \times T_{d*}^{im} & \cdots & T_{c*}^{mm} \times T_{d*}^{mm} \end{bmatrix} \quad (12)$$

Taking G^*, and by raising it to a sufficiently large power, φ (i.e., $\lim_{\varphi \to \infty} (G^*)^{\varphi}$) will obtain the final global priority matrix (i.e., $W = \left[W_1, \cdots W_j, \cdots W_n \right]$).

This study explores the impact of project risks, project management, and BSC-implemented cloud CRM projects in enterprises. Cloud CRM projects belong to the scope of IS projects; thus, the collection of literature used includes IS-related research topics. In the past, there was little discussion on cloud CRM in IS projects. Most of them were based on general IS project topics (Enterprise Resource Planning (ERP), traditional CRM, etc.). In order to understand more about the interaction between cloud CRM projects and related criteria, we use the DANP method to confirm the impact and importance of cloud CRM project criteria to meet research needs. We look forward to finding the key factors influencing the success of cloud CRM projects, from the point of view of this research topic, and how to reduce project risks and improve the project performance.

3. Research Methodology

The purpose of this section is to introduce the procedures, including the research framework and data collection.

3.1. Research Framework

Based on the literature review and the Stimulus-Organism-Response (S-O-R) model, which posits that environmental factors act as stimuli that affect individuals' cognitive reactions and then their behavior [35], S-O-R mainly provides the stimulus of the environment, the state of the emotions, and the possible connections among human behavior. In this study, the S-O-R model uses the basis of the research framework, and understands the impact of project risk and organizational performance to further explore the relationships among variables. Questionnaires for this study were collected using a questionnaire survey. This study is a cloud CRM project experience of experts in the field. Figure 2 shows the research framework used to investigate the relationship among the three dimensions of project risk, project management, and organizational performance, and includes 14 related constructs. Major dimensions and criteria of this study can be summarized, as shown in Table 4.

Table 4. Dimensions and influential criteria of the research framework.

Dimension	Influential Criterion
A—Project risk	a1 User risk a2 Requirements risk a3 Project complexity risk a4 Planning and control risk a5 Team risk a6 Organizational environment risk
B—Project management	b1 Top management support b2 Project planning and control b3 Internal integration b4 User participation
C—Organizational performance	c1 Customer performance c2 Internal business process performance c3 Financial performance c4 Learning and growth performance

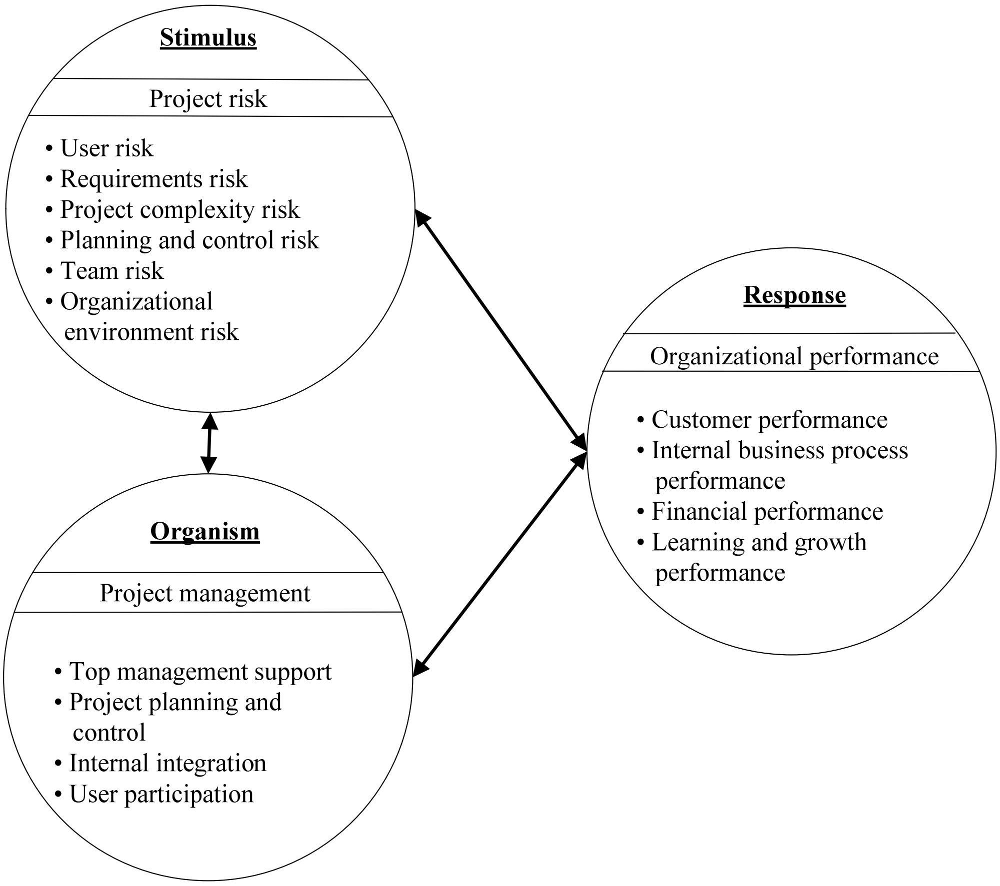

Figure 2. Research framework of this study.

3.2. Data Collection

This study invited a number of experts from various areas of cloud CRM project experience to participate in the survey. Through the experiences of experts in the cloud CRM project implementation process, we determined project risk factors and performance improvements. The sample size of the questionnaire collected was based on the principle of theoretic saturation [36], obtaining consensus data from 18 experts. The consensus data were put through the DANP operation in order to finally obtain the DNP weight data.

We conducted a survey of 18 experts who are currently employed as cloud CRM experts, with multiple years of practical experience in project management. This was based on the recommendations of Northcutt and McCoy [37], who suggested that a focus group should be comprised of 12–20 experts who are (a) knowledgeable and highly experienced in the research topic; (b) capable of contemplating a topic and transcribing their thoughts into text; (c) motivated and available to participate in the research; (d) homogeneous regarding distance and power; and (e) able to exhibit excellent teamwork and are not overly dominant or excessively shy in expressing their opinions.

The number of participants was determined based on the principle of information saturation. We asked the experts the questions presented in the questionnaire in person, while providing them with detailed explanations and examples to ensure they understood the actual meaning of the research framework. The participants assessed the impacts of the criteria by conducting pairwise comparisons. Table 5 presents demographic information about the surveyed experts.

Table 5. Demographic data of the cloud customer relationship management experts.

Feature	Demographic Variable	No. of People	Percentage
Gender	Male	13	72.22%
	Female	5	28.78%
Age	31–40 years	13	72.22%
	41–50 years	5	28.78%
Education level	Bachelors	4	22.22%
	Masters	13	72.22%
	Doctor	1	5.56%
Occupation	Business Manager	1	5.56%
	Information personnel	10	55.56%
	Information manager	4	22.22%
	R&D Engineer	2	11.11%
	Educators	1	5.56%
Seniority	0–2 years	1	5.56%
	3–5 years	3	16.67%
	6–10 years	9	50.00%
	11 years and more	5	27.78%
Years of experience in cloud CRM project management	4–5 years	9	50.00%
	6–10 years	8	44.44%
	11 years and more	1	5.56%

4. Experiments and Data Analysis

4.1. Establishing IRMs Using the DEMATEL Technique

We determined the sample size based on the principle of theoretical saturation [36]. The theoretical saturation of this study is evaluated using the "errors of gap ratio" (EGR), as defined below [25]:

$$EGR = \frac{1}{n\,(n-1)} \sum_{i=1}^{n} \sum_{j=1}^{n} \frac{\left| a_{ij}^{p} - a_{ij}^{p-1} \right|}{a_{ij}^{p}} \times 100\% \quad (13)$$

where p denotes the number of samples and a_{ij}^{p} is the average influence of i criteria on j; the number of gap ratio elements is $n\,(n-1)$. When EGR is α, the significant confidence is $(1-\alpha)$. In general, when α is less than 5%, we have over 95% confidence to note that there are no significant differences between evaluations of sample sizes p and $p-1$. Consequently, it is reasonable to propose that sample size p is significantly closer to the theoretical saturation and is qualified to be an appropriate size.

First, based on the data in Tables 6 and 7, EGR is counted as 4.766%, representing a significant confidence of 95.234% on group consensus. Consequently, Table 7 is used as input data for further DEMATEL calculations. Accordingly, Procedures 1 to 3, presented in Section 3.2., were implemented. (1) In Procedure 1, the initial direct-relationship matrix B was normalized to obtain matrix Y. All elements y_{ij} in Y must satisfy $0 \leq y_{ij} \leq 1$, and the principal diagonal element must equal 0. Table 8 presents the results of the normalized initial direct-relation matrix. (2) In Procedure 2, the total criteria relation matrix T_c and the total dimensions relation matrix T_d can be obtained through matrix Y. Tables 9 and 10 show the total criteria relationship matrix and the total dimensions relationship matrix, respectively. (3) In Procedure 3, the degree to which each criterion and dimension influences and is influenced by all others was determined. Table 11 describes the sum of influences given and received by dimensions and criteria.

After Procedures 1 to 3, the attained results were adopted to produce four IRMs: A dimensions of IRM, a dimension A–criterion of IRM, a dimension B–criterion of IRM, and a dimension C–criterion of IRM, all of which are displayed in Figures 3–6, respectively.

Table 6. Group consensus of the 17 respondents on the degree of influence among the criteria.

Criteria	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4
a1	0.000	2.647	1.647	2.235	1.471	0.941	1.000	1.941	1.588	2.765	1.706	2.176	1.353	1.765
a2	1.882	0.000	2.765	2.176	1.765	1.176	1.588	1.412	1.824	1.706	1.706	2.235	1.706	1.765
a3	2.941	1.588	0.000	2.529	2.059	1.412	0.882	2.765	1.647	1.824	1.471	2.176	1.706	1.529
a4	2.118	2.118	1.765	0.000	2.118	1.412	1.118	2.529	2.235	2.059	2.176	2.294	2.353	2.353
a5	2.000	1.471	2.529	2.176	0.000	1.941	1.235	1.882	2.765	1.824	1.882	2.176	1.765	1.706
a6	2.235	1.882	2.000	2.294	2.118	0.000	1.471	1.765	2.235	1.176	1.176	2.176	2.118	1.529
b1	3.059	2.471	2.529	2.176	1.706	2.882	0.000	3.176	3.000	2.118	1.588	2.176	2.176	2.000
b2	2.647	2.412	2.118	2.471	1.588	1.412	1.941	0.000	2.941	2.765	2.353	2.706	2.647	2.118
b3	2.235	1.941	2.176	2.059	2.471	2.000	1.588	2.059	0.000	2.471	2.176	3.118	2.471	2.000
b4	3.059	2.118	1.647	1.235	1.471	1.235	1.059	1.294	1.706	0.000	2.412	2.000	1.647	2.412
c1	1.118	0.588	0.647	0.471	0.647	0.412	1.176	0.588	0.235	1.294	0.000	1.176	2.294	1.059
c2	1.000	0.941	0.706	0.706	0.882	0.588	1.176	1.529	1.353	0.941	1.941	0.000	2.294	1.529
c3	0.647	0.588	0.706	0.588	0.529	0.412	1.706	1.176	0.412	0.294	0.941	1.529	0.000	0.824
c4	1.294	0.706	1.118	1.000	0.882	0.353	1.059	1.353	1.118	1.353	1.471	1.647	1.235	0.000

Table 7. Group consensus of the 18 respondents on the degree of influence among the criteria.

Criteria	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4
a1	0.000	2.722	1.556	2.111	1.389	0.889	1.111	1.833	1.500	2.778	1.778	2.167	1.278	1.778
a2	1.778	0.000	2.778	2.222	1.833	1.222	1.611	1.500	1.722	1.611	1.833	2.333	1.778	1.667
a3	2.778	1.500	0.000	2.389	2.111	1.333	0.833	2.611	1.556	1.722	1.389	2.056	1.611	1.611
a4	2.167	2.000	1.889	0.000	2.222	1.333	1.056	2.556	2.278	2.111	2.222	2.333	2.389	2.389
a5	2.056	1.556	2.556	2.222	0.000	1.833	1.167	2.000	2.778	1.722	2.000	2.278	1.833	1.778
a6	2.333	1.944	1.889	2.333	2.167	0.000	1.556	1.833	2.278	1.333	1.222	2.222	2.222	1.556
b1	3.111	2.500	2.389	2.222	1.778	2.889	0.000	3.222	3.056	2.167	1.667	2.222	2.278	2.056
b2	2.500	2.444	2.111	2.500	1.500	1.333	1.833	0.000	2.778	2.611	2.389	2.722	2.722	2.111
b3	2.278	2.000	2.222	2.167	2.500	1.889	1.500	2.111	0.000	2.500	2.222	3.056	2.444	2.000
b4	3.056	2.167	1.556	1.333	1.556	1.167	1.000	1.389	1.778	0.000	2.389	2.056	1.556	2.444
c1	1.222	0.556	0.778	0.444	0.611	0.389	1.222	0.556	0.222	1.222	0.000	1.333	2.333	1.167
c2	1.111	0.889	0.833	0.667	0.833	0.556	1.111	1.444	1.278	1.000	1.833	0.000	2.389	1.611
c3	0.611	0.556	0.833	0.556	0.500	0.389	1.611	1.111	0.389	0.278	0.889	1.444	0.000	0.778
c4	1.389	0.833	1.222	1.111	1.000	0.333	1.000	1.278	1.056	1.444	1.389	1.722	1.167	0.000

The data in Table 8 are calculated using Equations (1) and (2), and express the results of the normalized initial direct-relation matrix.

Table 8. Normalized initial direct-relationship matrix.

Criteria	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4
a1	0.000	0.086	0.049	0.067	0.044	0.028	0.035	0.058	0.048	0.088	0.056	0.069	0.040	0.056
a2	0.056	0.000	0.088	0.070	0.058	0.039	0.051	0.048	0.055	0.051	0.058	0.074	0.056	0.053
a3	0.088	0.048	0.000	0.076	0.067	0.042	0.026	0.083	0.049	0.055	0.044	0.065	0.051	0.051
a4	0.069	0.063	0.060	0.000	0.070	0.042	0.033	0.081	0.072	0.067	0.070	0.074	0.076	0.076
a5	0.065	0.049	0.081	0.070	0.000	0.058	0.037	0.063	0.088	0.055	0.063	0.072	0.058	0.056
a6	0.074	0.062	0.060	0.074	0.069	0.000	0.049	0.058	0.072	0.042	0.039	0.070	0.070	0.049
b1	0.099	0.079	0.076	0.070	0.056	0.092	0.000	0.102	0.097	0.069	0.053	0.070	0.072	0.065
b2	0.079	0.077	0.067	0.079	0.048	0.042	0.058	0.000	0.088	0.083	0.076	0.086	0.086	0.067
b3	0.072	0.063	0.070	0.069	0.079	0.060	0.048	0.067	0.000	0.079	0.070	0.097	0.077	0.063
b4	0.097	0.069	0.049	0.042	0.049	0.037	0.032	0.044	0.056	0.000	0.076	0.065	0.049	0.077
c1	0.039	0.018	0.025	0.014	0.019	0.012	0.039	0.018	0.007	0.039	0.000	0.042	0.074	0.037
c2	0.035	0.028	0.026	0.021	0.026	0.018	0.035	0.046	0.040	0.032	0.058	0.000	0.076	0.051
c3	0.019	0.018	0.026	0.018	0.016	0.012	0.051	0.035	0.012	0.009	0.028	0.046	0.000	0.025
c4	0.044	0.026	0.039	0.035	0.032	0.011	0.032	0.040	0.033	0.046	0.044	0.055	0.037	0.000

The data in Tables 9 and 10 are calculated using Equation (3) to Equation (6), and express the total criteria relationship matrix and the total dimensions relationship matrices, respectively.

Table 9. Total criteria relationship matrix.

Criteria	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4
a1	0.141	0.198	0.169	0.182	0.150	0.110	0.126	0.180	0.165	0.205	0.183	0.216	0.180	0.180
a2	0.200	0.122	0.208	0.190	0.168	0.124	0.144	0.178	0.177	0.176	0.188	0.226	0.201	0.181
a3	0.227	0.168	0.126	0.195	0.175	0.126	0.122	0.208	0.173	0.181	0.176	0.219	0.195	0.179
a4	0.225	0.194	0.195	0.136	0.189	0.135	0.139	0.219	0.205	0.204	0.214	0.243	0.234	0.215
a5	0.219	0.179	0.212	0.201	0.122	0.148	0.139	0.202	0.217	0.191	0.204	0.238	0.215	0.194
a6	0.223	0.187	0.190	0.201	0.184	0.092	0.148	0.194	0.201	0.176	0.178	0.232	0.221	0.184
b1	0.288	0.239	0.241	0.234	0.205	0.202	0.129	0.270	0.259	0.237	0.228	0.277	0.264	0.236
b2	0.250	0.220	0.215	0.223	0.181	0.145	0.171	0.158	0.232	0.232	0.232	0.270	0.259	0.221
b3	0.240	0.203	0.215	0.210	0.206	0.158	0.159	0.217	0.148	0.224	0.224	0.275	0.247	0.214
b4	0.228	0.181	0.167	0.159	0.153	0.117	0.123	0.166	0.171	0.123	0.198	0.211	0.187	0.197
c1	0.106	0.075	0.083	0.072	0.071	0.053	0.084	0.080	0.066	0.097	0.063	0.114	0.140	0.097
c2	0.124	0.102	0.104	0.097	0.094	0.071	0.095	0.125	0.115	0.110	0.138	0.098	0.164	0.129
c3	0.082	0.070	0.080	0.071	0.063	0.051	0.090	0.091	0.067	0.064	0.084	0.111	0.064	0.080
c4	0.134	0.102	0.115	0.111	0.100	0.065	0.091	0.121	0.110	0.124	0.126	0.150	0.128	0.082

Table 10. Total dimensions relation matrix.

Criteria	A	B	C	r_j
A	0.173	0.178	0.204	0.554
B	0.203	0.189	0.234	0.626
C	0.087	0.096	0.111	0.294
s_j	0.463	0.462	0.548	

The data in Table 11 are calculated using Equations (7) and (8), and express the sum of influences given and received by dimensions and criteria.

Table 11. Sum of influences given and received by dimensions and criteria.

	r_i	s_j	$r_i + s_j$	$r_i - s_j$
A	0.554	0.463	1.018	0.091
a1	0.949	1.235	2.184	–0.286
a2	1.011	1.048	2.059	–0.037
a3	1.018	1.100	2.118	–0.081
a4	1.075	1.105	2.180	–0.030
a5	1.081	0.988	2.069	0.094
a6	1.077	0.736	1.813	0.342
B	0.626	0.462	1.088	0.164
b1	0.895	0.582	1.478	0.313
b2	0.793	0.812	1.606	–0.019
b3	0.749	0.809	1.558	–0.060
b4	0.583	0.817	1.399	–0.234
C	0.294	0.548	0.842	–0.255
c1	0.414	0.412	0.826	0.002
c2	0.529	0.473	1.003	0.056
c3	0.340	0.496	0.836	–0.156
c4	0.487	0.389	0.876	0.098

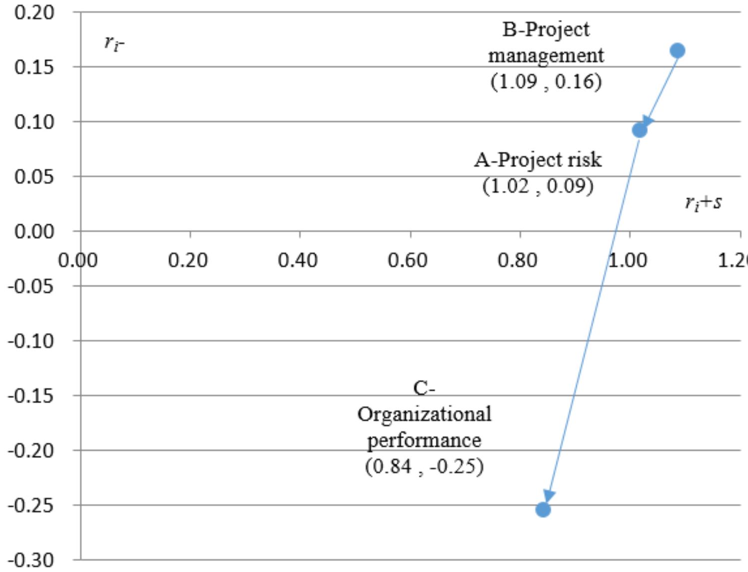

Figure 3. Dimensions of impact relationship map (IRM).

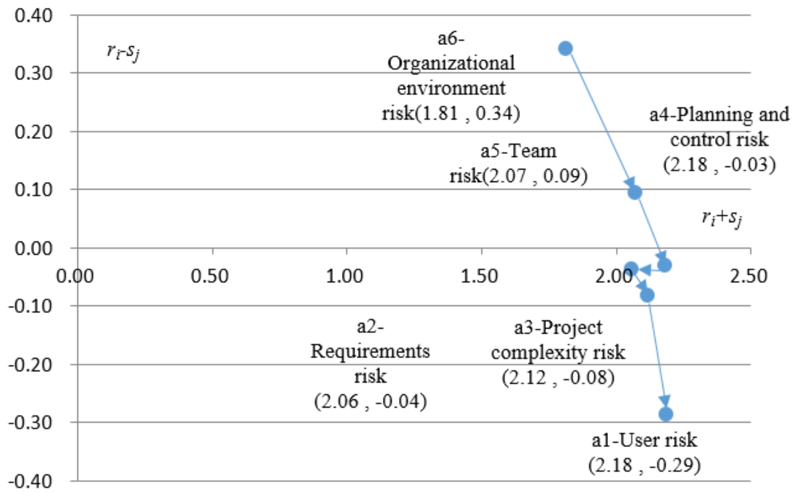

Figure 4. Dimension A–criterion of IRM.

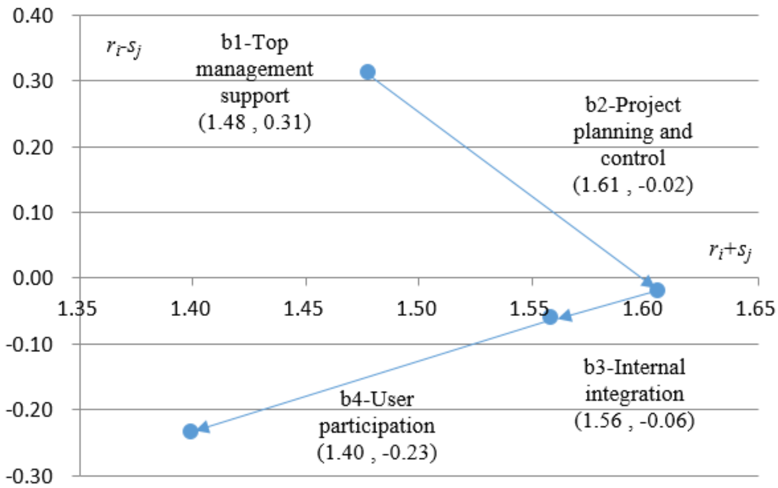

Figure 5. Dimension B–criterion of IRM.

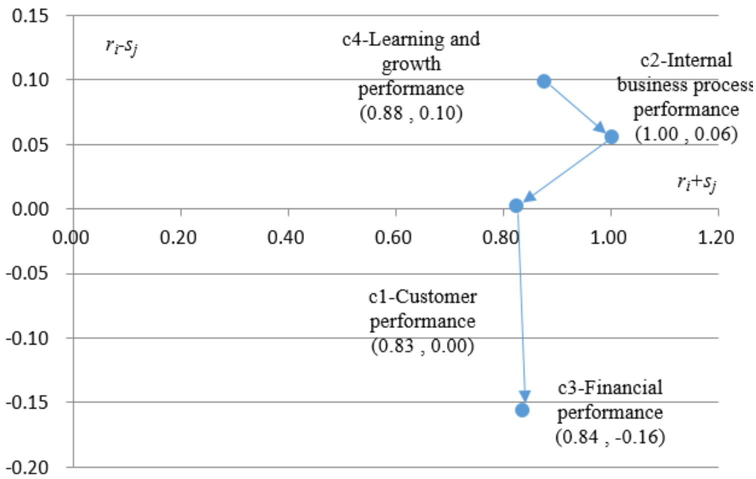

Figure 6. Dimension C–criterion of IRM.

4.2. Calculating Criterion Weights Using ANP

In the ANP technique processing, Procedures 4 to 6 were executed accordingly. (1) In Procedures 4 and 5, the total criteria relationship matrix and total dimension relationship matrix were normalized to yield T_c^* and T_d^*, respectively, and were subsequently multiplied with each other to produce the original weighted super-matrix. Tables 12 and 13 list the results of the normalized total criteria relationship matrix and the normalized total dimensions relationship matrix, respectively. (2) In Procedure 6, Matrix G was transposed to G^* such that G^* satisfies the column-stochastic principle. Table 14 shows the weighted super-matrix. Next, G^* was multiplied by itself ($\lim_{\varphi \to \infty} (G^*)^{\varphi}$), forming a converged stable limited matrix W. Table 15 lists the limit of the weighted super-matrix. From the experimental results, Table 16 presents the results of criterion weights, Table 17 shows the relationship matrix of organizational performance and project risk, and Table 18 shows the relationship matrix of organizational performance and project management.

The data in Tables 12 and 13 are calculated using Equations (9) and (10), and express the results of the normalized total criteria relationship matrix and the normalized total dimensions relationship matrix, respectively.

Table 12. Normalized total criteria relationship matrix.

Criteria	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4
a1	0.149	0.208	0.178	0.191	0.158	0.116	0.186	0.266	0.245	0.303	0.241	0.284	0.238	0.237
a2	0.198	0.120	0.206	0.188	0.166	0.123	0.213	0.263	0.262	0.261	0.236	0.284	0.252	0.227
a3	0.223	0.165	0.124	0.192	0.172	0.124	0.178	0.304	0.253	0.265	0.229	0.284	0.254	0.233
a4	0.209	0.180	0.182	0.127	0.176	0.126	0.181	0.285	0.267	0.266	0.236	0.268	0.258	0.237
a5	0.203	0.165	0.196	0.186	0.113	0.137	0.186	0.270	0.290	0.255	0.240	0.280	0.252	0.228
a6	0.207	0.174	0.177	0.187	0.170	0.085	0.206	0.270	0.279	0.245	0.218	0.285	0.271	0.226
b1	0.204	0.170	0.171	0.166	0.146	0.143	0.144	0.302	0.289	0.265	0.227	0.276	0.263	0.234
b2	0.203	0.178	0.174	0.181	0.147	0.117	0.216	0.200	0.292	0.292	0.237	0.275	0.263	0.225
b3	0.195	0.165	0.174	0.171	0.167	0.128	0.212	0.290	0.198	0.300	0.233	0.287	0.257	0.223
b4	0.227	0.180	0.166	0.158	0.153	0.116	0.210	0.285	0.293	0.211	0.250	0.266	0.235	0.248
c1	0.231	0.163	0.180	0.156	0.154	0.115	0.256	0.245	0.203	0.296	0.152	0.276	0.337	0.235
c2	0.209	0.173	0.175	0.164	0.159	0.120	0.214	0.280	0.259	0.247	0.261	0.185	0.310	0.244
c3	0.197	0.168	0.191	0.170	0.152	0.121	0.288	0.291	0.215	0.206	0.248	0.327	0.189	0.236
c4	0.213	0.163	0.184	0.177	0.160	0.103	0.204	0.271	0.247	0.278	0.259	0.308	0.263	0.169

Table 13. Normalized total dimensions relationship matrix.

Criteria	A	B	C
A	0.404	0.278	0.318
B	0.419	0.26	0.321
C	0.388	0.284	0.328

The data in Tables 14 and 15 are calculated using Equations (11) and (12), and express the weighted super-matrix and the limit of the weighted super-matrix.

Table 14. Weighted super-matrix.

Criteria	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4
a1	0.060	0.080	0.090	0.085	0.082	0.084	0.086	0.085	0.082	0.095	0.090	0.081	0.077	0.083
a2	0.084	0.049	0.067	0.073	0.067	0.070	0.071	0.075	0.069	0.075	0.063	0.067	0.065	0.063
a3	0.072	0.083	0.050	0.073	0.079	0.071	0.072	0.073	0.073	0.070	0.070	0.068	0.074	0.071
a4	0.077	0.076	0.078	0.051	0.075	0.075	0.070	0.076	0.072	0.066	0.061	0.064	0.066	0.069
a5	0.064	0.067	0.069	0.071	0.046	0.069	0.061	0.062	0.070	0.064	0.060	0.062	0.059	0.062
a6	0.047	0.050	0.050	0.051	0.055	0.035	0.060	0.049	0.054	0.049	0.045	0.046	0.047	0.040
b1	0.052	0.059	0.049	0.050	0.052	0.057	0.037	0.056	0.055	0.055	0.073	0.061	0.082	0.058
b2	0.074	0.073	0.084	0.079	0.075	0.075	0.078	0.052	0.075	0.074	0.070	0.079	0.083	0.077
b3	0.068	0.073	0.070	0.074	0.080	0.077	0.075	0.076	0.051	0.076	0.057	0.073	0.061	0.070
b4	0.084	0.073	0.074	0.074	0.071	0.068	0.069	0.076	0.078	0.055	0.084	0.070	0.058	0.079
c1	0.077	0.075	0.073	0.075	0.076	0.069	0.073	0.076	0.075	0.080	0.050	0.086	0.081	0.085
c2	0.090	0.091	0.090	0.085	0.089	0.091	0.089	0.088	0.092	0.086	0.091	0.061	0.107	0.101
c3	0.076	0.080	0.081	0.082	0.080	0.086	0.084	0.085	0.083	0.076	0.111	0.102	0.062	0.086
c4	0.075	0.072	0.074	0.076	0.073	0.072	0.075	0.072	0.072	0.080	0.077	0.080	0.077	0.055

Table 15. Limit of the weighted super-matrix.

Criteria	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	c4
a1	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
a2	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069
a3	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071
a4	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069
a5	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
a6	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048
b1	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
b2	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075
b3	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070
b4	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072
c1	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075
c2	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
c3	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084
c4	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074

Table 16. Weights of each dimension, criterion, and weight rank.

Dimension	Criterion	Dimension		Criterion	
		Weight	Weight rank	Weight	Weight rank
A	a1	0.403	1	0.082	3
	a2			0.069	11
	a3			0.071	8
	a4			0.069	10
	a5			0.063	12
	a6			0.049	14
B	b1	0.275	3	0.058	13
	b2			0.075	5
	b3			0.070	9
	b4			0.072	7
C	c1	0.322	2	0.075	4
	c2			0.089	1
	c3			0.084	2
	c4			0.074	6

Table 17. Relationship matrix of organizational performance and project risk.

Criterion	Relative Weight	a1	a2	a3	a4	a5	a6
c1	0.234	0.106	0.075	0.083	0.072	0.071	0.053
c2	0.277	0.124	0.102	0.104	0.097	0.094	0.071
c3	0.260	0.082	0.070	0.080	0.071	0.063	0.051
c4	0.229	0.134	0.102	0.115	0.111	0.100	0.065
Added weight		0.111	0.088	0.095	0.087	0.082	0.060
Relative importance		0.212	0.167	0.182	0.167	0.157	0.115

Table 18. Relationship matrix of organizational performance and project management.

Criterion	Relative Weight	b1	b2	b3	b4
c1	0.234	0.084	0.080	0.066	0.097
c2	0.277	0.095	0.125	0.115	0.110
c3	0.260	0.090	0.091	0.067	0.064
c4	0.229	0.091	0.121	0.110	0.124
Added weight		0.090	0.105	0.090	0.098
Relative importance		0.236	0.273	0.235	0.256

5. Results and Discussion

By using the practical experience of cloud CRM experts and the Multiple Criteria Decision Making (MCDM)-based DANP model, we determined the dimensions and criteria that have weights.

5.1. Findings

(1) Dimension impact relationship: The impact relationships between the three dimensions of project risk, project management, and organizational performance are validated because the total criteria relationship matrix and total dimensions relationship matrix can reveal the impact levels among each element. Additionally, the matrix contains no null values, thus reflecting the dynamic and complex relationships existing in real-world organizations. Figure 3 presents the impact relationship among the three dimensions. Dimension B impacts A and C (termed as B→{A, C}), and A impacts C (A→{C}). For dimension B (project management), the maximal value on $r_i + s_j$ (the horizontal axis) is 1.09, indicating that the experts felt that B has the strongest impact relationship intensity; the maximal relationship on $r_i - s_j$ (the vertical axis) is 0.16, meaning that the experts believed B has the strongest direct effect on other dimensions; finally, the minimal value of $r_i - s_j$ (the vertical axis) is –0.25, suggesting that the experts thought C (organizational performance) is easily influenced by other criteria.

(2) Dimension A–criterion impact relationship: Figure 4 shows the impact relationship of dimension A with six criteria. Criterion a6 impacts a5, a4, a2, a3, and a1 (a6→{a5, a4, a2, a3, a1}); a5 impacts a4, a2, a3, and a1 (a5→{a4, a2, a3, a1}); a4 impacts a2, a3, and a1 (a4→{a2, a3, a1}); a2 impacts a3 and a1 (a2→{a3, a1}); and a3 impacts a1 (a3→{a1}). According to the degree of influence, organizational environment risk exerts the strongest impact on other criteria, indicating that the organizational environment for projects exerts a profound influence on project risk.

(3) Dimension B–criterion impact relationship: Figure 5 shows the impact relationship of dimension B with four criteria. Criterion b1 impacts b2, b3, and b4 (b1→{b2, b3, b4}); b2 impacts b3 and b4 (b2→{b3, b4}); and b3 impacts b4 (b3→{b4}). According to the degree of influence, top management support exerts the strongest impact on other criteria, indicating that the amount of supporting senior managers provided to projects strongly influences project management.

(4) Dimension C–criterion impact relationship: Figure 6 shows the impact relationship of dimension C with four criteria. Criterion c4 impacts c2, c1, and c3 (c4→{c2, c1, c3}); c2 impacts c1 and c3 (c2→{c1, c3}); and c1 impacts c3 (c1→{c3}). According to the degree of influence, innovative and learning performance highly impacts other criteria, indicating that personal or organizational learning and growth associated with an information project strongly influence organizational performance.

(5) Weights of each dimension and criterion impact relationship: Furthermore, the influential weights of criteria and dimensions are clearly shown in Table 16. The highest dimension weight was found in the project risk dimension, indicating that the experts placed a high value on project risk; in addition, c2 (internal business process performance) was ranked number one. Furthermore, b1 (top management support) and a6 (organizational environment risk) had the lowest weights, which indicates that these two criteria exert the least impact compared with other criteria.

(6) The impact relationship of organizational performance, project risk, and project management: Next, we analyzed the relative importance of the overall organization for each project risk (Table 17) and project management (Table 18) criteria. Specifically, a1 (user risk) plays a critical role in organizational performance. As shown in Table 18, b2 (project planning and control) in the dimension of project management is essential to organizational performance.

(7) Required improvements for each dimension and criterion: Based on the causal relationship between each dimension and criterion, there were three dimensions (in order of priority) that required improvement: project management, project risk, and organizational performance. Moreover, improving the criteria, user risk, and project planning and control should be prioritized.

5.2. Academic and Managerial Implications

5.2.1. Academic Implications

In the results of this study, if a user has a negative attitude toward a project, it will have a high impact on project risk; Hung et al. [38] studied these same results. The most direct impact of user risk is a delay in project planning. When users do not want to cooperate, or even violate the project, then project priorities gradually reduce. When the user keeps in touch with the project and the development team, the user risk can be reduced. The main reasons for user risk include low motivation and no demand or no opportunity to participate. Therefore, the DANP can correctly point out the weight of these variables and identify priorities for improvement, which can provide decision-makers with the right project management strategy.

5.2.2. Managerial Implications

According to the results of this study, using project management practices improves the cloud CRM project risk and organizational performance. This study recommends that the following criteria be prioritized for improvement. (1) Internal business process performance: Through time management program planning, which is work schedule content analysis with a work breakdown structure (WBS), the critical path method (CPM), the program evaluation review technique (PERT), Pert and Gantt chart tools or techniques to improve the efficiency of the project development processes and activities. (2) Financial performance: One can use the project management information system (PMIS) to perform project cost management. Only project objectives can be controlled; therefore, it is important that the project cost determine the cost management objective at the beginning of the project. Project cost management includes estimated costs, budgeted costs, and controlled costs so that the project can be completed within an approved budget. Expecting project development costs within a budget can achieve a return on investment (ROI). (3) User risk: Improves the user's resistance to changes in mentality and reduces the negative impacts of users on the cloud CRM project.

6. Conclusions

In this study, using DEAMTEL can affect the known dimension order of a cloud CRM project for Internet services as follows: "project management (B)", "project risk (A)", "organizational performance (C)". For dimension A, the order of the criterion impact degrees is as follows: "organizational environment risk (a6)", "team risk (a5)", "planning and control risk (a4)", "requirements risk (a2)", "project complexity risk (a3)", and "user risk (a1)". For dimension B, the order of the criterion impact degrees is as follows: "top management support (b1)", "project planning and control (b2)", "internal integration (b3)", and "user participation (b4)"; regarding dimension C, the order of the criterion impact degrees is: "learning and growth performance (c4)", "internal business process performance (c2)", "customer performance (c1)", and "financial performance (c3)". Furthermore, calculation of DANP weights indicates that "project risk (A)" is the most important in a cloud CRM project. "Internal business process performance (c2)", "financial performance (c3)", and "user risk (a1)" have the highest influences, while "customer performance (c1)" and "project planning and control (b2)" were ranked as the fourth and fifth weights.

Based on the causality between dimensions, criteria gain highly influential factors, which are project management, organizational environment risk, top management support, learning, and growth performance. Cloud CRM projects need to improve the internal business process performance, financial performance, and user risk. The following suggestions for improvement are proposed.

According to the results of the cloud CRM expert study, cloud CRM project managers can consider making relevant improvements based on the following three criteria. (1) Internal business process performance through effective project quality planning and problem solving can improve internal processes of cloud CRM project planning, execution, and control, thereby supporting effective tracking of milestones. The purpose of monitoring project results is to determine project quality standards. Project results include the results of projects and the project management performance that can be delivered. (2) Financial performance during execution of a project and periodic review of financial performance can ensure the best use of limited resources. When a budget is added, it should be strictly monitored. Financial audits should be implemented regularly at each stage of a project in order to find problems at early stages. (3) If the user does not have sufficient knowledge of the cloud CRM system, a project knowledge management system can be created; thus, project management experience and best practices can be transferred to the relevant members of a project, and staff training results can be improved significantly.

The reasons for the present selection of research methods and analyses are as follows: The difference between the ANP method and the analytic hierarchical process (AHP) method is that the criteria and dimensions in the AHP method must be independent of each other in order to calculate the full weight of the assessment. The ANP method can evaluate the method of criteria and dimension weights. The DEMATEL method can determine the direct and indirect relationships between the dimensions. The use of the DEMATEL method is more than a traditional evaluation method, and it is more suitable for dealing with real-world complex decision-making issues. The DEMATEL method can quantify the relationship of complex problems, so that decision-makers can determine the structure of a problem and the causal relationships in factors. The DANP method can be combined with DEMATEL and ANP in order to improve the overall factor relevance and the performance of cloud CRM projects.

Most previous IS project studies focus on key success factors which our research contributions can analyze, from different contexts and criteria. The relevance of the study results can provide recommendations to an enterprise for cloud CRM project risk improvement, and enhance the organizational performance of enterprises. Future directions in this research can study different IS or non-IS projects, and the scope of sampling can be expanded in order to fit other areas of a project.

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