African Journal of Business Management Vol. 7(7), pp. 559-571, 21 February, 2013
Available online at http://www.academicjournals.org/AJBM
DOI: 10.5897/AJBM11.210
ISSN 1993-8233 ©2013 Academic Journals

Full Length Research Paper

Decision support model for employee selection: A strategic human resource management (HRM) perspective

Shu-Hsuan Chang[1]*, Mei-Rei Huang[1], Hwai-En Tseng[2], Yi-Cheng Jiang[1] and Li-Chih You[1]

[1]Department of Industrial Education and Technology, National Changhua University of Education, Changhua, Taiwan, Republic of China.
[2]Industrial Engineering and Management, National Chin-Yi University of Technology, Taichung, Taiwan, Republic of China.

Accepted 17 March, 2011

Human resource has been regarded as an important factor for an organization to gain competitive advantages. Employee selection is an essential decision especially to intellectual property technology service industry, since "human" is the theoretical basis of establishing the important assets for an organization. The decision makers should select the specialists who best match the needs of the organizational strategy by contemporaneously considering multiple and interdependent evaluation criteria. Thus far, literatures detailing employee selection problems assumed that the criteria for evaluating specialists are independent and ignore the strategic viewpoint. Since the process for employee selection is so complicated, an effective tool, especially for dealing with interdependence among criteria, is needed. Based on the viewpoint of strategic human resource management and resource-based theory, the study aimed to develop a systematic decision support model that combines an Analytic network process (ANP) with an analytic hierarchy process (AHP) for employee selection decisions. To implement the model, an empirical study for the intellectual property technology service industry in Taiwan was conducted. Moreover, an empirical example of specialist selection for company G demonstrated the computational process and effectiveness of the proposed model. The results calculated by the decision support model were confirmed to be a useful point of reference for decision makers during practical implementation.

Key words: Analytic network process (ANP), analytic hierarchy process (AHP), employee selection, human resource management (HRM), resource-based theory.

INTRODUCTION

Human resource has been regarded as an important factor for an organization to gain competitive advantages and realize organizational targets since the emergence and prevalence of firm resource-based views (Barney, 2001; Wright et al., 2001). The success of many organizations possibly results from the outstanding leadership and execution, the technical prominence and innovation, the excellent quality and the distinguished reputation, but all these relate to "human". "Human" is the theoretical basis of establishing the important assets for an organization. Thus since 1980, the human resource management strategy has become an important emerging issue for human resource management (Terpstra and Rozell, 1993; Huang, 1997; Barba-Sánchez and Atienza-Sahuquillo, 2010).

Strategic human resource management (SHRM) is the macro-organizational approach to viewing the role and function of HRM in the larger organization (Bulter et al., 1991). It entails the linking of HRM practices with the strategic management process of the organization (Guest, 1989). Resource-based theory (RBT) also

*Corresponding author. E-mail: shc@cc.ncue.edu.tw, csh.at.g@gmail.com. Tel: +886-4-723-2105 ext. 7262.

emphasizes that the firm's competitive advantage is on the link between strategy and its internal resources (Grant, 1991). On top of these, the human resource management strategy still follows the principle of "decision-making of a strategy must be done ahead of the strategy of implementation" (Wang et al., 2010).

Employee selection is an essential decision especially in a knowledge-based economy. The old industrial era has been supplanted by a new knowledge-based economy in which ideas and innovation rather than land or natural resources have become the principal wellsprings of economic growth and competitive business advantage (Rivette and Kline, 2000). In the knowledge-intensive society, intellectual property (IP) is an increasingly important source of prosperity. Companies can increase profitability by developing and safeguarding IP (Borg, 2001). The intellectual property technology service industry (IPTSI) is one of the most important strategic industries in the policy of R.O.C. government (Industrial Development Bureau Ministry of Economic Affairs, 2001). It is a knowledge-based industry that integrates knowledge from management, legal practitioners and technology. Knowledge workers who can really create value for the industry are the key success factors of this industry. For this reason, the key issue is how to select employees that will ascertain whether an organization can maintain its competition advantage or not.

The employee selection problem is modeled as a multi-criteria decision making (MCDM) problem (Chen and Cheng, 2005; Tsao and Chu, 2001; Gardiner and Wright, 2000; Liang and Wang, 1994; Saaty, 1988). According to the viewpoints of SHRM and RBT, the decision makers should select the specialists during the selection process who best match the needs of the organizational strategy by contemporaneously considering multiple and interdependent evaluation criteria (Wanous, 1980; Boerlijst and Meijboom, 1989). These factors make the development of an effective selection tool extremely difficult.

Thus far, most of the literatures detailing employee selection problems ignore the SHRM and RBT viewpoints, suppose that the criteria for evaluating candidates are independent, and thus usually adopt Analytic Hierarchy Process (AHP) to solve these problems. Since the process for employee selection is so complicated, an effective tool, especially for dealing with the interdependent criteria, is needed. The analytic network process (ANP) can be considered as a more general form of the AHP in which dependencies and feedbacks between elements of a decision can be modeled (Saaty, 2001). Hence, the ANP is more accurate in complex situation due to its capability of modeling complexity and the way in which comparisons are performed (Yang et al., 2010). The ANP has been applied to many areas including:

(1) Evaluation and selection, in which the ANP was utilized to construct a model to select a proper project (Lee and Kim, 2001; Shang et al., 2004; Chang et al., 2007), an enterprise partner (Chen et al., 2004), and an appropriate product design (Karsak et al., 2002).
(2) Optimization, in which the ANP was adopted to find the optimal product mix (Chung et al., 2005) and price allocation (Momoh and Zhu, 2003).
(3) Performance assessment, in which the ANP was applied to construct a model for the measurement of a company's long-term performance (Yurdakul, 2003).
(4) Forecasting, in which the ANP was employed to construct an expert decision model to forecast the economic trend (Blair et al., 2002) and financial crisis (Niemira and Saaty, 2004).

Therefore, based on SHRM and RBT, the study aims to develop a systematic decision support model that combines an ANP with an AHP for employee selection decisions. To implement the model, an empirical study for the intellectual property technology service industry in Taiwan was conducted. Moreover, an empirical example of specialist selection for company G demonstrates the computational process and effectiveness of the proposed model. The results calculated by the decision support model are confirmed to be a useful point of reference for decision makers during practical implementation.

PBOBLEM OF EMPLOYEE SELECTION WITH INTERDEPENDENT CRITERIA

In classical management theory the organization is viewed as a closed system and the traditional selection model is static. Decision makers tend to adopt the view "what happened in the past was a great guide to what will happen in the future" (Guion, 1998) for employee selection. As long as the individual behavior met the job requirements, the selection decision would be appropriate. However, it should be noted that the job content in every position will continuously vary with the environment (Schneider, 1976). The individual's self-identity will be continuously shaped and developed when they interact with others and their environment. However, the traditional selection model only works well for hierarchical organizations (Guion, 1998).

In accordance with the results from the in-depth interview and industry investigation, it is found that IPTSI is mainly composed of small or medium sized firms operated by the teamwork model. The organization pattern tends to be organic or of another kind. It is improper only to adopt the view of the traditional selection model which neglects the fitness between employee and organization development. According to SHRM viewpoint, an organization's human resources are of critical strategic importance – that the skills, behaviors, and interactions of employees have the potential to provide both the foundation for strategy formulation and the means for

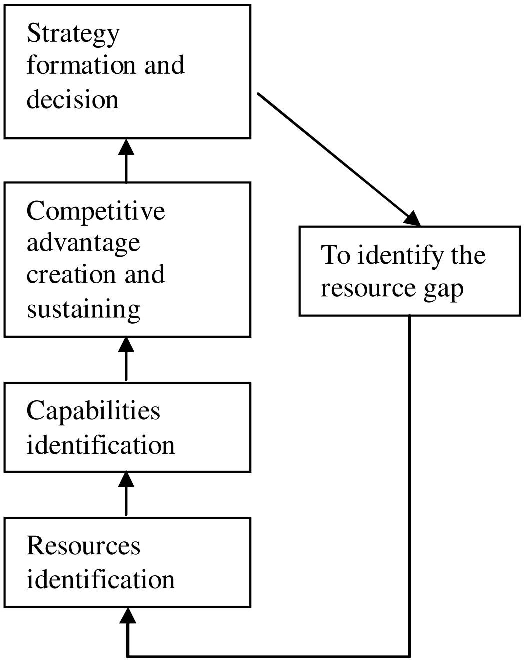

Figure 1. Strategy formulation of competitive advantage on the viewpoint of the resource-based theory.

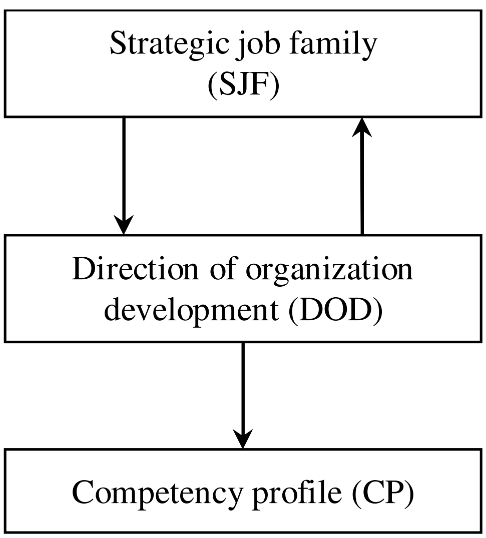

Figure 2. Framework for employee selection with viewpoints of SHRM and RBT.

strategy implementation (Colbert, 2004). Furthermore, the RBT also states that a firm develops competitive advantages by not only acquiring but also developing, combining, and effectively deploying its resources in ways that add unique value and are difficult for competitors to imitate (Barney, 1991). The resources of a firm may include physical capital resources (Williamson, 1975), human capital resources (Becker, 1964), and organizational capital resources (Tomer, 1987) controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness (Daft, 1983). Therefore, the viewpoints of SHRM and RBT are adopted to demonstrate the interdependence between strategic job family (SJF) and direction of organization development (DOD). The framework for employee selection with the viewpoints of SHRM and RBT is illustrated in Figure 1.

Conceptual frame for employee selection

According to RBT (Grant, 1991; Barney, 1991), strategy formulation of competitive advantage was illustrated in Figure 1. Firstly, the firm has to evaluate its resources by capering with those of competitors and to identify its core resources and capabilities to create its own competitive advantage. Then, the strategy of competitive advantage for the future development can be developed. The next step is to identify the resource gap between the strategy-required resources and the currently existing resources and then supply it. By repeating the process, the competitive advantage can be fulfilled and sustained.

Based on the RBT mentioned above, the framework for employee selection decision was decomposed into three layers comprising SJF, DOD, and competency profile (CP), as shown in Figure 2. The strategic planning process can be divided into two stages. The first stage is to confirm their existing resources. As IPTSI is a knowledge-based industry, it mainly provides intermediate products and services that are knowledge-based and relies heavily on professional knowledge. Therefore, the specialists who possess knowledge can create competitive advantages and are the most important resource in the industry. According to the characteristics of the industry, the existing resources are simplified and represented mainly by the human resource– the existing SJFs in the research. As organizational competitive strategies are based on the strength of employees (Stewart and Carson, 1997), the existing human resource will influence the DOD. At the second stage of the strategic planning process, it is necessary to confirm the gap between strategy and the currently existing resources. The existing resources are redeployed in accordance with gap analysis. The RBT demonstrates the fact that strategies are not universally implementable, but are contingent on having the human resource base necessary to implement them (Wright and McMahan, 1992). The DOD will influence the redeploy-ment of SJF. Consequently, on the basis of the develop-ment direction in the company, the decision makers will redeploy their existing specialists and select new CP.

Criteria and their measures for specialist selection

According to the results of literature review and

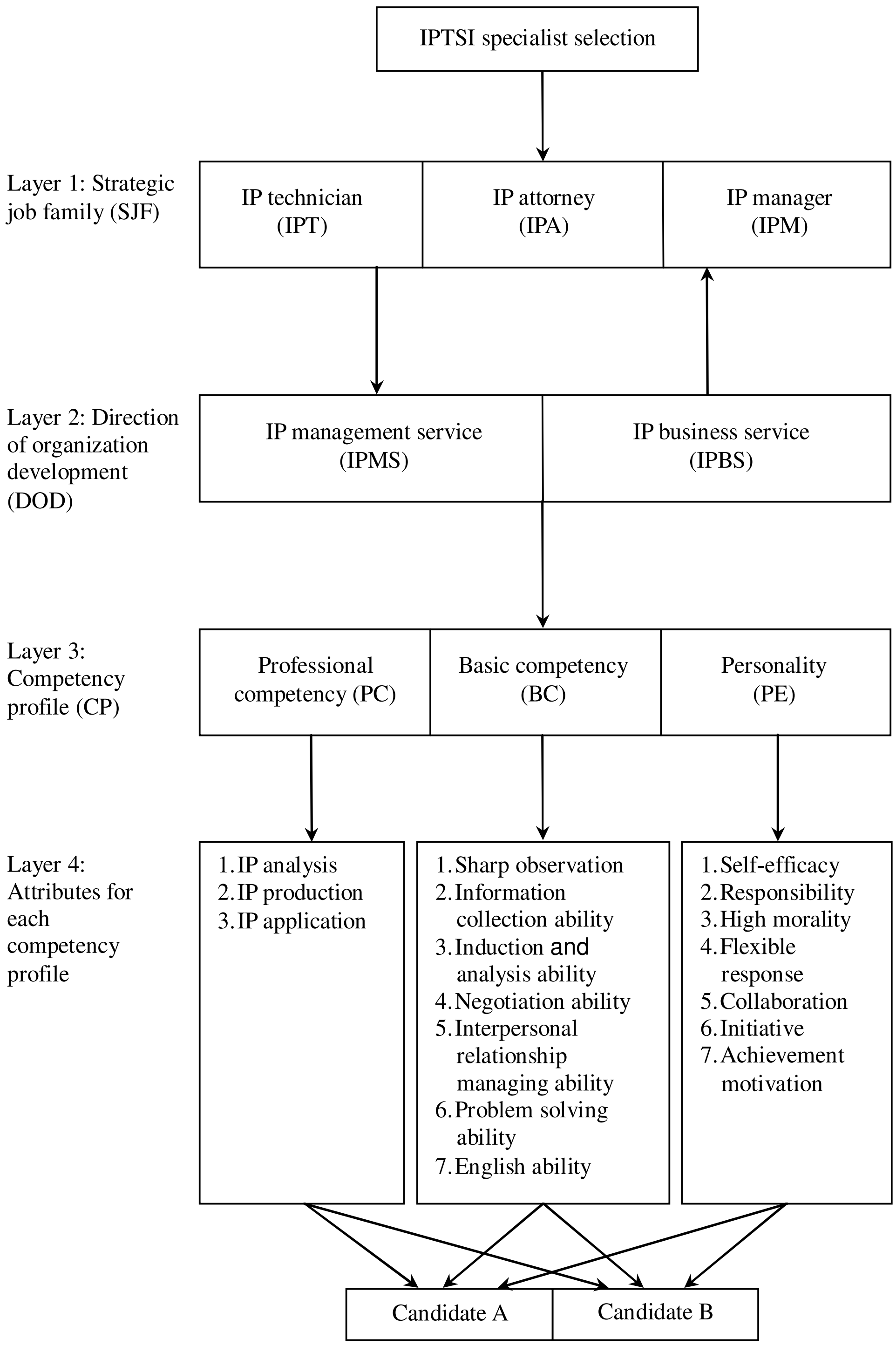

Figure 3. Decision model for IPTSI specialist selection.

interviews with six experts who have been working as the top-level managers at least five years in the IPTSI and have the experience to take part in the specialist selection decision, the decision model for specialist selection is summarized in Figure 3.

As shown in Figure 3, the decision model is decomposed into three layers comprising SJF, DOD, and CP. The strategic job is composed of three job families, which are IP technician (IPT), IP attorney (IPA), and IP manager (IPM). The organization development is split into two directions – IP management service (IPMS) and IP business service (IPBS). Each direction contains three CPs –professional competency (PC), basic competency (BC), and personality (PE). The interdependence occurs between SJF and DOD. The three layers of the decision model and the corresponding criteria for specialist selection are described as follows:

First layer: SJF Strategic job family (SJF) refers to the employees who can strengthen the internal process of the organization (Kaplan and Norton, 2004). In accordance with the value chain of IPTSI, these workers can be classified into three categories:

(1) IPT, which is responsible for searching and analyzing IP information, and proceeding with IP application.
(2) IPA, which is responsible for licensing, making contracts, litigating, and providing consultant services.
(3) IPM, which is responsible for planning, developing and implementing all aspects of the IP function consistent with the customers' business strategy and the needs of their research and development programs.

Second layer: DOD On the basis of "regulations of identification and implementation for the IPTSI" provided by the Ministry of Economic Affairs, R.O.C., the IPTSI can be divided into two categories – IPMS and IPBS (Ministry of Economic Affairs, 2005). In addition, according to the industry investigation, it is found that the IPTSI is mainly composed of small firms, and the services are focused on either IPMS or IPBS. Furthermore, all companies in the industry will develop both IPMS and IPBS to provide better service to their customers. For example, a firm may focus on IPMS at present. In the future, the firm will develop the IPBS based on IPMS. Different firms in IPTSI may have different weights for IPBS and IPMS. Consequently, the two directions are adopted to present the dimension of present or future development. The possible development directions for cooperation in the industry are defined as:

(1) IPMS: including IP retrieval, tendency analysis, exploitation, overall arrangement and strategic analysis, infringement analysis, and establishment of IP management and application system.
(2) IPBS: including IP marketing, transaction, evaluation, licensing, packaging, and establishment of IP profit-making model. Third layer: CP The set of necessary knowledge, personality, and abilities for executing the different development directions (Kaplan and Norton, 2004). According to the results from the related literature analysis and in-depth expert interviews, the criteria and their measures are described as follows:

(1) PC: Knowledge related to implementing specific work. The measures include IP analysis, IP production, and IP application.
(2) BC: Ability related to assisting in applying knowledge. The measures include sharp observation, information collection ability, induction and analysis ability, negotiation ability, interpersonal relationship managing ability, problem solving ability, and English ability.
(3) PE: Special behaviors or attitudes related to implementing in specific work. The measures include self-efficacy, responsibility, high morality, flexible response, collaboration, initiative, and achievement motivation.

Interdependent components

Interdependence occurs when the direction of influence of components at two levels is not unidirectional. With interdependence, components at one level influence and at the same time are influenced by components at another level (Meade and Presley, 2002). In the research, interdependence occurs between SJF and DOD. The existing SJF influences the DOD. Furthermore, since the existing resources are redeployed in accordance with gap analysis, the DOD will influence the redeployment of SJF. The service contents of IPTSI can be IPMS and/or IPBS. IPMS primarily focuses on analyzing and managing IP for customers. This service is mainly provided by IPTs who possess the technical knowledge and skills. On the other hand, IPBS primarily focuses on assisting the customers in how to combine their strategy and IP to create a competitive advantage. This service is mainly provided by IPMs who possess the skills related to strategy management of IP. Therefore, if the majority of specialists in the case company are technicians, the service of the company might primarily focus on IPMS. However, if the tendency of the industry is to provide an overall service, the case company will provide the IPBS in the future. Consequently, based on the development direction in the company, the decision makers will redeploy their existing specialists and select new ones.

METHODOLOGY

ANP and AHP

The study aims to develop a systematic decision support model that combines an ANP with an AHP for employee selection decisions. As aforementioned discussion in previous section, the interdependence between SJF and DOD can not be ignored during decision process.

As aforementioned, the employee selection problem is modeled as a MCDM problem. AHP for decision structuring and decision analysis was first introduced by Saaty (1988). The approach is capable of handling different layers of criteria by obtaining the composite weights.

By decomposing a decision problem from the top overall goal to a level of manageable decision criteria and using pair-wise comparison to assign weights to these criteria, AHP models a decision making framework that assumes an unidirectional hierarchical relationship among decision levels (Saaty, 1988; Meade and Presley, 2002).

The method helps to establish decision models through a process that contains both qualitative and quantitative components (Saaty, 1988; Cheng and Li, 2004). But in the real world, the decision problems are so complicated and involve interdependence between elements of the same clusters or different clusters. This requires the

Table 1. Pair-wise comparison matrix of the components at a level for a specific control criterion.

Control criterion	Criterion 1	Criterion 2	Criterion 3	…	Criterion m	Relative weights ω
Criterion 1	1	3	7	…	5	ω_1
Criterion 2	1/3	1	5	…	3	ω_2
Criterion 3	1/7	1/5	1	…	9	ω_3
⋮	⋮	⋮	⋮	⋮	⋮	⋮
Criterion m	1/5	1/3	1/9	…	1	ω_m

generic analytic method, ANP, which can evaluate multi-directional relationship among decision criteria (Saaty, 2001; Meade and Sarkis, 1999).

The ANP is a general form of AHP. The major difference between the two methods is that AHP models a decision making framework that assumes an unidirectional hierarchical relationship among decision levels, ANP allows for many complex interrelationships among the decision levels and attributes (Meade and Presley, 2002).

The ANP comprises four main steps: (1) Conducting pair-wise comparisons on the elements at the cluster and sub-cluster levels; (2) Placing the resulting relative importance weights (eigenvectors) in submatrices within the supermatrix; (3) Adjusting the values in the supermatrix so that the supermatrix can achieve column stochastic; and (4) Raising the supermatrix to limiting powers until the weights have converged and remain stable (Sarkis, 1999).

In ANP, like AHP, to elicit preferences of various criteria and attributes, pair-wise comparisons of the components at each level are conducted with respect to their relative importance toward a control criterion at the upper or lower level, as shown in Table 1.

Once the pair-wise comparisons are completed, the local priority vector ω is computed as the unique solution to:

$$R\omega = \lambda_{max}\omega, \quad (1)$$

where λ_{max} is the largest eigen value of pair-wise comparison matrix *R*. This paper adopts a two-stage model proposed by Meade and Sarkis (1998) to approximate vector ω. This is represented as

$$\omega_i = \frac{\sum_{j=1}^{m}\left[\frac{R_{i,j}}{\sum_{i=1}^{m} R_{i,j}}\right]}{j}, \quad (2)$$

where ω_i is the weighted priority for component *i*, *j* is index number of columns, *i* is index number of rows.

Decision process of employee selection

According to the employee selection model, ANP and AHP are combined to construct the model which can meet the needs of the IPTSI. To implement the model, different SJF, DOD, and CP and their corresponding criteria for evaluating each candidate have to be examined beforehand. The interdependence between SJF and DOD is solved by ANP; the hierarchy between CPs and their corresponding attributes for each CP is solved by AHP. The decision process for specialist selection is described in Figure 4.

As shown in Figure 4, the decision process is briefly described as follows.

Step 1: Define and screen evaluation criteria.

According to the results of the literature review and interviews with experts, the criteria for IPTSI specialist selection are listed.

Step 2: Collect the relative importance of each criterion.

Collect the relative importance of each criterion with respect to attaining the top goal and the relative importance of each sub-criterion with respect to its upper level criterion by assuming that there is dependence among criteria. According to Saaty (2001) recommended scaling procedure, a score of 1 represents indifference between two components, a score of 9 represents overwhelming dominance of a row component over a column component, and 1/9 represents overwhelming dominance of a column component over a row component. When scoring is conducted for a pair, a reciprocal value is automatically assigned to the reverse comparison within the matrix.

Step 3: Establish the pair-wise comparison matrix.

Pair-wise comparisons of the elements in each level are conducted with respect to their relative importance toward their control criterion. The pair-wise data provided by each expert are integrated by geometric mean (Saaty, 1988). Then, the pair-wise comparison matrix is established according to the integrated data.

Step 4: Check consistency.

Check if the CR is equal to or less than 0.1. If the CR is not, go back to step 3. If the CR value is smaller than 0.1, the judgment of decision maker is consistent (Saaty, 1988).

Step 5: Calculate the relative importance of each criterion.

The relative importance of each criterion, that is, the weight vector for each criterion, is determined by Equation (2). Because these initial supermatrix weights might not converge, the Markovian-based analysis, which first normalizes the weights in each column, and then raises the supermatrix to a sufficiently large power such that the weights converge at limited level, is conducted (Saaty, 2001).

Step 6: Score all candidates.

Each candidate has to be evaluated with regard to each measure with scores from 1 to 7. The scores 1, 2, 3, 4, 5, 6, 7 mean bad, very poor, poor, fair, good, very good, and excellent, respectively.

Step 7: Calculate the desirability index (DI) for each candidate.

The selection of the best candidate depends on the calculation of

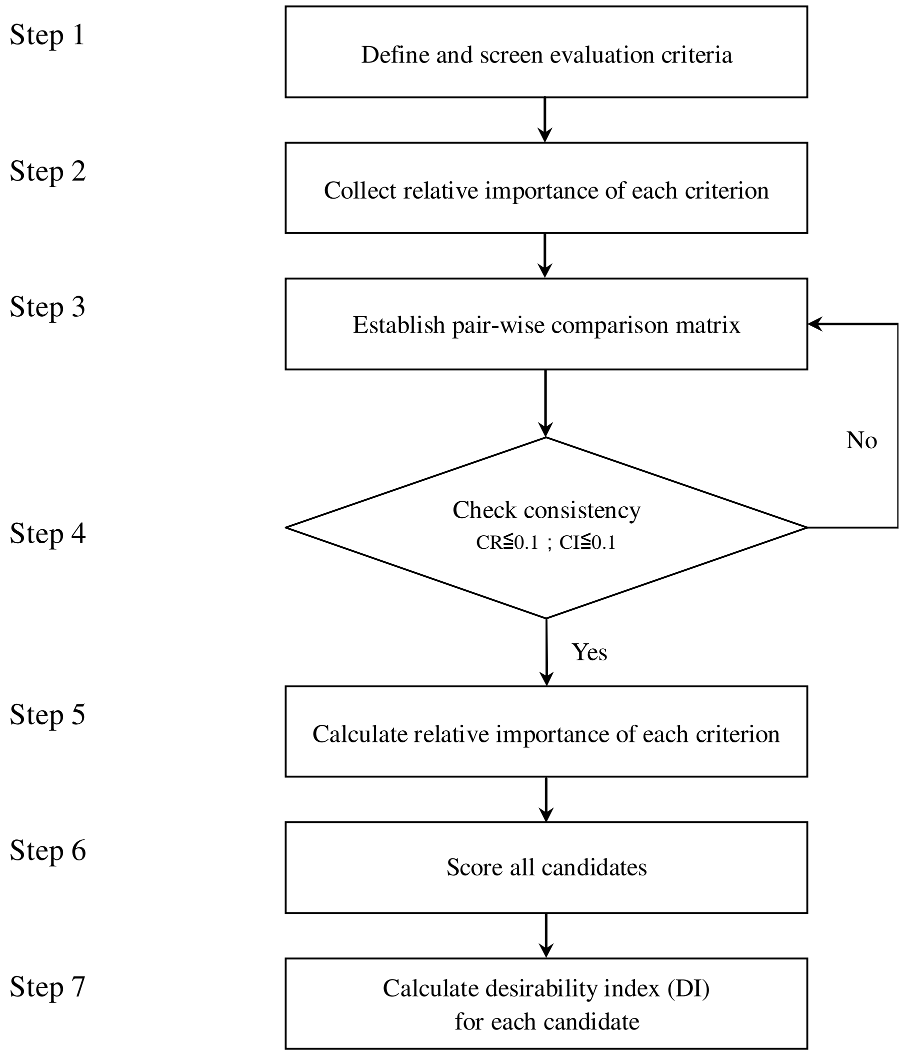

Figure 4. Decision process for IPTSI specialist selection.

DI for each candidate. The potential candidate with the largest DI should be selected. The equation is defined by Meade and Presley (2002)

$$DI = \sum C_i M_i S_i, \forall i = 1,2,...., r \quad (3)$$

where Ci is the relative importance weight of criterion i, Mi is the relative importance weight for each measure, Si is the score for each measure.

CASE STUDY AND DEMONSTRATION

Company G, which has fifteen staffs and capital of thirteen million dollars, has been established for approximately two years. Company G has been issued a "Certificate of Registration as a Technological Service Organization" by MOEA in 2004. In this case, for company G, the primary services are IPMS (including IP retrieval, tendency analysis, exploitation, overall arrangement and strategic analysis, infringement analysis, and establishment of IP management and application system) and IPBS (including IP marketing, transaction, evaluation, licensing, packaging, and establishment of IP profit-making model) is its future DOD. Most of its specialists major in science or engineering, and only a few major in law and commercial management.

The study collects the data by administering the questionnaire to seven decision makers who have the experience to take part in the specialist selection decision in company G. The weighting factor for each criterion and measure can be calculated by the model designed for this purpose. The decision makers evaluate the candidates according to each measure. The specialist selection decision can be made by selecting the candidate with the highest score following synthesis evaluation.

Illustration of application

Step 1: Define and screen evaluation criteria

According to the results of the literature review and the professional opinions of six experts, the evaluation criteria are selected and the model is reconfirmed. The model can be divided into three layers, including SJF, DOD, and CP. The SJF may have some degree of interdependence with the DOD. According to the strategic planning

Table 2. Pair-wise comparison matrix of three components for PC.

Professional competency	IP analysis	IP production	IP application	Geometric mean	Weight
IP analysis	1.00	2.35	1.91	1.65	0.513
IP production	0.42	1.00	0.91	0.73	0.227
IP application	0.52	1.10	1.00	0.83	0.260

λ_{max} = 3.00137, C.I. = 0.00069, C.R. = 0.00118

Table 3. Pair-wise comparison matrix of DODs for IPT.

IP technician	IPMS	IPBS	Geometric mean	Relative weights
IPMS	1	1.10	1.05	0.524
IPBS	0.91	1	0.95	0.476

λ_{max} = 2.00000, C.I. = 0.00000, C.R. = 0.00000

Table 4. Matrix A formed by the relative weight vectors of the two DODs for the three SJFs**.**

Matrix A	IP technicians (IPT)	IP attorney (IPA)	IP manager (IPM)
IPMS	0.524	0.475	0.540
IPBS	0.476	0.525	0.460

process in the context of RBT, there is a gap between the development direction and the specialists currently existing in the organization. In order to best implement the strategy and achieve the goal, the decision makers have to redeploy the human resources and select new ones. Consequently, the DOD will influence the deployment of the existing SJF and the selection of the future ones.

Step 2-4: Determine the importance of each decision criterion, establish the pair-wise comparison matrix, and check the consistency

Eliciting preferences of various components and attributes requires a series of pair-wise comparisons where the decision makers will compare two components at a time with respect to an upper level criterion. The data collected from the returned questionnaires administrated to the seven decision makers is integrated by geometric mean, and a pair-wise comparison matrix is established according to the integrated data. The step is to form the supermatrix which allows a solution for the effect of interdependence between the criteria at different levels of the system.

(1) AHP implementation: The relative weight of each component for the PC, BC, and PE can be determined by applying AHP which models a decision making framework by assuming a unidirectional hierarchical relationship among decisions levels. For example, the pair-wise comparison matrix of three components for PC is shown in Table 2.

As shown in Table 2, under PC, the most important measure is IP analysis, the second is IP application, and IP production is of the least importance. As for consistency, the CR value of matrix is 0.001, which is smaller than 0.1, indicating that the judgment of decision maker is consistent (Saaty, 1988).

(2) ANP implementation: As aforementioned, the interdependence between the criteria at three levels, SJF, DOD, and CP, can be solved by applying ANP. A pair-wise comparison matrix of the DODs for IPT is illustrated in Table 3. The priority vector is obtained by using equation (2) with the integrated data in Table 3. In this relationship, from the view point of IPT, the IPMS is considered slightly more important than the IPBS. The relative weight vectors for each SJF are normalized and integrated to form matrix A, as shown in Table 4, which describes the relative impact of different SJFs. In summary, from the view point of IPT and IPM, the IPMS is more important than the IPBS; from the view point of IPA, the IPBS is more important than the IPMS.

The pair-wise comparison matrix of SJF for IPMS is shown in Table 5, which illustrates the impact of various SJFs on the DOD, IPMS. Note that family IPT influences IPMS more than another two families, IPA and IPM. The matrix B, which is formed by the relative weight vectors of the three SJFs for the two DODs, is shown in Table 6. When the IPMS is regarded as DOD, IPT is significantly more important than IPA and IPM. When the IPBS is regarded as DOD, IPM becomes more important. Hence, IPM and IPT should be the main human resource for company G.

By repeating this process for each component of the three layers, the pair-wise comparison matrix for the whole decision model, that is, the initial supermatrix, can be determined. The unweighted supermatix which contains matrices A and B is shown in Table 7, and the weighted supermatrix is shown in Table 8.

Step 5: Calculate the relative importance of each criterion

The initial supermatrix for all criteria converges after completing a Markovian-based analysis and the limited supermatrix is obtained, as shown in Table 9. The weights for various criteria, which are normalized by cluster and limiting, are shown in Table 10.As shownin Table 10, under the effect of interdependence, for the three SJFs, the weight of IPT (0.48495) is much higher than those of IPM (0.28297) and IPA (0.23208); for the two DODs, the weight of IPMS (0.51737) is slightly higher than that of IPBS (0.48263); for the three CPs, the weight of PC (0.37310) is the highest, the second is PE (0.35951), and that of BC (0.26739) is the lowest. Therefore, among

Table 5. Pair-wise comparison matrix of SJFs for IPMS.

IPMS	IPT	IPA	IPM	Geometric mean	Relative weights
IPT	1	1.62	2.55	1.61	0.504
IPA	0.62	1	0.70	0.76	0.238
IPM	0.39	1.42	1	0.82	0.258

λmax = 3.07243, C.I. = 0.0361, C.R. = 0.06244.

Table 6. Matrix B formed by the relative weight vectors of the three SJFs for the two DODs.

B matrix	IPMS	IPBS
IPT	0.504	0.465
IPA	0.238	0.226
IPM	0.258	0.309

the three SJFs, IPT is much more important than IPA and IPM for decision makers. In the meantime, the decision makers emphasize IPMS in DOD based on the evaluation of the relative importance of the three SJFs with respect to the two DODs. Finally, for the three CPs, the most important criterion is PC, the second is PE, and BC is of the least importance as evaluated by the decision makers in company G.

Step 6-7: Score and calculate the desirability index (DI) for each candidate

All candidates have to be evaluated with regard to each measure by scores of 1-7 and the candidate with the highest DI should be selected. In the case study, suppose the decision makers were trying to determine which of the three candidates, A, B and C, would meet the company's needs, let us consider the situation given in Table 11.

Candidates A, B, and C have the best performance in PC, BC, and PE, respectively. Based on the weight and the score for each criterion, the DI for each candidate can then be calculated, as shown in Table 11.

Note that candidate A has the highest DI of 5.21142, which is a little higher than that of candidate C (5.18424) and is much higher than that of candidate B (4.78858). Therefore, candidate A should be selected.

DISCUSSION

The case study is conducted to validate the model that selects the best specialist to meet the company's strategy. Since the competitive advantage of company G in knowledge-based industry is based on the strength of employees, the existing SJF influences the DOD, which in turn will influence the redeployment of the SJF because the existing resources are redeployed in accordance with the gap analysis. Therefore, the interdependence between SJF and DOD should be considered and the gap between strategy and the currently existing resources should be confirmed. According to the results of analysis, from the view point of IPT and IPM, the IPMS is considered more important than the IPBS; on the other hand, from the view point of IPA, the IPBS is considered more important than the IPMS. From the view point of IPMS, IPT is much more important than IPA and IPM; on the other hand, from the view point of IPBS, IPM becomes more important. Hence, IPM and IPT should be the main human resource for company G.

According to the industry investigation, it is found that the IPTSI is mainly composed of small firms, and the services are focused on either IPMS or IPBS. Furthermore, all companies in the industry will develop both IPMS and IPBS to provide better service to their customers. In this case, for company G, the IPMS is the main focus at present, and the main human resource is IPT who majors in science or engineering. However, as the case company develops toward IPBS in the future, PC and PE will be viewed as more important factors in CPs. As aforementioned, IPTSI, a knowledge-based industry, relies heavily on professional knowledge which verifies the results for PC. The iceberg model proposed by Spencer and Spencer (1993) verifies these results for PE. According to the analyzed results, enterprises should select employees with qualified professional competency and the appro-priate personality, and then offer the training courses to help the specialists acquiring the knowledge and skills required by the job. Therefore, candidate A or C is more suitable than candidate B in the case company.

CONCLUSIONS

As Collins (2002) stressed “First Who, then What”, selecting the specialists that fit the needs of organization development and then offering the opportunity for relevant training can facilitate the fulfillment of an organization's goals.

The study, based on SHRM and RBT, aims to develop a systematic decision support model that combines an ANP with an AHP for employee selection decisions. The data of the SJF, DOD, and CP and their corresponding criteria for evaluating each candidate are collected by administering the questionnaire to the decision makers in company G. The weighting factor for each criterion and measure can be calculated by the model. The decision makers evaluate the candidates according to each measure. The specialist selection decision can be made by selecting the candidate with the highest score following synthesis evaluation. The important findings of

Table 7. Unweighted supermatrix.

Cluster node labels		Strategic job families (SJF)			Direction of organization development (DOD)		Competency profiles (CP)		
		IPT	IPA	IPM	IPMS	IPBS	PC	BC	PE
SJF	IPT	0	0	0	0.50395	0.46458	0	0	0
	IPA	0	0	0	0.23771	0.22605	0	0	0
	IPM	0	0	0	0.25834	0.30937	0	0	0
DOD	IPMS	0.52356	0.47619	0.54054	0	0	0	0	0
	IPBS	0.47644	0.52381	0.45946	0	0	0	0	0
CP	PC	0	0	0	0.42250	0.29199	0	0	0
	BC	0	0	0	0.21549	0.32303	0	0	0
	PE	0	0	0	0.36201	0.38499	0	0	0

Table 8. Weighted supermatrix.

Cluster node labels		Strategic job families (SJF)			Direction of organization development (DOD)		Competency profiles (CP)		
		IPT	IPA	IPM	IPMS	IPBS	PC	BC	PE
SJF	IPT	0	0	0	0.25198	0.23229	0	0	0
	IPA	0	0	0	0.11885	0.11302	0	0	0
	IPM	0	0	0	0.12917	0.15469	0	0	0
DOD	IPMS	0.52356	0.47619	0.54054	0	0	0	0	0
	IPBS	0.47644	0.52381	0.45946	0	0	0	0	0
CP	PC	0	0	0	0.21125	0.14600	0	0	0
	BC	0	0	0	0.10774	0.16151	0	0	0
	PE	0	0	0	0.18101	0.19249	0	0	0

Table 9. Limited supermatrix.

Cluster node labels		Strategic job families (SJF)			Direction of organization development (DOD)		Competency profiles (CP)		
		IPT	IPA	IPM	IPMS	IPBS	PC	BC	PE
SJF	IPT	0.12124	0.12124	0.12124	0.12124	0.12124	0	0	0
	IPA	0.05802	0.05802	0.05802	0.05802	0.05802	0	0	0
	IPM	0.07074	0.07074	0.07074	0.07074	0.07074	0	0	0
DOD	IPMS	0.25869	0.25869	0.25869	0.25869	0.25869	0	0	0
	IPBS	0.24131	0.24131	0.24131	0.24131	0.24131	0	0	0
CP	PC	0.08988	0.08988	0.08988	0.08988	0.08988	0	0	0
	BC	0.06685	0.06685	0.06685	0.06685	0.06685	0	0	0
	PE	0.09327	0.09327	0.09327	0.09327	0.09327	0	0	0

this study are concluded as follows:

(1) The decision support model for specialist selection including the viewpoints of SHRM and RBT and the results calculated by the decision support model are confirmed to be a useful point of reference for decision

Table 10. Weights for criteria (normalized by cluster and limiting).

Layer	Components	Limiting	Normalized by cluster
Strategic job family (SJF)	IP technician (IPT)	0.12124	0.48495
	IP attorney (IPA)	0.05802	0.23208
	IP manager (IPM)	0.07074	0.28297
Direction of organization development (DOD)	IP management service (IPMS)	0.25869	0.51737
	IP business service (IPBS)	0.24131	0.48263
Competency profile (CP)	Professional competency (PC)	0.08988	0.37310
	Basic competency (BC)	0.06685	0.26739
	Personality (PE)	0.09327	0. 35951

Table 11. DI for each candidate.

Criteria (C)	Weight	Measure (M)	Weight	C × M × S		
				Candidate A	Candidate B	Candidate C
Professional competency	0.37310	IP analysis	0.51385	7	3	3
		IP production	0.22656	7	3	3
		IP application	0.25959	7	3	3
Basic competency	0.26739	Sharp observation	0.11344	3	7	5
		Information collecting ability	0.10450	3	7	5
		Induction and analysis ability	0.21008	3	7	5
		Negotiation ability	0.15544	3	7	5
		Interpersonal relationship managing ability	0.13818	3	7	5
		Problem solving ability	0.15698	3	7	5
		English ability	0.12138	3	7	5
Personality	0.35951	Self-efficacy	0.10304	5	5	7
		Responsibility	0.15316	5	5	7
		High morality	0.19063	5	5	7
		Flexible response	0.12234	5	5	7
		Collaboration	0.18595	5	5	7
		Initiative	0.15529	5	5	7
		Achievement motivation	0.08957	5	5	7
			Desirability index (DI)	5.21142	4.78858	5.18424

makers during practical implementation.
(2) To implement the model, different SJF, DOD, and CP and their corresponding criteria for evaluating each candidate have to be examined beforehand. The interdependence between SJF and DOD is emphasized in ANP; the hierarchy between CPs and their corresponding attributes for each CP is emphasized in AHP.
(3) According to the interview with the experts, the IPTSI is still at the initial development stage in R.O.C. and the IPT is the most indispensable member of any company in the IPTSI in R.O.C.
(4) For company G, which has fifteen staffs and capital of thirteen million dollars, and has been established for approximately two years, the development of an IPMS is strategically selected as the present development direction, and the employees of the industry are still primarily based on IPTs.It should be noted that the criteria for employee selection will vary with industry, organization culture, and organization life cycle.

Two directions for future research are proffered by this study, the first of which is to modify the decision model according to the application industry, organization culture, and organization life cycle. Secondly, the entire evaluation process can be more objective by including a group-decision approach.

ACKNOWLEDGEMENTS

This research is partially supported by the National Science Council, Taiwan, R.O.C., under grants NSC-93-2516-S-018-011 and NSC-94-2516-S-018-014. The authors would like to thank Li-Jen Yang and Shu-Ling Wang for helpful discussions and technical assistance. Special thanks are extended to company G (http://www.gainia.com/front/bin/home.phtml) in Taiwan, R.O.C., which provided the empirical data to assist the research in this paper.

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