International Journal of Commerce and Management Research
ISSN: 2455-1627
www.managejournal.com
Volume 1; Issue 1; November 2015; Page No. 70-79

Business Model of Hakkanese Culture Relics Museums for Tourism Industry

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Abstract
Many museums of Hakkanese cultural relics in Taiwan are some of them lack management and have weaknesses that are exposed after they go into operation. In order to resolve the current situation and future development trend regarding the Hakkanese museums of cultural relics, this study conducted the BCRU (The Business model of Culture Relics Museums) established by SWOT, TOWS analysis and Analytic Network Process method to proposed weaknesses-threats, weaknesses-opportunities, strengths-threats and strengths-opportunities strategies for these museums by market competition.

Keywords: Local Cultural Museums, Hakkanese cultural relics, Co-opetition strategy.

1. Introduction

As the Hakka culture awareness continuously increases, the Taiwanese government established Hakka Affairs Commission in 2001 to actively promote "Hakka Culture Revitalization Program" and revitalize Hakkanese culture relics museums. Since then, Hakkanese culture relics museums are established constantly in Taiwan. By the end of 2013, number of museums with Hakka culture theme approved by the Hakka Affairs Commission, registered, opened or under construction reached 80 (Hakka Affairs Council, 2011) [16]. Hakkanese culture relics museums are the place of holding Hakka culture activities. They can conserve and revitalize geographical, cultural and historical resources, and act as community museums, show halls or exhibition halls for Hakka people. They also bring job opportunities and economic benefits (Hualien County Government, 2010) [17]. After review of the government policy on promotion of vacant space reuse, it can be found that some Hakkanese culture relics museums are restricted to existing spatial planning, or have insufficient space or cannot meet needs in response to diversified development trend, and even some of them lack management and have weakness after going into operation. To respond changes in Hakka culture and social structure, the policy on Hakka culture has been shifted from establishment of Hakkanese culture relics museums to the concept of integrating cultural living environment so as to utilize the surrounding facilities and resources of Hakkanese culture relics museums.

The tourism industry is also called "smokeless industry". Nowadays, the leisure tourism has played increasingly important role in the world. Leisure tourism prevails in various countries, which use natural and cultural resources to actively develop the tourism industry. According to the analysis report published by World Travel & Tourism Council (WTTC) in 2013 [42], output value of the global tourism industry reached 6.63 trillion USD [1], accounting for 9.3% of global GDP (Gross Domestic Product) in 2013. It was estimated that output will be 10.51 trillion USD in 2023 with composite annual grow rate of 4.4% [2] (WTTC, 2013) [42]. The tourism industry has become the second global largest industry. The research data show the tourism industry has become the first source of the foreign exchange for many countries. In the single state economic performance, it has played an important role (Lin, 2013).

In order to understand current situations and future development trend of the Hakkanese culture relics museums, this study collected, summarized and analyzed the literature, and used bottom-up model and interactive model in informal discussion, workshops and in-depth interview to discuss internal and external environment of the Hakkanese culture relics museums and collect industrial, governmental and academic opinions. We also conducted qualitative and quantitative analysis, SWOT analysis, TOWS matrix, Analytic Network Process and the decision model established to analyze external environment, opportunities and threats, internal environment, strengths and weaknesses and deduce co-opetition strategy, providing reference for future development of Hakkanese culture relics museums.

2. Literature review

Various tourism activities can attract public participation, so as to revitalize cultural tourism and fully use facilities Depth and connotations of local tourism industry also need to be improved through culture. Thus, through literature review the main dimensions can be summarized as follows.

1) Cultural tourism and ethnic tourism

United Nations Educational, Scientific and Cultural Organization (UNESCO) defined "Cultural Tourism" as one type of tourism activity involving cultural environment, including landscape, visual and performing arts and life style in other special areas, traditional value, event activities and cultural exchange. In order to revitalize culture, we should develop tourism activities to attract public participation. Depth and connotations of local tourism industry should be improved through culture; the tourism needs culture to enrich its connotations while culture also needs tourism development to achieve its economic value (Hughes, 1995; Mckercher *et al*., 2006; Cloke *et al*., 2002; Rogerson, 2002) [19, 22]. In addition, festival activities in the ethnic tourism and cultural tourism are two sides of the same coin, and are prevailing in the world. In recent years, the cultural tourism has gradually become a trend of tourism industry, drive of improving residential life quality,

and prime assets to strive for internal investment and attract tourists. However, this situation is not spontaneous, and is designed and operated manually. Tourists visit historical sites or festival activities because they are attracted by the local cultural landscape or special culture (Hughes *et al*., 2005; Nuryanti, 1996; Carter *et al*., 2002) [8, 18, 23]. The cultural tourism is the subset of tourism concerned with a country or region's national customs, religious rites, folk arts, traditional skills, and various cultural activities in different spaces and time, and shows features of all cultural activities for the tourists (Adams, 1995; Ondimu, 2002; Van den Berghe, 1992; Chang *et al*., 1999) [1, 7, 37].

2) Hakka culture and Tourism Industry

Hakka culture is generic terms of unique material and spiritual culture of Hakka people, and lifestyle of the Hakka ethnic group; Hakka culture features of various places refer to the resources which constitute or symbolize special image or spiritual representation of the places, including the nature, ecology, culture, special local products, and festival activities. The ethnic group culture is irreplaceable, and it is the most attractive and unique cultural features of the places. The cultural image is the first task of Taiwanese Hakkas villages and towns, such as Hualien Fenglin, Hsinchu Beipu and Xinpu, and Kaohsiung Meinong. They have vivid and unique Hakka culture, and are well-known Hakka villages and towns. In order to effectively promote Hakka cultural tourism, the local features should be developed (Oliver *et al*., 2003; Teo *et al*., 1997; Unaya *et al*., 2012) [24, 33, 35] to create beauty of Hakkanese culture relics museums; the local features can be used to create festival themes; Falassi (1987) [13] considered festivals are cultural events or social phenomenon. Thus, a region which develops tourism must have unique style, regardless of ethnicity, language, buildings, customs or festival activities so as to attract large number of tourists (Getz, 1991; Peter *et al*., 2000) [14, 26] (Getz, 1991; Peter *et al*., 2000) [14, 26]. Willim (1997) [39] and Cole (2006) [6] considered festival is a theme activity celebrated by many people, and can help create community features and sense of identity of local residents; Quinn (2009) [29] indicated features of festivals and celebrations are important because festivals and celebration activities are important ceremonies with long history and namely they are cultural customs. Thus, in development of "cultural tourism" the Hakka villages and towns need to use local resources and festivals and conduct man-made design and packaging of Hakkas theme to achieve the possibility that there are features and attractions everywhere. The tourism includes not only traveling, and appreciating beauty of the rivers and mountains but also has economical, education, social and cultural implications. It is a healthful leisure activities and cognitive tourism (OECD, 2009) [34].

3) Hakka Elements and marketing

Promotion of cultural tourism is one of the methods to protect local culture. The main purpose is to make tourists understand the local culture and local people identify their own culture, and strengthen the local cohesion (Oliver, 2003; Williams, 1991) [24, 38]. Further, existing museums or landscape resources are not enough in development of Hakka cultural tourism; thus, Hakka tourism industry can be developed by using Hakka elements in clothing and life utensils, and music, life pattern and festivals and integrating Hakka tourism industry, leisure, traveling with rural life to regain lost lifestyle and customs, beliefs, industry, arts and literature and songs. Further, features of Hakka life can be developed through the diversified management. This can boom local economy and increase farmer income. Joint efforts are made to create high-quality Hakka tourism environment.

Currently, many regions have implemented cultural tourism marketing, and quite a few of them achieved success. However, each region has their different resources. The successful cases cannot be simply copied (Busby *et al*., 2001; Kozak, 2001) [2, 20]. Management and planning of travel route in the ethnic tourism derived from Hakka elements can be jointly cooperated by travel agencies, and the local resources can also be utilized. The tourism is combined with the local industry activities; Uysal & Hagan (1993) [36] considered the short-term festivals which use local cultural resources and cultural assets can enhance local tourism brand image and attract more tourists. Consumption in these festivals can promote local economic development (Glickman, 1997; Besculides *et al*., 2002; Cole, 2007) [3, 5, 15]. Thus, the Hakka elements can be integrated into independent and joint operation plans of Hakkanese culture relics museums of Taiwanese local governments.

4) Application of strategic management

Natural selection is natural law. It is also applied to business organizations. How enterprises survive and are not eliminated by the environment is a concern of enterprise organizations. Due to national financial difficulty, Hakkanese culture relics museums also face the problem; in order to activate Hakkanese culture relics museums, one set of rigorous and integrated plan is needed. The strategic management is one of the most suitable methods. After review of the strategic planning literature, we can deduce effective strategy analysis tools: SWOT and TOWS matrixes:

(1) SWOT analysis: SWOT analysis can help understand and determine business strategy suitable for organizations, and strengths, weaknesses, opportunities and threats (Proctor, 1997) [27]. The external opportunities and threats mean positive and adverse impacts of society, economy, population, culture, politics, environment and laws on businesses; the internal strengths and weakness mean controlled activities of the businesses and implementation effect, such as software and hardware of the businesses. SWOT analysis was originally applied to formation of corporate strategy (Weihrich, 1982) [40], and now has been widely used to form overall strategy of corporate enterprises (Weihrich, 1993; Proctor, 1997; Proctor, 2000) [28, 41], industrial strategy analysis (Beckmann, 2014) [4, 27], or strategic planning of the industries of tourism and hospitality (Ramos, Salazar and Gomes, 2000).

(2) TOWS matrixes derivation and multicriteria decision making theory: TOWS matrix was proposed by Weihrich in 1982 [40]. Based on SWOT analysis results, TOWS (threats, opportunities, weaknesses and strengths) matrix matching tool is used to confirm and establish four types of strategies through logical derivation and links (Weihrich, 1982) [40]: (1) SO strategies; (2) WO strategies; (3) use internal strengths of museums to avoid external strengths and threats (ST strategies); (4) minimize internal threats of museums, and avoid external weakness and threats (WT strategies). For more details, see Figure 1.

	1. Strength (S) 2. (list strengths):	1. Weakness (W) 2. (list weakness):
1. Opportunity (O) 2. (list opportunity):	SO Use strength to take advantages of opportunities (Max-Max.)	WO Use opportunities to prevent weaknesses (Min-Max.)
1. Threats (T) 2. (list threats):	ST Use strength to avoid threats (Max-Min.)	WT Minimize weakness to avoid threats (Min-Min.)

Source: David (1997) [12].

Fig 1: TOWS matrix derivation principle

The findings obtained in the recent 10 years shows SWOT is combined with TOWS matrix to deduce effective strategic planning required for individual cases. For example, Chen (2003) [10] conducted integrated analysis for organizational structure, environment, technologies and strategies of Chunghwa Telecom; also Chen (2011) [9] conducted SWOT analysis to analyze strengths, weaknesses, opportunities, and threats of management transformation of Yuemei Sugar Refinery, and next used TOWS strategic matrix to find the effective strategy suggestions. However, strategy suggestions were not prioritized. This study used Analytic Network Process of Multicriteria decision making and BCRU (The Business model of Culture Relics Museums) established coupled with SWOT and TOWS for co-opetition strategy planning of Hakkanese culture relics museums. The analysis tools are practical and effective.

3. Model and hypotheses

3.1 Conceptual

In Taiwan, most Hakkanese culture relics museums have bad management and are empty. The central government and local government make every effort to solve the problem left over by history. This paper is one part of joint operation plan of Hakkanese culture relics museums in Hualian County, and the research logical structure and flow chart is shown in Figures 2 and 3.

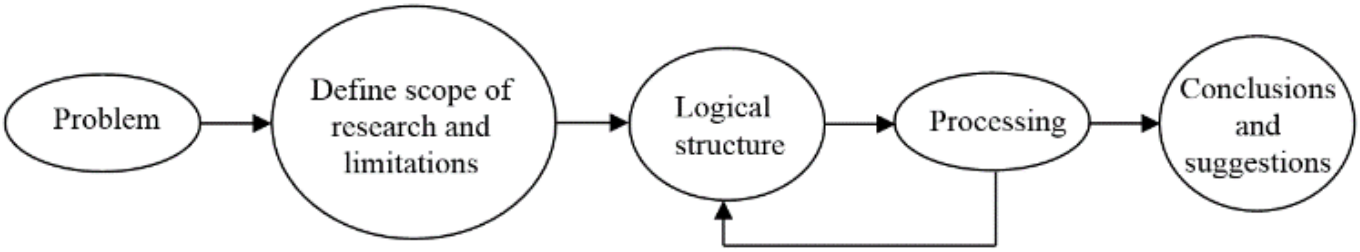

Fig 2: Research logical structure chart

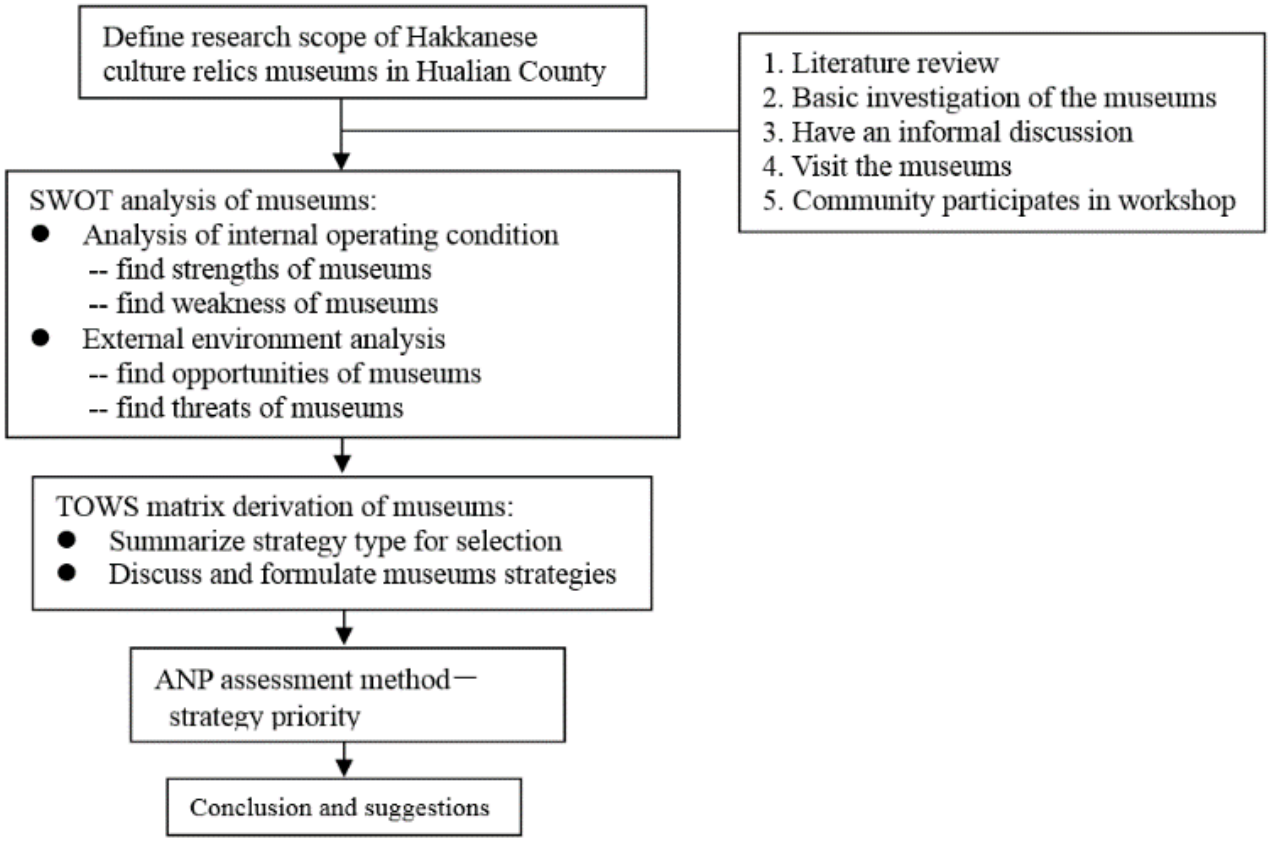

Fig 3: Research process flow

After the problems and demands are known, this study collected the relevant literature, visited local personalities, held informal discussion, and visited and investigated the museums to know the management problems of the Taiwanese Hakkanese culture relics museums, and conceive revitalization of Hakkanese culture resource development. It is divided into two dimensions "conservation and reuse of Hakka culture assets" and "transmission and re-development of Hakkanese arts and culture resources". From the perspectives of humanities, culture, geology, landscape and industry's, the future business strategy can be oriented. From the perspective of "humanities", "enhance organization's operation strengths", "effectively train local groups", and "encourage part-time job of junior college students; from the perspective of "culture", "community cultural festival research and development", "investigation and research of community culture and history and "research results promotion and publications" are recommended; from the perspective of geology and landscape, "revitalize local museums", "reuse old buildings" and conduct "culture space construction and management"; from the perspective of "industry", "encourage cultural and creative industry" and "provide special local products and souvenir" and "museum culture DIY experience". For details, see Figure 4.

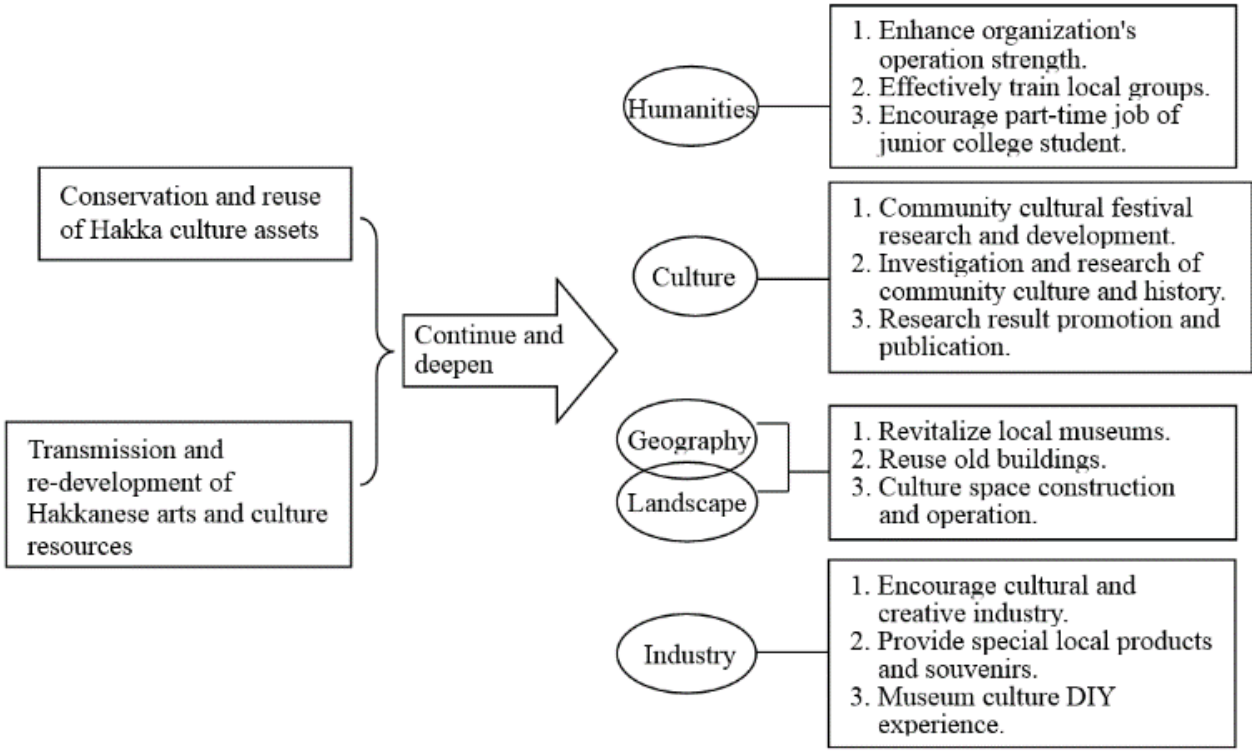

Fig 4: Concept for innovation and revitalization of Hakka culture resources

Based on SWTO analysis results and TOWS matrix derivation principle, TOWS (threats-opportunities-weaknesses-strengths) matrix matching tool is used to confirm and establish co-opetition strategies of Taiwanese Hakkanese culture relics museums through logical derivation and links: there are four types of co-opetition strategies: (1) use strengths of the museums to take advantage of external opportunities (SO strategies); (2) use external opportunities of the museums to overcome internal weaknesses (WO strategies); use internal strengths of the museums to avoid external threats (ST strategies); (4) minimize internal weaknesses of the museums to avoid external threats (WT strategies). The four co-opetition strategies are prioritized by using Analytic Network Process of Multicriteria decision making.

3.2 Hypotheses

It is assumed that Hakkanese culture relics museums in Hualien country have A_{n_k} feasible strategies, the weight of each criterion C_j decided by the review committee member is w_j (j=1, 2, …, m), and the score of feasible strategies under C_j assessment criterion is r_{ej}; for the MCDM problems (Multiple Criteria Decision Making), the feasible strategies of Hakkanese culture relics museums can be investigated and assessed though the following decision matrix, providing reference.

Table 1: Assessment form of feasible business strategies of Hakkanese culture relics museums

Feasible strategies	C_1	C_2	C_3	…	C_j	…	C_m
	w_1	w_2	w_3	…	w_j	…	w_m
A_1	r_{11}	r_{12}	r_{13}	…	r_{1j}	…	r_{1m}
A_2	r_{21}	r_{22}	r_{23}	…	r_{2j}	…	r_{2m}
:	:	:	:	…	:	…	:
A_e	r_{e1}	r_{e2}	r_{e3}	…	r_{ej}	…	r_{em}
:	:	:	:	…	:	…	:
A_{i_k}	r_{i_k1}	r_{i_k2}	r_{i_k3}	…	r_{i_kj}	…	r_{i_km}

3.3 Model and Procedure

Step 1: Composition of decision making group

According to field and complexity of decision problems, the decision making group consists of five relevant competent departments, five scholars, five operators, five local persons and five visitors.

Step 2: assess system establishment

According to the literature review, interview of decision group members and brain storming, system elements affecting the decision problems can be found. The business strategies of Hakkanese culture relics museums are wide and complicated, and thus an inclusive and flexible approach must be used. ANP (Analytic Network Process) can solve dependence and feedback between elements in complicated decision problems. Meanwhile, it can collect most expert opinions. Next, consistency check can be conducted to show comparison between criterions by experts and find whether they are consistent and logic, as shown in Figure 5.

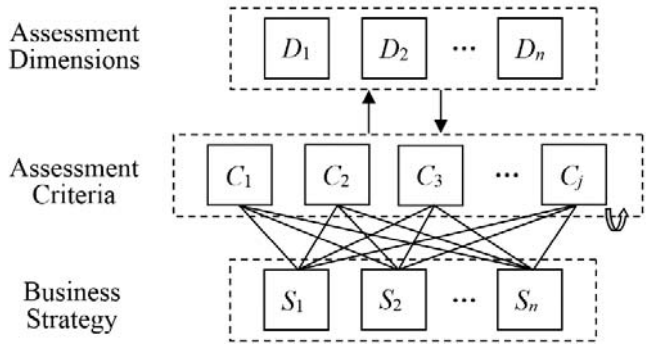

Fig 5: Assessment architecture

Step 3: Questionnaire design and investigation

Based on the assessment hierarchy structure, upper element of each element serves as assessment benchmark. Experts of the decision group identify relative importance of elements.

Step 4: integration of expert preference

It is assumed that number of experts of the decision group is *R*. Based on the established hierarchy structure, importance of elements on each layer shall be identified. In pairwise comparison of n elements, each expert can obtain one pairwise compassion matrix $A^h(h=1,2,...,R)$:

$$A^h = \left(a_{ii'}^h\right), ii' = 1,2,...,n) \quad (1)$$

Each expert has different cognitions for problems, and the obtained judgment values of pairwise comparison are different; thus, the expert preference can be integrated. Normally, geometric method and majority decision are used. In this plan, geometric method is used. In this study, the geometric method is used to integrate experts' judgment values in pairwise comparison which meet consistency. The integrated pairwise comparison matrix *A* is

$$A = \left(a_{ii'}\right) \quad (2)$$

where, $$a_{ii'} = \left(\prod_{h=1}^{R} a_{ii'}^h\right)^{1/h}, ii' = 1,2,...,n \quad (3)$$

Step 5: Establish pairwise comparison matrix and calculate weight of each element

Judgment of relative importance between *m* assessment criteria is taken as an example. It is assumed that comparison of importance of assessment criteria C_i and C_j, and the judgment result of review committee member *h* are denoted by w_{ij}^{hc} and w_{ji}^{hc}, then

(a) $$w_{ij}^{hc} = 1/w_{ji}^{hc}, \forall h \quad (4)$$

(b) w_{ij}^{hc} is assigned with 1-9 assessed values as per the importance.

According to the above comparison, *m* × *m* pairwise comparison matrix D_c^h can be established, and the elements are as follows:

(a) $$d_{ij}^{hc} = 1, i = j, \forall h \quad (5)$$

(b) $$d_{ij}^{hc} = w_{ij}^{hc}, i \neq j, \forall h \quad (6)$$

(c) $$d_{ji}^{hc} = 1/d_{ij}^{hc}, \forall h \quad (7)$$

Step 6: consistency test

At last, maximum eigenvalue $\lambda_{\max}$ of matrix D_c^h and the corresponding eigenvector W_h can be calculated.

$$D_c^h W_h = \lambda_{\max} W_h \quad (8)$$

where $W_h = \left(w_1^h, w_2^h, ..., w_m^h\right)^T$ is the obtained weights of the m goals after judgment of the review committee member *h*. D_c^h is positive reciprocal matrix, and thus D_c^h has one maximum eigenvector $\lambda_{\max}$, and the other eignevalues are 0. Theoretically, $\lambda_{\max}$ shall be equal to *m*. The subjective judgment may cause inconsistency, and thus $\lambda_{\max}$ is often greater than *m*. Due to this nature, consistency index *CI* can be used to measure consistency of judgment by the decision makers, i.e.

$$CI = \left(\lambda_{\max} - m\right)/\left(m-1\right) \quad (9)$$

When $CI \leq 0.1$, it can be regarded that subjective judgment of review committee members have consistency (Saaty, 1980) [31]. W_h is vector of goal weight subjectively identified by the review committee member *h*.

Step 7: supermatrix operation

In order to solve dependence between elements in the problem structure, ANP uses supermtrix calculate relative weights of the elements. The supermatrix consists of many sub-matrices. The sub-matrices are pairwise comparison matrices obtained in the Step 1. If no correlation exists between elements, pairwise comparison values of the sub-matrices are 0. In this plan, the assessment and assessment criteria have external dependence, and the sub-matrix *C* represents pairwise comparison matrix of assessment criteria at assessment level. The sub-matrix *D*

represents pairwise comparison matrix of assessment level based on assessment criteria; if internal dependence exists between assessment criteria, sub-matrix of pairwise comparison is denoted by *E*; if no dependence exists between assessment criteria, the sub-matrix is 0. The unweighted supermatrix *W*' consists of the above sub-matrices. A converged limit value $\lim_{k\to\infty} A^{2k+1}$ can be obtained by multiplying matrices to solve dependence between the elements. The limit value is the finally determined weight, i.e. relative weights between elements (Saaty, 1996) [32].

$$W' = \begin{bmatrix} 0 & D \\ C & E \end{bmatrix} \tag{10}$$

Step 8: Calculate relative weights of feasible strategies
Based on each assessment criterion, the importance of feasible strategies is compared, and pairwise comparison matrices are established. The preference is integrated to determine maximum eigenvalue and the corresponding eigenvector. Accordingly, the relative weights of the feasible strategies can be determined.
Step 9: Decide optimal strategy
The optimal strategy can be judged by using Desirability Index (*DI*). The desirability index of feasible strategy A_i can be expressed by $DI_i\left(i = 1,2,\cdots,n\right)$.

$$DI_i = \sum_{j=1}^{m} S_{ij} = \sum_{j=1}^{m} R_j W_{ij}, \forall i \tag{11}$$

where, S_{ij} : weight of the *i* feasible strategy under the *j* assessment criterion.

R_j : relative weight of the *j* assessment criterion.

W_{ij} : relative weight of the *i* feasible strategy under the *j* assessment criterion.
Thus, the feasible strategy with the highest desirability index is the optimal business strategy of Hakkanese museums, and it is denoted by A^*.

$$A^* = \left\{ A_i \middle| DI_i = \max_{k=1,2,\cdots,n} imum\left(DI_k\right) \right\} \tag{12}$$

3.4. Application

It is assumed the local government intends to propose business strategies of Hakkanese cultural museums, and four periods *O*= { O_1, O_2, O_3, O_4 } , three assessment dimensions *D*= { D_1, D_2, D_3 } and five assessment criteria *C*= { C_1, C_2, C_3, C_4, C_5 } and three feasible business strategies *S*= { S_1, S_2, S_3 } are considered. It is assumed the external dependence exists between the four periods and the assessment; the external dependence also exists between assessment and assessment criteria; the internal dependence exists between assessment criteria. It is assumed the local government selects the optimal business strategy.
Step 1: Define decision problem and composition of the decision group
The decision problem is selection of business strategies with dependence and multiple criteria. In order to simplify the calculation, the decision maker is the local governor.
Step 2: Problem structuring
The network hierarchy structure of decision problem can be established based on the assessment criteria, feasible business strategy and dependence. For details, see Figure 6:

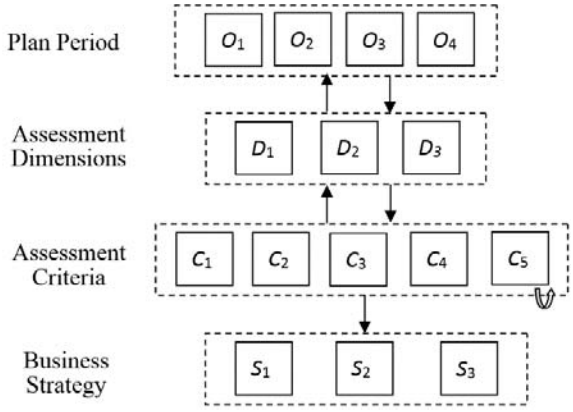

Fig 6: Assessment architecture

Step 3: questionnaire design and investigation
We can conduct questionnaire survey to know preference of the local governor.
Step 4: establish pairwise comparison matrix, and calculate weight of each element. It is assumed at assessment levels D_1, D_2 and D_3 the judgment results of the local governor in pairwise comparison of C_1, C_2, C_3, C_4, C_5 are shown in Tables 2, 3, and 4.

Table 2: Pairwise comparison of C_1, C_2, C_3, C_4 and C_5 at D_1

D_1	C_1	C_2	C_3	C_4	C_5	Eigenvector
C_1	1	2	3	5	4	0.362
C_2	1/2	1	1/3	2	3	0.174
C_3	1/3	3	1	3	3	0.268
C_4	1/5	1/2	1/3	1	1	0.132
C_5	1/4	1/3	1/3	1	1	0.064

$\lambda_{\max}$ =5.142; *CR*=0.031

Table 3: Pairwise comparison of C_1, C_2, C_3, C_4 and C_5 at D_2

D_2	C_1	C_2	C_3	C_4	C_5	Eigenvector
C_1	1	1/2	1/3	1	1/2	0.074
C_2	2	1	1/2	3	1/3	0.154
C_3	3	2	1	3	2	0.376
C_4	1	1/3	1/3	1	1/5	0.075
C_5	2	3	1/2	5	1	0.321

$\lambda_{\max}$ =5.173; CR=0.026

Table 4: Pairwise comparison of C_1, C_2, C_3, C_4 and C_5 at D_3

D_3	C_1	C_2	C_3	C_4	C_5	Eigenvector
C_1	1	2	1/3	7	5	0.264
C_2	1/2	1	1/5	2	3	0.142
C_3	3	5	1	9	5	0.461
C_4	1/7	1/2	1/9	1	1/3	0.052
C_5	1/5	1/3	1/5	3	1	0.081

$\lambda_{\max}$ =5.113; CR=0.018

Step 5: consistency test

From Tables 2, 3 and 4, CR of the three pairwise comparison matrices is 0.031, 0.026 and 0.018 respectively. This indicates judgment of the local governor has consistency. Likewise, consistent CR of other pairwise comparison matrices can also be determined; if CR is greater than 0.1, the governor is required to correct the judgment till all the results have consistency.

Step 6: Supermatrix operation

In Tables 2, 3 and 4, the corresponding eigenvectors of the three maximum eigenvalues are weights of assessment criteria at each assessment level after normalization. After the three weight vectors are integrated, relative weight matrices A of five assessment criteria at the assessment level can be obtained:

$$A=C_3=\begin{array}{c} \\ C_1 \\ C_2 \\ C_3 \\ C_4 \\ C_5 \end{array}\begin{array}{c} \begin{array}{ccc} D_1 & D_2 & D_3 \end{array} \\ \begin{bmatrix} 0.362 & 0.074 & 0.264 \\ 0.174 & 0.154 & 0.142 \\ 0.268 & 0.376 & 0.461 \\ 0.132 & 0.075 & 0.052 \\ 0.064 & 0.321 & 0.081 \end{bmatrix} \end{array}$$

Likewise, the relative weight matrices of the pairwise comparison at different assessment criteria can be denoted by B. The dependence between planed period and assessment level can be denoted by C and D. The internal dependence between assessment criteria can be determined by pairwise comparison of assessment criteria; if there is no dependence between two assessment criteria, the weights can be denoted by 0. Accordingly, it is assumed that no dependence exists between assessment criterion C_4 and other assessment criteria when the assessment criterion C_3 is used as main benchmark. The pairwise comparison results are shown in Table 5.

Table 5: Comparison analysis at assessment criterion C_3

C_3	C_1	C_2	C_4	C_5	Eigenvector
C_1	1	5	1/6	1/5	0.146
C_2	1/5	1	1/7	1/9	0.063
C_4	6	7	1	3	0.534
C_5	5	9	1/3	1	0.257

$\lambda_{\max}$ =4.183; CR=0.021

Likewise, pairwise comparison matrices are determined at assessment criteria C_1, C_2, C_4 and C_5 as benchmarks. If C_4 is used as main benchmark, no dependence exists between C_5 and other assessment criteria; after weight vectors are combined, the relative weight matrix E can be determined.

$$E=C_3=\begin{array}{c} \\ C_1 \\ C_2 \\ C_3 \\ C_4 \\ C_5 \end{array}\begin{array}{c} \begin{array}{ccccc} C_1 & C_2 & C_3 & C_4 & C_5 \end{array} \\ \begin{bmatrix} 0.483 & 0.193 & 0.146 & 0.031 & 0.134 \\ 0.261 & 0.463 & 0.063 & 0.134 & 0.031 \\ 0.173 & 0.126 & 0.534 & 0.193 & 0.187 \\ 0.052 & 0.051 & 0 & 0.642 & 0.036 \\ 0.031 & 0.167 & 0.257 & 0 & 0.612 \end{bmatrix} \end{array}$$

After sub-matrices A, B, C, D and E are integrated, the unweighted supermatrix W' can be determined. The relative positions and weights of sub-matrices in the supermatrix are shown in Figure 6 and Table 6.

$$W'=\begin{bmatrix} 0 & D & 0 \\ C & 0 & B \\ 0 & A & E \end{bmatrix}$$

← Plan Period
← Assessment Dimensions
← Assessment Criteria

Plan Period | Assessment Criteria | Assessment Dimensions

Fig 6: Relative position of submatrix in supermatrix

Table 6: Unweighted supermatrix W' after dependence between elements is considered

		O				***D***			***C***				
		O_1	O_2	O_3	O_4	D_1	D_2	D_3	C_1	C_2	C_3	C_4	C_5
O	O_1	0	0	0	0	0.123	0.373	0.124	0	0	0	0	0
	O_2	0	0	0	0	0.216	0.321	0.213	0	0	0	0	0
	O_3	0	0	0	0	0.127	0.214	0.212	0	0	0	0	0
	O_4	0	0	0	0	0.534	0.092	0.451	0	0	0	0	0
D	D_1	0.413	0.336	0.261	0.214	0	0	0	0.143	0.356	0.416	0.361	0.321
	D_2	0.326	0.385	0.423	0.251	0	0	0	0.231	0.273	0.233	0.205	0.416
	D_3	0.261	0.279	0.316	0.535	0	0	0	0.626	0.371	0.351	0.434	0.263
C	C_1	0	0	0	0	0.362	0.074	0.264	0.483	0.193	0.146	0.031	0.134
	C_2	0	0	0	0	0.174	0.154	0.142	0.261	0.463	0.063	0.134	0.031
	C_3	0	0	0	0	0.268	0.376	0.461	0.173	0.126	0.534	0.193	0.187
	C_4	0	0	0	0	0.132	0.075	0.052	0.052	0.051	0	0.642	0.036
	C_5					0.064	0.321	0.081	0.031	0.167	0.257	0	0.612

A converged limit value can be obtained by multiplying matrices to solve dependence between the elements (Saaty, 1996) [32]. for details, see supermatrix in Table 7.

Table 7: Limiting super matrix

		O				***D***			***C***				
		O_1	O_2	O_3	O_4	D_1	D_2	D_3	C_1	C_2	C_3	C_4	C_5
O	O_1	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042
	O_2	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083
	O_3	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
	O_4	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123
D	D_1	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
	D_2	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143
	D_3	0.183	0.183	0.183	0.183	0.183	0.183	0.183	0.183	0.183	0.183	0.183	0.183
C	C_1	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
	C_2	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
	C_3	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
	C_4	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
	C_5	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054

Step 7: determine relative weights of the feasible business strategies

The relative weights of the feasible business strategies can be determined by pairwise judgment according to each assessment criterion. For example, the judgment results of the local governor in pairwise comparison of the three feasible business strategies based on assessment criterion C_1 are shown in Table 8.

Table 8: Pairwise comparison of feasible business strategies at C_1

C_1	S_1	S_2	S_3	Eigenvector
S_1	1	3	1	0.134
S_2	1/3	1	1/2	0.515
S_3	1	2	1	0.351

$\lambda_{\max}$ =3.412; *CI*=0.073

Likewise, relative weights of feasible business strategies based on other assessment criteria are shown in Table 9.

Table 9: Weights of feasible business strategies based on each assessment criterion

Feasible business strategies	**Assessment criterion**				
	C_1	C_2	C_3	C_4	C_5
S_1	0.134	0.214	0.343	0.137	0.242
S_2	0.515	0.225	0.321	0.428	0.164
S_3	0.351	0.561	0.336	0.435	0.594

Step 8: decision on optimal feasible strategies

Using relative weights of assessment criteria and relative weights of feasible business strategies based on each assessment criterion, desirability index of each feasible business strategy are shown in Table 10. The weight of feasible business strategy S_1 based on the assessment criterion C_1 is determined as follows:

Table 10: Desirability index of feasible business strategy

Assessment criteria		S_1	S_2	S_3
	Weight (R_{C_j})	$S_{S_1C_j}$	$S_{S_2C_j}$	$S_{S_3C_j}$
C_1	0.240	0.032	0.124	0.084
C_2	0.167	0.036	0.038	0.094
C_3	0.225	0.077	0.054	0.076
C_4	0.159	0.022	0.068	0.069
C_5	0.209	0.051	0.034	0.124
Desirability index DI_i of feasible business strategy		0.217	0.317	0.447

Table 10 shows desirability index of the three feasible business strategies S_1, S_2 and S_3 are 0.217, 0.317 and 0.447 respectively, and expressed by $S_3 \succ S_2 \succ$ and S_1. Among the business strategies of Hakkanese culture relics museums, the local governor should select S_3 which meet the environment demands and expand tourism industry.

4. Conclusions

In this study, it can be found that the eight key factors affecting internal strengths and weaknesses of Hakkanese culture relics museums are human resources, administrations, organizational management, business concept, financial structure, orientation of museums, facilities, and marketing, and the key factors affecting external opportunities and threats are transportation, locations of the museums, budget subsidies, tourists, decrees and cooperation with communities after collecting literature, investigating basic information of the museums, holding local informal discussion, visiting the museums and community workshop. SWOT analysis is used to find internal and strengths and weaknesses and external environment opportunities and threats of the museums; at last, TOWS matrix and BCRU established using SAW Analytic Network Process are used to find out co-opetition strategies for the museums, including (1)

use strengths of the museums to take advantage of external opportunities (SO strategies); (2) use external opportunities of the museums to overcome the internal weaknesses (WO strategies); (3) use internal strengths of the museums to avoid external threats (ST strategies); (4) minimize internal weaknesses of the museums to avoid external threats (WT strategies). All these strategies can serve as reference for future development of the Hakkanese culture relics museums.

The BCRU (The Business model of Culture Relics Museums) is feasible after numerical examples and expert group discussion. It can be used in future empirical analysis of Hualien Hakkanese culture relics museums.

5. Acknowledgements

First of all, the work described in this article was substantially supported by a grant from the Research Hakkanese culture relics museums of the Hualien County Government, Taiwan [Project No. HAKKA10106]. I thank Sung-Ken Kao, Yung-Ching Wu and our student helpers for research assistance. Secondly, the author would like to express his gratitude for the detailed attention and valuable feedback comments from the *10th Triennial Conference of the Association of Asia-Pacific Operational Research Societies* held from 02 - 06 August 2015, in Kuching, Sarawak, Malaysia.

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44. Compound Annual Growth Rate (CAGR) means annual growth rate of an investment within a specified period.