AN ANALYTICAL FRAMEWORK WITH SENSITIVITY ANALYSIS TO QUANTIFY MANAGEMENT CONSULTANCY SELECTION

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ABSTRACT

This paper provides a comprehensive review and critique of a firms' management consultancy selection, and presents a new analytical framework with sensitivity analysis to quantify the priority of criteria and sub-criteria in the management consultancy selection. The advantage of this analytical framework is that it adds the quantitative precision and sensitivity analysis to increase applicability and ease of use for decision making in the consultancy selection. Through literature reviews and in-depth interviews and case studies, this paper clarifies the importance of criteria in overcoming the difficulty of ex ante evaluation due to information asymmetries when using the analytic hierarchy process. It also extends the alternatives of consultancy selection from a management consulting company to academic consultants, and

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explores the possibilities of a dynamic selection mechanism depending on the nature of the problem, and the circumstances. The results show that the most important criterion is the type of solution (43.51%), followed by the consultant's ability (25.79%), then the type of problem (24.17%), and lastly the perceived benefits of the consulting project (6.53%). Also, the results suggest that a management consulting company is preferred to academic consultants. Further analysis of the Limit Matrix and sensitivity analysis shows that the type of solution, the consultant's ability and the perceived benefit of the consulting project have direct and dominant influence in the consultancy selection, and the type of problem has the opposite effect in the consultancy selection. This paper contributes to the theoretical research, and improves the practitioner's ability to achieve a proper selection in management consultancy.

Keywords: Multiple Criteria Decision Making, Management Consultancy Selection, Analytic Hierarchy Process, Priority Analysis, Sensitivity Analysis

http://dx.doi.org/10.13033/ijahp.v5i1.167

1. Introduction

The purchase of a wide range of external professional consultancy services by enterprises has been a rapidly growing phenomenon in recent decades (Altinay, 2004; Bennett and Smith, 2004; Dyer and Ross, 2007; Freeman et al., 2007; Lu et al., 2010; Sonmez and Moorhouse, 2010; Wynstra et al., 2006). The investigation of British small-to-median enterprises (SME) showed that by 2002, 95 percent of SMEs had already used external consultancy services for over three years (Bennett and Robson, 2002). A survey revealed that 97 percent of the top 200 companies in the U.K. and U.S. have used professional consultants (Clark, 2007). Empirical reports also showed that there has been a general shift of management consultancy service from 'West to East' (Hanssens et al., 2011). The purchase of external professional consultancy has become the worldwide phenomenon.

The main objectives of enterprises using these services include the ability to resolve problems or improve situations when it is not possible to have a quick solution for urgent needs (Soriano et al., 2002). Enterprises use consultancy services when they have experienced difficulty gaining access to certain modern technologies (Kirby and Jones-Evans, 1997), when they lack certain capabilities or knowledge for growth or competition (Kumar et al., 2000; Richter and Niewiem, 2009), and when they need an

agent of change or standardization of organizational practice around the world (Furusten, 2009).

In today's competitive environment, management consultants are important business partners for enterprises in problem solving (Balconi and Laboranti, 2006; Corcoran and McLean, 1998; Furusten, 2009; Gustafson and Di Marco, 1973; Sáez et al, 2002), knowledge interaction (Bell, 1993; Knudsen, 2007; Natti et al., 2006; Richter and Niewiem, 2009; Sáez et al., 2002; Schartinger et al., 2002), new product development (Knudsen, 2007; Mitchell, 1994), information technology adoption (Wei et al., 2005), and product quality control (Saremi et al., 2009). Enterprises can learn from consultants, and the benefits they produce exceed the cost of their services. As a result, it is critical for enterprises to know how to select an appropriate consultant.

Previous research has identified many criteria that are involved in consultancy selection. Interestingly, some research argued that the existing relations with clients, third-party recommendations, and prior experiences were the most important criteria (Bennett and Smith, 2004; Corcoran and McLean, 1998; Richter and Niewiem, 2009). Others suggested that the nature of the problem was focused on the quality of the consultants, the consultant's reputation, and product features (Dawes et al., 1992; Sonmez and Moorhouse, 2010; Soriano et al., 2002). These contradictory results make it necessary to further investigate the differences from various viewpoints, and to provide a comprehensive overview to help enterprises make a better decision.

When encountering business problems, enterprises will seek help from more than one consultant. Management consulting companies and academic consultants are the two major sources from which they seek help (Furnham and Pendleton, 1991; Gustafson and Di Marco, 1973). In Taiwan, 38.2 percent of SMES employ academic consultants, and 31.6 percent employ management consulting companies (MOEA, 2008). Academics agree on the importance of engaging academic consultants (Docherty and Smith, 2007; Furnham and Pendleton, 1991; Ormerod, 1996; Schartinger et al., 2002), but little attention has been given to academic consultant selection. Furnham and Pendleton (1991) have argued that there is a large difference between academic consultants and a management consulting company. Furthermore, the literature shows inconsistent results when discussing the most important criterion for management consultancy selection. It is debatable which criterions are more important and how they rank in terms of priority. Those ambiguities undermine the applicability of current knowledge concerning management consultant selection. This

paper plans to reexamine a firms' consultancy selection through literature review and in-depth interview and case studies to present a new analytical framework of better decision-making in consultancy selection.

2. Literature review and research focus

Management schools should be able to engage in a consultancy-driven environment and conduct research relating to practices performed by a management consulting company (Docherty and Smith, 2007). Ormerod (1996) also recommended that management schools combine management consultancy and research. These two types (sources) of management consultancy seem to have similar features in terms of consultant work. Furnham and Pendleton (1991), however, reported differences in objectives, methods, and solutions between academic consultants and management consulting companies. An academic consultant's intention is to create knowledge, to understand the root cause of the problem, or to have a comprehensive understanding from management research. This knowledge may not be useful or applicable. On the other hand, the mission of the management consulting company is to provide quick and applicable solutions for urgent problems. Academics "are usually satisfied to know and understand the root cause of the problem, while the consultants use the knowledge" to solve the problem (Furnham and Pendleton, 1991, p. 16).

According to Furnham and Pendleton (1991), firms may choose between a management consulting company and an academic consultant based on the objective of the consulting project or the solution they are seeking. Many researchers suggested that firms should access a more comprehensive set of criteria, including the characteristics of consultancy, consulting ability, service contents, and cost and benefit of the consultancy (Burke and Bandick, 1997; Saremi et al., 2009; Wei et al., 2005).

This paper argues that firms should employ either an academic consultant or management consulting company based on different criteria or by the different priority of the criteria with the nature of the consultancy in mind. The management consulting company and the academic consultant are empirically identified as the two major sources of consultancy providers, and since they are vastly different it is necessary to refine the criteria used in the selection process and to elaborate the difference of priority between the criteria used.

Management consultancy is an unregulated market surrounded by information asymmetries that the enterprise must overcome ex ante evaluation as the delivery of the management consultancy is considerably complex and uncertain (Bennett and Smith, 2004; Clark, 1993; Fitzsimmons et al., 1998; Gallouj, 1997). The enterprise is unable to accurately evaluate the quality of the service or advice purchased because the process of purchasing advice appears to be very complex, and most existing models seem unsuitable (Gallouj, 1997; Sonmez and Moorhouse 2010). Sonmez and Moorhouse (2010) suggested a two-stage process for selecting consultancy providers. The first stage, named pre-qualification, involves narrowing the choices from a large number of possible service providers. The final stage, differentiators, outlines the firm's decision to contract with a selected one.

The focus of this paper is on the first stage. Sonmez and Moorhouse (2010) argued that in the first stage a consultant's reputation, organizational capability, and cost are the main criteria, but the cost has been empirically confirmed as the least important role in the management consultancy selection (Dawes et al., 1992; Soriano et al., 2002). Sonmez and Moorhouse's perspective seems to be inconsistent with empirical results. It is necessary to reinvestigate the criteria used in the first stage. The overall goal of this paper is to reexamine a firms' consultancy selection process, and to reconstruct the selection criteria in the context of alternative consultancy selections.

Through a general literature study on consultancy selection, some "more important" criteria are determined. The first is the consultants' reputation, which is the most important criterion in a clients' evaluation process (Corcoran and McLean, 1998; Sonmez and Moorhouse, 2010). A consultant's commitment (Burke and Bandick, 1997; Wei et al., 2005), expertise (Day and Barksdale, 2003; Sonmez and Moorhouse, 2010), and relevant experience in similar projects (Gustafson and Di Marco, 1973; Saremi et al., 2009) are identified as other more important criteria. Moreover, a consultant's relevant experiences in the industry and third-party recommendations are other important criteria to be considered (Bennett and Smith, 2004). Richter and Niewiem (2009) highlighted that 'A consultant's experience in a client's industry was an important knowledge-related factor that led clients to decide in favor of an external consultant, and …the lack of relevant industry experience was ranked as the most important reason for clients not to choose a consultant. (p. 276)'.

The relationship between clients and service providers are the most influential criteria in the selection process. Many managers and employees also showed greater preference for a consulting company with whom they had cooperated before (Bennett and Smith, 2004; Furusten, 2009). Firms believe that a good relationship will help a consultant to better understand their needs and facilitate a higher-quality project performed by the consultant. (Furusten, 2009; West, 1997).Some scholars claimed cost of the work as an important criterion used for selection (Sonmez and Moorhouse, 2010). Others asserted that cost should assume a less important role in the selection of a management consulting company (Soriano et al., 2002). Consultancy service providers suggested a management consulting company must offer its project at a reasonable price, because quality and cost are the most relevant criteria when engaged in management consulting services. For clients, the cost whether financial or not is not the main concern when the project is beneficial to them (Lapiedra et al, 2011; Sonmez and Moorhouse, 2010; Soriano et al., 2002; Fontana et al., 2006; Schein, 1990).

Both management consulting companies (Corcoran and McLean, 1998) and academic consultants (Balconi and Laboranti, 2006; Sáez et al., 2002) are professionals whose aim is to solve problems. Therefore, Schein's (1988, 1990) model reveals that there is no one-size-fits-all solution. A consultant should offer a customized solution based on the type of problem their client has (Ormerod, 1996; Schein, 1988, 1990).

The above literature review focused mainly on the selection of a management consulting company. Because of the large difference between the academic consultant and the management consulting company, this study conducted in-depth interview and case studies to explore the firms' evaluation of the academic consultant and the management consulting company simultaneously.

3. Methodology

This study first interviewed the enterprises and academics who participated in the academic-industry cooperation program launched by the NSC (National Science Council) and a group of academic business and management schools in Taiwan. During the interview we gathered information related to consultant selection, especially for academic consultants, which is almost absent from literature (Docherty and Smith, 2007; Schartinger et al., 2002). The second step was to identify and rank

the criteria used in the multiple sources of selection decision. To do so, the multi-criteria decision making (MCDM) was applied.

The case study method is appropriate for exploratory research (Yin, 2002), such as this study. The case study is also an empirical investigation into a contemporary phenomenon within its real-life context. A multiple-case study design is used for a more robust replication of results recommended by Yin (2002). The unit of analysis for this study is the specific consultancy project, defined as a case. Within this context, each of the consultants and managers involved in the specific project could be considered a sample of the case. Six cases were selected based on the firms' industry (two firms in the manufacturing industry; four firms in the service industry) and prior cooperation with two sources of consultancy from the university-industry cooperation project launched by NSC in Taiwan.

This study performed twenty interviews with responsible managers, including leaders of academic consultancy groups and senior managers. The amount of time spent in in-depth interviews was more than thirty hours (from one to two hours) with the six case studies (case 1, 2 interviews; case 2, 2 interviews; case 3, 4 interviews; case 5, 6 interviews; case 5, 2 interviews; case 6, 4 interviews). The interviews were recorded and transcribed, and the validations were received through feedback and respondents' validation. The convergence of multiple data sources and key informant reviews was to ensure construction validity. Multiple case studies and relevant literature as data sources could help this paper to obtain external validity.

The qualitative data was coded and labeled according to qualitative analysis methods (Charmaz, 2006). For codification, several stages were applied iteratively throughout the study which resulted in twenty-three indicators, named sub-criteria. These were then categorized into five groups, named criteria, according to relevant perspectives. Three criteria that are based on the emphasis of previous literature are consultant's ability, perceived benefits, and project cost. The last two criteria, based on suggestions from in-depth interviews, are type of problems and type of solutions. These were mentioned very little in previous literature. The five criteria and indicators are given in Table 1.

As Table 1 shows, this study generated five new indicators beyond what the literature discussed, including (1) organizational resources in consultant's ability, (2) additional

resources involved in project cost, (3) cost evaluation of project, (4) performance measurement in perceived benefit, and (5) best practice in the specific type of solution.

Some interviewees stressed the importance of organizational resources available to clients, such as a market database, designated support teams as backstage support, commercial intellectual property rights, and knowledge bases all over the world. Consultants can mobilize these kinds of resources to better serve their clients.

Table 1

The criteria used for consultancy selection

Criteria	Sub-Criteira	Brief description	Reference
Consultant's ability	Hands-on experiences	A consultant's hand-on experiences in industries.	Bennett and Smith, 2004;Gustafson and Di Marco, 1973; Richter and Niewiem, 2009
	Reputation	The consultant's reputation, brand or referral from third party.	Bennett and Smith, 2004;Corcoran and McLean, 1998; Sonmez and Moorhouse, 2010.
	Commitment	A consultant's ability to satisfy a firm's needs.	Burke and Bandick, 1997; Wei et al., 2005.
	Expertise	The consultant's expertise.	Day and Barksdale, 2003; Sonmez and Moorhouse, 2010; .
	Previous working relationship	A consultant's working relationship with the firm.	Bennett and Smith, 2004;Freeman et al., 2007; Furusten, 2009; Mitchell, 1994; Richter and Niewiem, 2009; West, 1997
	Organizational resources	The organizational resources available to the project which consultants can mobilize.	Interviews

Criteria	Sub-Criteria	Brief description	Reference
Perceived benefit of the project	Project quality	The proposal of the project can meet a firm's needs.	Mitchell, 1994; Soriano et al., 2002; Sonmez and Moorhouse, 2010; Lapiedra et al, 2011.
	The ratio of cost/benefit	A firm perceives that the financial benefits received from a project are positive related to the project cost.	Soriano et al., 2002.
	Non-financial benefits	A firm perceives that he/she may receive some non-financial benefits from a project, for example, knowledge, the feasibility of organization learning.	Natti et al., 2006; Richter and Niewiem, 2009; Schein, 1990.
	Financial benefits	A firm perceives that he/she may receive financial benefits as soon as he/she carries out the project.	Fontana et al., 2006.
	Performance measurement	A project's performance can be measured with a group of indicators.	Interviews
Project cost	Consulting fee	Consulting fees of the project	Gustafson and Di Marco, 1973; Wei et al., 2005.
	Funding	The project has been fund by organization, university-industry cooperation in common.	Balconi and Laboranti, 2006; Sáez et al., 2002;
	Additional resources involved	A firm has to allocate other resources beyond the contract.	Interviews
	Cost evaluation	The consultancy provider has a well-defined measurement to estimate the total cost of the project.	Interviews

Criteria	Sub-Criteria	Brief description	Reference
The type of problem	Urgency	A firm wishes that his/her problems can solve as soon as possibility.	Schein, 1990; Ormerod, 1996.
	Complexity	A firm has to organize a cross-functional team for problem identity and solving.	Schein, 1990; Ormerod, 1996.
	Clearness	A firm has known what problem is or has the root of problem before the beginning of project.	Schein, 1990; Ormerod, 1996.
The type of solution	Best Practice	A firm wishes that he/she may receive best practice from the project.	Interviews
	Information about problem	A firm wishes that he/she may have valuable information relating to a given problem from the project.	Schein, 1990.
	Feasible solution	A firm wishes that he/she may have a feasible solution received from the project.	Balconi and Laboranti,2006;Sáez et al.,2002; Schein, 1990
	Problem modeling	A firm wishes that he/she may acquire information about the causality of a given problem, and he/she will look for a solution himself/herself.	Schein, 1990.

In dealing with academic consultants, some interviewees argued that firms need additional resources beyond the contract, such as human resources, for project execution. In the case of cooperation with a consulting company, a well-defined cost evaluation and performance measurement is required due to the high expense. Some interviewees suggested that providing best practice is a more preferable reason for consultancy selection.

With respect to our thesis, firms employ either an academic consultant or a consulting company based on either different criteria or by different priority of criteria. All senior managers agreed that they use similar criteria for the selection of either the academic consultant or the consulting company, but use varied priorities of criteria in the consultancy selection. The results of the case study partially supported our argument. It is necessary to elaborate on the different priority of criteria between the two sources of consultancy. Henceforth, this study adopted Murry and Hammons' (1995) suggestion to generate a Delphi-based questionnaire. We invited nine senior managers to rank the twenty-three indicators from least important to most important (from1 to 9). Six of twenty-three indicators were removed due to low mean (< 5); interestingly, four of them are related to project cost. For further evidence, this study asked them to rank the five criteria from 1 to 9. The mean of project cost was still less than five (see Table 2). Based on the statistical results, this study removed project cost from Table 1 and concluded that project cost is the least important criteria in the pre-qualification stage.

Table 2
The descriptive statistics of criteria

Criteria	Mean	S.D.
The type of solution	8.3	0.5
Consultant's capability	7.7	1.2
The type of problem	7.7	1.5
Perceived benefit of consulting project	6.3	0.6
Cost	4.3	1.2

The criteria and indicators have been integrated through a multiple decision -making method using the Analytic Hierarchy Process (AHP) to rank the selection of evaluation decision problems (Golden et al., 1989; Saaty, 1987; Saaty, 1994). During the years 2005-2009, AHP has been used exponentially as a managerial decision tool

in many industries for strategy evaluation, performance assessment, product and process design, risk evaluation, system selection, cost/benefit analysis, quality evaluation, and measurement of objectives (Sipahi and Timor, 2010). Thus this paper chooses the AHP to formulate the proposed model.

In the AHP, a typical decision problem is structured in three levels: the decision goal, criteria used to judge, and the alternatives for the decision goal (Sipahi and Timor, 2010). The criteria have been structured into a hierarchical decision scheme (see Table 1).Following AHP, the indicator is called the sub-criteria. The advantages of AHP include its ability to make both qualitative and quantitative decision attributes commensurable, and its flexibility in terms of setting the objective (Naesens et al, 2007). This AHP framework has been tested by the case study described below.

The company in the case study is Synthetic Rubber Company (SRC) located in Taiwan. The company has more than 1,000 employees, and its revenue was approximately 1.2 billion US dollars in 2010. This company has vast experience cooperating with both academic consultants and management consulting companies. The necessary data (weight and scope per criterion) were provided by six managers of the committee responsible for the consultancy project.

4. Analysis and discussion

This study follows the AHP procedures recommended by Saaty (2008).

1. Define the problem and determine the kind of knowledge sought: The purpose of this project for SRC was to improve its business performance. The project committee expected to obtain consultancy services from either a management consulting company or an academic consultant through the university-industry cooperation plan. Therefore, their first decision was to determine the source of the consultancy provider.

2. Structure the decision hierarchy from the top with the goal of the decision, then the objectives from a broad perspective, through the intermediate levels to the lowest level: In this AHP model of SRC, the problem is structured as a hierarchical decision scheme, consisting of four criteria, 18 sub-criteria (see Table 1 except project cost), and two alternatives- academic consultant or management consulting company, as depicted in Figure 1.

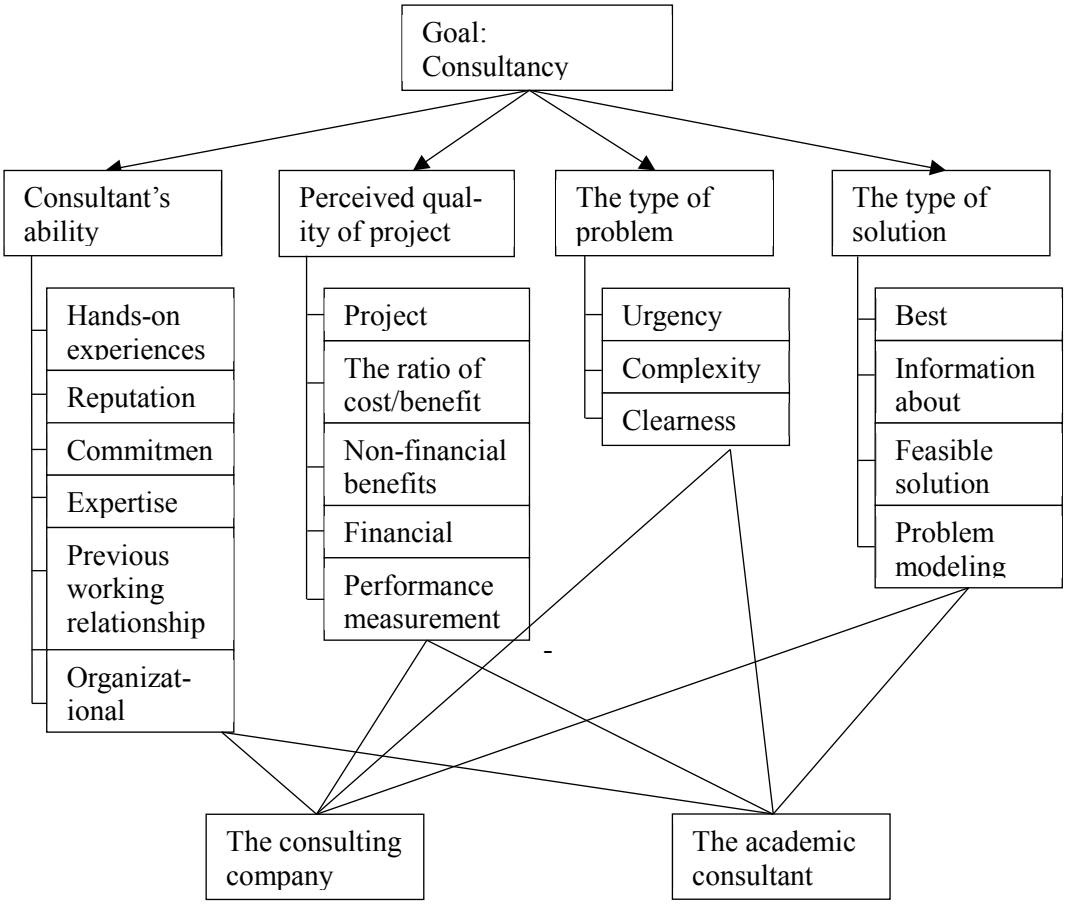

Figure 1 Hierarchical decision structure

3. Construct a set of pairwise comparison matrices where each element in an upper level is compared with the elements in the level immediately below: Once the objective has been set, the committee should give a priority to each element, criteria, sub-criteria, and alternative. An AHP questionnaire recommended by Saaty (1987, 1994) was made for measurement. The AHP measured the intensity of importance of one element over another element using a 1-9 scale through two-by-two comparisons.

4. Use the priorities obtained from the comparisons to weigh the priorities in the level immediately below. Then for each element in the level below, add its weighed values and obtain its overall or global priority until the final priorities of the alternatives are obtained: For this step, we used the Super Decisions software (Creative Decision Foundation, 2013), which was developed by Saaty, to obtain

the result of the elements' priority. The results of the pair-wise comparisons are given in Tables 3 and 4 (All the comparison matrices are presented in Appendix 1). Both criteria and sub-criteria are ranked according to their own priority in order to evaluate the different elements. It is necessary to check the consistency of the pair-wise comparison. Thus, the consistency index (CI) must be used to determine whether it would comply with the principles and considerations of the pairwise comparison. The range of the CI should be below 0.1. Moreover, the consistency ratio (CR) is used to measure the coherence of the pair-wise comparison. The acceptable levels of the CR should be less than 0.1 for the matrix of $n > 4$ (Saaty, 2000). The range of CI and CR value of this study is 0.0494 and 0.025, respectively, satisfying the requirements.

Table 3
The priority of each element

Criteria	Priority of criteria	Sub-Criteria	Priority of sub-criteria	Global weights (Ranks)
The type of solution	0.4351	Feasible solution	0.5763	0.2507 (1)
		Best practice	0.2418	0.1052 (3)
		Problem modeling	0.1056	0.0459 (9)
		Information about problem	0.0764	0.0332 (10)
Consultant's ability	0.2579	Reputation	0.3850	0.0993 (4)
		Commitment	0.2470	0.0637 (5)
		Organizational resources	0.1928	0.0497 (8)
		Previous working relationship	0.0639	0.0165 (12)
		Expertise	0.0655	0.0156 (13)
		Hands-on experience	0.0459	0.0118 (15)
The type of problem	0.2417	Complexity	0.5499	0.1329 (2)
		Urgency	0.2403	0.0507 (6)
		Clearness	0.2099	0.0581 (7)

Criteria	Priority of criteria	Sub-Criteria	Priority of sub-criteria	Global weights (Ranks)
Perceived benefit of consulting project	0.0653	Performance measurement	0.4819	0.0057 (11)
		The ratio of cost/benefit	0.2137	0.014 (14)
		Project quality	0.1809	0.0118 (16)
		Financial benefits	0.0879	0.0315 (17)
		Non-financial benefits	0.0356	0.0023 (18)

The range of independent CI are from 0.000 to 0.0494
CR = 0.025 < 0.1; The range of independent CR are from 0.000 to 0.0441

Table 4
Priorities of the alternatives

Criteria	The final priority of criteria	
	The management consulting company	The academic consultants
The type of solution	0.342	0.158
Consultant's ability	0.391	0.109
The type of problem	0.247	0.253
Perceived benefit of consulting project	0.392	0.108
Priorities of the alternatives (Normals)	0.670	0.330
Priorities of the alternatives (Ideals)	1.000	0.491
Rank	1	2

4.1. The priority of criteria

The column of priority of criteria in Table 3 shows that the most important criterion is the type of solution (0.4351), followed by the consultant's ability (0.2579), then the type of problem (0.2417), and lastly, the perceived benefit of the consulting project (0.0653). This result implies that in the pre-qualification stage the committee looked for a consultant who had the ability to offer an appropriate solution to the firm's problem. The empirical results also echo our treatment of the criteria category to

separate the type of solution and the type of problem. Previous literature only highlighted the importance of providing a customized solution based on the type of a clients' problems (Ormerod, 1996; Schein, 1988, 1990). This study distinguishes these two criteria based on the perspective of the interviewees. The type of solution is ranked the highest priority of management consultancy selection in the empirical result. The type of problem is ranked third in the management consultancy selection priority. This result further elaborates on previous scholars' views. The previous literature mainly emphasized the importance of a consultants' ability in the management consultancy selection, including hands-on experiences (Bennett and Smith, 2004; Sonmez and Moorhouse, 2010), reputation (Bennett and Smith, 2004; Corcoran and McLean, 1998; Sonmez and Moorhouse, 2010), commitment (Burke and Bandick, 1997; Wei et al., 2005), expertise (Day and Barksdale, 2003; Sonmez and Moorhouse, 2010), and previous working relationship (Bennett and Smith, 2004; Freeman et al., 2007; Furusten, 2009; Mitchell, 1994; Richter and Niewiem, 2009; West, 1997). The empirical results show that the consultants' ability is ranked second. However, the consultants' ability, the consultant's reputation, commitment and organizational resources are still major considerations. The previous working relationship, expertise, and hands-on experiences are the relatively less important sub-criteria. Interestingly, the perceived benefit of the consulting project is the least important criteria. Some scholars highlighted that the firms expect to receive benefits from consultancy services, e.g. knowledge acquirement and increased sales (Fontana et al., 2006; Natti et al., 2006; Richter and Niewiem, 2009; Schein, 1988; 1990). Other scholars stressed that the whole reason to use the services of the consultants is to benefit the firms in both financial and non-financial aspects (Fontana et al., 2006; Lapiedra et al, 2011; Schein, 1990; Sonmez and Moorhouse, 2010; Soriano et al., 2002). This empirical result shows that the perceived benefit of the consulting project is relatively less important in the first stage of consultancy selection process.

The column of priority of sub-criteria in Table 3 represents the priority of each sub-criterion within its criteria. For comparison, the global weight of each sub-criterion is multiplied by the priority of its criterion. The column of global weights in Table 3 shows the five most important sub-criteria are the feasible solution (0.2507) in the type of solution, complexity (0.1329) in the type of problem, best practice (0.1052) in the type of solution, reputation (0.0993), and commitment (0.0637) in the consultant's ability. This result implies that the committee looked for both an appropriate solution and the consultant's reputation. The top five priorities of

sub-criteria further elaborate how the committee conducted their consultancy selection. When encountering a complex problem, the committee employed the academic consultant or management consulting company to generate a feasible solution and the best practice through strong commitment and reputation of the consultancy.

Through in-depth interviews, this study generated five new indicators beyond the literature. Only the best practice in the type of solution is ranked among the top five priorities of global weights. The empirical result shows that the best practice is valuable and important for consultancy, which was not often mentioned in the literature. The organizational resources in the consultant's ability are ranked eighth in the global weights. Previous literature emphasized the importance of the consultant's reputation (Bennett and Smith, 2004; Corcoran and McLean, 1998; Sonmen and Moorhouse, 2010) and commitment (Burke and Bandick, 1997, Wei et al., 2005) in the consultant's ability. The empirical result echoes interviewees' opinions that consultants should mobilize organizational resources such as a market database, designated support teams, commercial intellectual property rights, and knowledge bases all over the world to better serve clients. Therefore, the organizational resources should be used to judge the consultant's ability.

The next new indicator is performance measurement in the perceived benefit of the consulting project. This priority is ranked eleventh in global weights. It is still the most important indicator within the perceived benefit of the consulting project, which implies that in the first stage of the consultancy selection process, a well-defined performance measurement should be established for the firm to evaluate how well the project will proceed. Although previous literature highlighted the importance of the expected benefit of knowledge acquisition from consultancy services (Fontana et al., 2006; Richter and Niewiem, 2009; Schein, 1988; 1990), expected quality of the consultants' service (Schein, 1988; Soriano et al., 2002), expected benefit in financial and non-financial aspects(Fontana et al., 2006; Schein, 1990; Sonmez and Moorhouse, 2010; Soriano et al., 2002), the interviewees argued that a set of solid performance measures are more important than expectations. The empirical result confirms this point of view. The other two new indicators are additional resources involved and cost evaluation in the project cost which have been removed in the process of categorizing the criteria.

4.2. Selecting the appropriate consultancy provider

The most appropriate consultancy provider is presented in Table 4, which shows two forms of priority. The row of the priority of alternative (Normals) shows the results normalized for each alternative, and the row of the priority of alternative (Ideals) present the results obtained by dividing the values in the normalized rows by the largest value in the row (Saaty, 2003). Table 4 shows the management consulting company (0.670) would be preferred above the academic consultant (0.330) in the priority of alternatives (Normals). The interpretation of the row of the priority of alternative (Ideals) suggests that the academic consultant is 49.1% as good as the management consulting company. Furusten (2009) however argued that it is debatable whether or not the management consulting company is better at focusing on matters that are relevant to organizations than the academic consultant (p 265). The empirical results show that the committee prefers a management consulting company over an academic consultant.

5. Improvement Analysis

It is necessary to know whether each criterion has the dominant or restrained influence on the alternatives of consultancy selection in order to make a better decision. Table 4 also illustrates the final priority of criteria obtained from the Limit Matrix by Super Decisions software. The Limit Matrix is obtained when the weighted matrix is multiplied by itself several times to converge to a fixed weight of each element. It will display the intermediate priorities under every node in the model, and the final priority of each element obtained from the Limit Matrix can represent its dominant or restrained influence on the alternatives (Saaty, 2003).

For the type of solution, the number of limit priority of criteria for selecting a management consulting company is 0.342, greater than the number for selecting the academic consultant of 0.158. This result complies with the results judged by the priority of alternatives (Normals) which implies that the type of solution has a dominant influence on the alternative selection. Put another way, a management consulting company would always be preferable over an academic consultant if considering the criteria of the type of solution. The same results happen for the other two criteria: consultants' ability and the perceived benefit. The result for the type of problem is different. The number of limit priority on criteria for selecting a management consulting company is 0.247, less than that of an academic consultant's 0.253, which contradicts the results judged by the priority of alternatives (Normals).

This implies that the type of problem has restrained influence on the alternative selection. Put another way, a management consulting company may be a preferred selection only to a certain threshold of the weight of the type of problem. If considering more weight on the type of problem, exceeding the threshold, the academic consultant will become the preferred selection. Only the type of problem has this reserved effect, implying that the type of problem has a greater influence on the academic consultant in a certain situation. To find more evidence to support this reversed effect, this study conducted a sensitivity analysis through Super Decisions software to explore at what threshold the selection would have a reverse effect. The sensitivity analysis shows that if the priority of the type of problem is greater than 0.85, the academic consultant becomes the preferred selection; otherwise, a management consulting company is the best alternative. This paper also conducted the experiment on the other three criteria and found that the outcome is very stable, having no effect on the overall ranking.

This paper also conducted a sensitivity analysis to explore the reverse effect on each sub-criterion. The outcome of the sensitivity analysis on each one is very stable and does not change the overall ranks except with three criteria: complexity, problem modeling, and information about problem. The empirical results show that if the priority of complexity, problem modeling and information about the problem are greater than 0.95, 0.91 and 0.91, respectively, the academic consultant becomes the preferred selection; otherwise, the management consulting company is the best. The evidence of the sensitivity analysis shows the type of problem, complexity, problem modeling and information about problem in the type of solution have reversed effect.

6. Conclusions

This paper has presented the AHP as an analytical framework to quantify the priority of criteria and sub-criteria in management consultancy selection. It adds the quantitative precision and sensitivity analysis to increase the applicability and ease of use for decision making on consultancy selection and responds to the need expressed by 'most existing models seem unsuitable' (Gallouj, 1997; Sonmez and Moorhouse 2010). There are several unique features about the proposed framework. First, it incorporates varied perspectives of selecting criteria through literature reviews and in-depth interview and case studies. It clarifies the importance of criteria to overcome the difficulty of ex ante evaluation due to the information asymmetries in management consultancy selection (Bennett and Smith, 2004; Clark, 1993;

Fitzsimmons et al., 1998; Gallouj, 1997). Second, previous studies are qualitative in nature and include neither an analytical framework nor corresponding alternatives. This proposed framework does not eliminate the subjectivity, but it adds quantitative precision and fine-tuning to an otherwise qualitative decision-making process. In consonance with the previous evidence, the importance of a consultants' ability in the management consultancy selection is emphasized (Bennett and Smith, 2004; Burke and Bandick, 1997; Corcoran and McLean, 1998; Day and Barksdale, 2003; Freeman et al., 2007; Furusten, 2009; Mitchell, 1994; Richter and Niewiem, 2009; Sonmez and Moorhouse, 2010; Wei et al., 2005; West, 1997). This paper emphasizes the importance of the type of solution and the type of problem. The results further elaborate the importance of previous scholars' views (Ormerod, 1996; Schein, 1988, 1990) and offer the potential to improve the practitioner's knowledge to achieve a proper selection in management consultancy. Third, the proposed framework extends the alternatives of consultancy selection from a management consulting company to an academic consultant. It explores the possibilities of situations where an academic consultant may be preferable by conducting advanced analysis of the Limit Matrix and a sensitivity analysis of the AHP methodology. This paper finds that the type of solution, consultants' ability and the perceived benefit of the consulting project have dominant influence on selecting a management consulting company, which implies that a management consulting company would almost always be preferred over an academic consultant. However, the type of problem has restrained influence in selecting a management consulting company, which implies that a management consulting company may be the preferred selection only to a certain threshold of weight of the type of problem. If considering greater weight on the type of problem to exceed the threshold, the academic consultant will be the preferred selection. This reverse effect emphasizes that the type of problem has greater influence on the selection of the academic consultant in certain situations. Further exploration of the reverse effect on each sub-criterion, shows that complexity, problem modeling, and information about the problem have the reverse effect. The findings elaborate some scholars' perspectives (Furnham and Pendleton, 1991) that academic consultants are usually satisfied to know and understand the root cause of a complex problem and are valuable in helping firms identify the problem or acquire information about the cause of a given problem. Finally, the case study provided in this paper demonstrates the applicability and ease of use for decision making in consultancy selection. The findings of this paper provide insights into the original research questions of practical implications.

Although this paper illustrates the use and benefit of the proposed analytical model, further evaluation and refinement of the model extending to additional field studies, such as small enterprises, may prove that it can have greater validity and applicability. Even though the AHP method demonstrates a powerful decision tool for assisting managers in many situations, it does not take into account dependencies and interrelations among factors. However, real world problems usually consist of dependence or feedback between elements. Compared to the AHP, the Analytic Network Process (ANP) method makes it possible to consider all kinds of dependence and feedback in a decision problem. Thus, future study may use the ANP to provide a more flexible model to further apply to real world situations.

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APPENDIX I

Comparison matrices

Comparison matrix for consultancy selection of criteria

Goal: Consultancy selection				
	Consultant's ability	Perceived quality of the project	The type of problem	The type of solution
Consultant's ability	1	5	1	1/2
Perceived quality of the project	1/5	1	1/4	1/5
The type of problem	1	4	1	1/2
The type of solution	2	5	2	1

Comparison matrix for consultant's ability of sub-criteria

Consultant's ability						
	Hands-on experiences	Reputation	Commitment	Expertise	Previous working relationship	Organizational resources
Hands-on experiences	1	1/6	1/4	1/2	1/2	1/5
Reputation	6	1	2	5	5	3
Commitment	4	1/2	1	4	4	2
Expertise	2	1/5	1/4	1	1	1/4
Previous working relationship	2	1/5	1/4	1	1	1/4
Organizational resources	5	1/3	1/2	4	4	1

Comparison matrix for perceived quality of project of sub-criteria

Perceived quality of the project					
	Project quality	The ratio of cost/benefit	Non-financial benefits	Financial benefits	Performance measurement
Project quality	1	1	6	2	1/3
The ratio of cost/benefit	1	1	7	4	1/4
Non-financial benefits	1/6	1/7	1	1/3	1/8
Financial benefits	1/2	1/4	3	1	1/4
Performance measurement	3	4	8	4	1

Comparison matrix for the type of problem of sub-criteria

The type of problem			
	Urgency	Complexity	Clearness
Urgency	1	1/2	1
Complexity	2	1	3
Clearness	1	1/3	1

Comparison matrix for the type of solution of sub-criteria

The type of solution				
	Best Practice	Information about problem	Feasible solution	Problem modeling
Best Practice	1	3	1/2	2
Information about problem	1/3	1	1/8	1
Feasible solution	2	8	1	5
Problem modeling	1/2	1	1/5	1

Comparison matrix for consultant's ability: hands-on experiences of alternatives

Consultant's ability: Hands-on experiences		
	The academic consultant	The consulting company
The academic consultant	1	1/7
The consulting company	7	1

Comparison matrix for consultant's ability: reputation of alternatives

Consultant's ability: Reputation		
	The academic consultant	The consulting company
The academic consultant	1	1/6
The consulting company	6	1

Comparison matrix for consultant's ability: commitment of alternatives

Consultant's ability: Commitment		
	The academic consultant	The consulting company
The academic consultant	1	1/3
The consulting company	3	1

Comparison matrix for consultant's ability: expertise of alternatives

Consultant's ability: Expertise		
	The academic consultant	The consulting company
The academic consultant	1	1/2
The consulting company	2	1

Comparison matrix for consultant's ability: previous working relationship of alternatives

Consultant's ability: Previous working relationship		
	The academic consultant	The consulting company
The academic consultant	1	1
The consulting company	1	1

Comparison matrix for consultant's ability: organizational resources of alternatives

Consultant's ability: Organizational resources		
	The academic consultant	The consulting company
The academic consultant	1	1/5
The consulting company	5	1

Comparison matrix for perceived quality of the project: project quality of alternatives

Perceived quality of the project: Project quality		
	The academic consultant	The consulting company
The academic consultant	1	1/2
The consulting company	2	1

Comparison matrix for perceived quality of the project: the ratio of cost/benefit of alternatives

Perceived quality of the project: The ratio of cost/benefit		
	The academic consultant	The consulting company
The academic consultant	1	1/5
The consulting company	5	1

Comparison matrix for perceived quality of the project: non-financial benefits of alternatives

Perceived quality of the project: Non-financial benefits		
	The academic consultant	The consulting company
The academic consultant	1	4
The consulting company	1/4	1

Comparison matrix for perceived quality of the project: financial benefits of alternatives

Perceived quality of the project: Financial benefits		
	The academic consultant	The consulting company
The academic consultant	1	1/7
The consulting company	7	1

Comparison matrix for perceived quality of the project: performance measurement of alternatives

Perceived quality of the project: Performance measurement		
	The academic consultant	The consulting company
The academic consultant	1	1/5
The consulting company	5	1

Comparison matrix for the type of problem: urgency of alternatives

The type of problem: Urgency		
	The academic consultant	The consulting company
The academic consultant	1	1/6
The consulting company	6	1

Comparison matrix for the type of problem: complexity of alternatives

The type of problem: Complexity		
	The academic consultant	The consulting company
The academic consultant	1	2
The consulting company	1/2	1

Comparison matrix for the type of problem: clearness of alternatives

The type of problem: Clearness		
	The academic consultant	The consulting company
The academic consultant	1	1
The consulting company	1	1

Comparison matrix for the type of solution: best practice of alternatives

The type of solution: Best Practice		
	The academic consultant	The consulting company
The academic consultant	1	1/6
The consulting company	6	1

Comparison matrix for the type of solution: information about problem of alternatives

The type of solution: Information about problem		
	The academic consultant	The consulting company
The academic consultant	1	3
The consulting company	1/3	1

Comparison matrix for the type of solution: feasible solution of alternatives

The type of solution: Feasible solution		
	The academic consultant	The consulting company
The academic consultant	1	1/3
The consulting company	3	1

Comparison matrix for the type of solution: problem modeling of alternatives

The type of solution: Problem modeling		
	The academic consultant	The consulting company
The academic consultant	1	3
The consulting company	1/3	1