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Abstract

Purpose – In the service economy era, service value is created from the evaluation of customer experience and it is important to study alliance partner selection for improving service provision. Nevertheless, most of the existing alliance partner selection approaches concentrate on the functional aspects. The purpose of this paper is to provide a novel approach that is customer-centric and emphasizes the emotional aspect of service value.

Design/methodology/approach – This paper presents a metaphor-based alliance partner recommendation mechanism (MAPRM) that employs the computing metaphor approach to recommend alliance partners for companies in an innovative way. The main ideas of metaphors are the comparison made between two unlike things that actually have something in common so as to attain innovative thinking.

Findings – This study uses the scenario of regional tourism innovation to demonstrate the attempted contributions of MAPRM. The simulation evaluation results show that MAPRM can utilize knowledge and resources from companies to achieve specific alliance goals of satisfying desired customer experiences represented by images that can be analyzed and created based on customers' feedback and their interactions with companies.

Originality/value – MAPRM aims to assist companies to find appropriate alliance partners which offer potential innovation opportunities for service value provision. It is capable of facilitating the alliance partner selection process and assessing customers' needs at the same time.

Keywords Customer experience, Alliance partner recommendation, Colour psychology, Computing metaphor

Paper type Technical paper

1. Introduction

An alliance can provide companies with a new source of competitive advantage (Bierly and Gallagher, 2007). A number of studies have sought to identify the underlying motivations for alliance formation. These motivations primarily include resource complement (Lin *et al.*, 2009; Shah and Swaminathan, 2008), transaction cost reductions (Lin *et al.*, 2009; Medcof, 1997) and knowledge sharing (Brouthers *et al.*, 1995; Dacin *et al.*, 1997). Companies tend to seek partners who can reduce their business transactions in order to do more with less effort and resources. Knowledge sharing is also an important consideration; learning through cooperation can be an efficient and effective way to gather additional expertise and skills in specific areas (Brouthers *et al.*, 1995;

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Dacin *et al.*, 1997). Meanwhile, alliance partner selection to improve service provision is the current trend in the current era of service economy (Li *et al.*, 2014).

In service economy, service value is created from the evaluation of customer service experiences (Vargo *et al.*, 2009; Basole and Rouse, 2008). Instead of considering only the factors present in business-to-business relationships, studying partner selection based on the perspectives of customers can play a crucial role in improving service value. It is necessary to take into account the roles of respective customer demands (i.e. their expected service experience) in order to better propose service values which can satisfy existing/prospective customers (Pine and Gilmore, 2011). Alliance for improved service provision should accordingly be capable of incorporating customers' expected service experiences into the service value evaluation process and deliver the expected service in a timely manner.

On the other hand, many studies have investigated how to apply metaphors in computing to support business tasks automatically (Wang and Liao, 2009; Hill and Levenhagen, 1995). Metaphors can stimulate creative and innovative thinking, and thus, offer great potential for solving design problems enhancing (Casakin, 2007; Lubart and Getz, 1997; Weick, 2003). Metaphors are broadly considered to be a conceptual mapping of properties between two knowledge domains, the target domain and the source domain (Lakoff and Johnson, 1980; Mason, 2004). The target domain provides dimensions for attribution, whereas the source domain (or vehicles) offers properties that may be applicable to the target (McGlone and Manfredi, 2001). That is, metaphors imply the comparison made between two unlike things that actually have something in common so as to attain innovative thinking. This paper argues that existing metaphors used in speech or writing can be regarded as knowledge sources for developing new knowledge-based techniques which support human decision making, learning or action. Different from traditional knowledge sources (e.g. taxonomies, ontologies, dictionaries, etc.), metaphor knowledge is often scattered and unstructured; thus, traditional knowledge-based techniques of representations (e.g. XML, RDF) and computation (e.g. logical tools, indexing/retrieval, text mining) might not be suitable.

In this study, we adopt a computing metaphor approach and develop a metaphor-based alliance partner recommendation mechanism (MAPRM). The proposed mechanism allows companies to find alliance partners to cooperate for innovative service provision considering the evaluation of customer service experiences. In this study, we also use the scenario of regional tourism innovation to demonstrate the attempted contributions of MAPRM. In the following sections, we first introduce previous exemplar studies related to alliance partner selection and computing metaphors. Then the proposed MAPRM framework is explained in Section 3. Section 4 evaluates a regional tourism scenario to demonstrate and discuss the utility of the MAPRM framework. Finally, the conclusion is provided in Section 5.

2. Literature review

2.1 Criteria for alliance partner selection

Alliance partner selection is the first step in creating successful and effective alliances (Ireland *et al.*, 2002). The reasons behind the ineffectiveness of an alliance are complex. Two common causes are inappropriate partner selection and poor alliance management (Holmberg and Cummings, 2009). The rich body of literature thus has explored and developed partner selection approaches, checklists and criteria for partner selection (Brouthers *et al.*, 1995; Dacin *et al.*, 1997; Lin *et al.*, 2009; Medcof, 1997; Shah and Swaminathan, 2008; Wu *et al.*, 2009). Literature reviews (Wu *et al.*, 2009) have summarized the partner selection criteria proposed by numerous studies (see Table I). Common criteria include the characteristics of the partner, marketing knowledge capability, intangible assets, complimentary capabilities and degree of fitness. These criteria can be further subdivided into minor aspects for evaluating the fitness of partners.

Such criteria contribute to studies developing systematic methods in partner selection. The above-listed criteria are often integrated into the development of partner selection methods. However, existing methods mostly concentrate on functional aspects (i.e. cost, quality, performance, etc.) of partner selection, especially those used in developing production networks or supply chain management. We argue that a customer-centric perspective should be brought into the partner selection issue, particularly for service industries like tourism, which inherently involve cross-industry alliances, because tourists need various kinds of services (e.g. transportation, accommodation, entertainment and so on) during a journey. Nevertheless, to best practice the customer-centric perspective, the intrinsic value (i.e. psychological or emotional value) should not be ignored. These psychological and emotional aspects are often neglected in current methods of alliance partner selection. The problem of how to select partners in order to create superior service experiences remains unanswered. Such inadequacy provides the motivation for this study to devise our MAPRM approach. The proposed approach can enlarge the potential partner base and facilitate the process of finding alliance partners in an innovative way.

2.2 Computing metaphor

This study aims to take advantage of metaphors to explore innovative solutions for alliance partner selection in a heuristic and automatic manner. Metaphors might be thought of as "understanding and experiencing one kind of things in terms of another" (Lakoff and Johnson, 1980). Literature reviews show the abilities of metaphor to facilitate knowledge change based on psychological aspects (Gentner and Wolff, 2000) and knowledge creation based on social interactions (Paavola and Hakkaaraine, 2005).

Criteria	Sub-criteria
Characteristics of the partner	(1) Unique competencies, compatible management styles (2) Compatible strategic objectives (3) Higher or equal level of technical capabilities between manufacturers and distributors (4) Openness to take risks (5) Readiness to adopt innovation information technologies to gain competitive advantage
Marketing knowledge capability	(1) Increased market share, better export opportunities (2) Knowledge of local business practices
Intangible assets	Trademarks, patents, licenses or other proprietary knowledge, reputation, previous alliance experiences, technically skilled employees among partners
Complimentary capabilities	Partners owned managerial capabilities, wider market coverage, diverse customer, the quality of distribution system to those of the strategic partners and customers
Degree of fitness	(1) Compatible organization cultures and decision style (2) Willingness to communication, share expertise and information (3) Equivalent of control

Source: Wu *et al.* (2009)

Table I. Criteria and sub-criteria for alliance partner selection

Many studies have investigated how to apply metaphors in computing to support business tasks automatically (Wang and Liao, 2009; Hill and Levenhagen, 1995). These studies can be generally classified into two categories. One is metaphor comprehension and the other is metaphor generation. Both tasks are designed to be done automatically by the aid of information technology. Metaphor comprehension is defined as a process of mapping between target and vehicle concepts in order to identify some similarities for metaphor interpretation (Zhou *et al.*, 2007). There are two main types of metaphor comprehension tasks. One is the rule-based approach and the other is the statistics-based approach (Zhou *et al.*, 2007). Approaches based on rules usually involve hand-coded rules or knowledge bases (D'Hanis, 2002; Martin, 1990). The level of applicability in these systems is limited to the predefined knowledge base. Notice that it is rather difficult to define all the rules or knowledge of human beings. Statistic-based approaches, alternatively, can be implemented by dynamically mining documents or corpuses on the fly to understand the metaphor components (Mason, 2004; Veale and Hao, 2007). The corpus from the web serves as a plentiful knowledge source that implicitly represents a different perspective in the world.

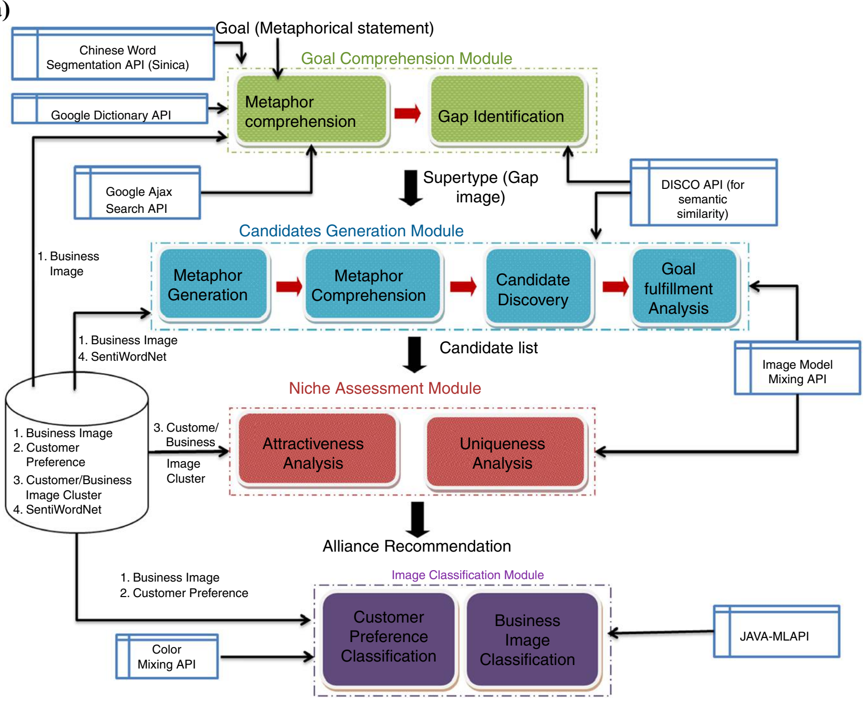
Similar to metaphor comprehension, the metaphor generation process involves identifying the vehicles associated with shared common attributes (Abe and Nakagawa, 2006). The approaches for metaphor generation are relatively few because generating a novel metaphor is more complex. However, there were still some approaches, e.g., the Sardonicus (Veale and Hao, 2007) and transparently-motivated (Jones, 1992) methods. These approaches can also be classified into two categories, statistic-based approaches and rule-based approaches. Statistic-based approaches are normally developed based on leveraging statistical methods in mining the corpus to establish a probabilistic model or identify the concept patterns (Abe and Nakagawa, 2006; Veale and Hao, 2007). Rule-based approaches can be implemented to build a knowledge base by framing grammatical or hierarchical structure relationships between target and source domains (Baumer *et al.*, 2009; Jones, 1992).

Although substantial bodies of research studies are now available to shed light on how to automatically understand or generate metaphors, the application of computing metaphors is still in an early stage. To help companies with making innovative alliance partner selection decisions, computing metaphors offer potential for finding alliance partner candidates so as to collectively offer unique and attractive service experience to customers. That is, the customer-centric perspective of alliance partner selection could achieve different results than previous methods working only on functional aspects.

3. MAPRM

The goal of the metaphor-based alliance partner recommendation system (MAPRS) is to use the computing metaphor approach to excavate the meaning behind proposed alliance goals and further identify possible partner candidates. In this study, alliance goal is defined as a service value (i.e. the evaluation of customer experience) attempted to deliver by the alliance to customers; in particular, we emphasize the emotional aspect of the service value that can be represented by images (described in Section 3.1). In order to help enterprises to get desired outcomes, market niche assessment of different recommendation choices is also carried out during the MAPRS process. To achieve these ends, the MAPRS system framework is designed and presented as in Figure 1(a). In essence, the overall system process works to comprehend the alliances goals, identify the missing image elements to achieve the goals, generate new metaphors, map these metaphors to a manageable set of partner candidates and evaluate and prioritize the candidates. Therefore, this MAPRS

(a)



MAPRS system framework

(b)

Module	Purpose	Main input	Main output
Goal comprehension module (GCM)	Comprehend the meaning of the goal and identify the missing image elements for goal achievement	A goal in the form of a metaphorical statement	Gap image elements
Candidates generation module (CGM)	Conduct metaphor generation and comprehension process to generate a series of partner composition choices	Gap image elements	Partner composition list
Niche assessment module (NAM)	Evaluate the market niche potential for different choices	A series of partner composition choices	Attractiveness score and unique score
Image classification module (ICM)	Process image data in advance to reduce the computation complexity of niche assessment	Customers' image preferences and business images	Customer image preference clusters and business image clusters

The main functions of the modules in MAPRS framework

Figure 1.
MAPRS system

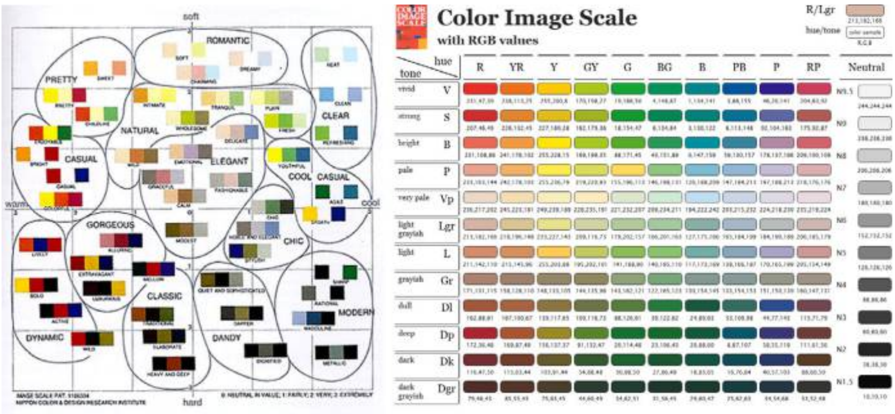
framework consists of an image model (Section 3.1) together with four main modules, including the goal comprehension module (GCM) (Section 3.2), candidates generation module (CGM) (Section 3.3), niche assessment module (NAM) (Section 3.4) and image classification module (Section 3.5). As the names of modules imply, each module represents the basic goal that the process needs to complete in order to achieve the desired end, as outlined in Figure 1(b). We provide descriptions of the image model and each module as follows.

3.1 Image model

In MAPRS, we adopt the concept of image theory (Beach, 1990) which depicts an image as a cognitive structure in a person's mind that is affected by human knowledge, and develop image models to address psychological value cognition for both tangible and intangible values. This is analogous to the concepts of brand image (Keller, 1993; Nelson, 2004) or destination image (Echtner and Ritchie, 2003). That is, images can represent the perceived customer benefits and the value of service offerings. We use image models to represent the emotional perceptions of companies based on their social interactions (i.e. images can be analyzed and created based on customers' feedback and their interactions with companies).

In this study, the image model serves as a basis for us to further collect, present and analyze image data in a systematic way. In order to easily analyze and process the image model, all of the image elements (i.e. emotional adjectives) can be represented by colors if necessary. A significant amount of research on color psychology has disclosed that colors are often associated with feelings or emotions (Kobayashi, 1981; Xin *et al.*, 1998; Nijdam, 2005; Ou *et al.*, 2004; Suk and Irtel, 2010; Yang and Yuan, 2010). Kobayashi proposed the Color Image Scale (Figure 2(a)) which is an excellent model relating colors to emotions. Through adopting this scale, every adjective manifesting the emotional perceptions of a target in image models can be

(a)



Color Image Scale (Kobayashi, 1992)

(b)

Image element no.	Adjective	RGB value	Image intensity
1	Charming	(255,18,204)	0.3
2	Fascinating	(176,119,72)	0.2
3	Enjoyable	(216,128,0)	0.5

A tourist image model example

Figure 2.
Image model

associated to a color with a RGB color model value. One of important considerations for mapping adjectives onto colors is that a quantitative method can be used to analyze or compute such image data after the adjectives are replaced with RGB values. Under the constraint of mapping every word onto a color, the number of image elements in an image model can reach up to 122 emotional adjectives (Yang and Yuan, 2010). Two types of image models are defined in MAPRS, including the business image model and customer image model. The meaning of the business image model is the emotional perceptions of a business drawn from the interaction between a business and its customers. A customer image model describes a customer's psychological preferences or emotional needs toward businesses. In addition, image models are used to represent the target and vehicle in computing metaphor analysis. That is, when an alliance goal is inputted as a target during computing metaphor analysis, it is decomposed by using the image model. In MAPRS, the structure of an image model involves adjectives used to describe the target (business or customer) and the intensity value of each adjective. Intensity value is the percentage of customers who think a specific adjective is appropriate for describing the target. Figure 2(b) illustrates an example of an image model of a tourist. The image element "enjoyable" has higher image intensity value, implying this tourist has relatively strong feelings about "enjoyable."

3.2 GCM

When designing MAPRS, we assume that enterprises have the ability to clearly define the images of their alliance goals for partner selection. For example, a tourism small and medium-sized enterprise (SME) owner needs to have the ability to think about the word "paradise" and input it into the proposed system. After that, MAPRS starts analyzing the goal "paradise" and identifies its latent meanings in order to find the most appropriate partners for collectively achieving the goal. The GCM is designed to perform this task.

In order to comprehend metaphors, e.g., a company (target) offers services which are just like paradise (vehicle), we adapt a web-driven, case-based approach called the Sandonicus approach (Veale and Hao, 2007). This approach leverages the text of the web as a plentiful knowledge source to identify what properties are most contextually appropriate to apply to both sides, the target and vehicle. This approach employs Google search engine as a retrieval mechanism for finding properties of words by using Google supported APIs, which allow us to search for a wildcard term * for any possible words. For example, if you send a query "as * as paradise" to Google, you may get a series of words, such as beautiful, gorgeous, wonderful. This implies paradise can be beautiful, gorgeous and wonderful. More specifically, these words can be considered as the properties of paradise. We treat these properties as the meaning of paradise.

To avoid undesired results such as the sentence pattern "as * as vehicle" in Google, we have an exception word list. In addition, only the positive adjective words are used to describe the goal because only positive aspects of the goal are regarded as important in building good images, in terms of leveraging SentiWordNet to keep only the positive adjective words in the results (Baccianella *et al.*, 2010; Esuli and Sebastiani, 2006).

Then, the gap identification component attempts to catch the missing part of the existing images for the company to achieve the goal. During the comparison process, semantic similarity analysis is conducted to evaluate how close the meanings of two words are, given that the images' elements are adjectives. We use DISCO (extracting DIstributionally related words using CO-occurrences) to retrieve the semantic similarity between arbitrary words (Kolb, 2008) and output a semantic similarity score. A higher score indicates higher semantic similarity. If any of the wanted images cannot be found among the existing images of the company or among the existing images with a high level of similarity, such image are considered to be gap images. In other words, gap images are those which cannot be fulfilled by existing images.

3.3 CGM

The CGM aims to attain possible partner lists. The main components of this process include metaphor generation and candidate discovery. This module uses the gap images identified in the last module, hereafter referred to as "supertype", to generate a collection of new metaphors. These metaphors are then analyzed by the metaphor comprehension process to ensure every generated metaphor makes sense and then each metaphor can also be projected to specific business types for potential cooperation accordingly. Once these candidates are identified, goal fulfilment analysis is executed to ensure that cooperating with these candidates can achieve the user's goal, thus identifying a set of businesses suitable for cooperation.

The basic idea behind the abovementioned process is to generate new metaphors that best describe potential partners. For example, if a new metaphor is generated like "your partner is as wonderful as a flower", MAPRS tries to find a partner who can be best described as a flower. Metaphor usage in design problems is primarily for analogy inspiration. Applying analogies to the design field can offer a heuristic problem solving strategy in which a problem solving method can be carried over to another new problem.

In this study, the Sandonicus approach (Veale and Hao, 2007) is extended so as to generate metaphors with multiple properties following a three-stage process. First, each property is put into the sentence "as property as *" and separately sent to Google search. Different sets of words then are returned. In this stage, different words (i.e. vehicles) with a given property are the new metaphors generated. Second, we use the metaphor comprehension technique to identify the properties of vehicles. Accordingly, a set of vehicles are generated and the properties of each vehicle are identified as well. The primary principle used to find the most appropriate vehicles is that the properties of the vehicle should contain as many gap images as possible. Finally, the vehicle containing the most gap properties is chosen in order to serve as the new metaphor.

After a set of metaphors is generated, the candidate discovery component then attempts to match the metaphors to real companies. If a new metaphor such as "your partner is just like a flower (vehicle)" is created, the component tries to find out which business entity (company) is just like a flower. Candidates are rated according to the similarity level and property fulfilment to vehicles. In the end, the candidate discovery component lists potential companies for cooperation.

For each matched real company, MAPRS computes the level of goal fulfilment. Since the goal of an SME is to convey and public a specific image through the aid of cooperation, it is essential to gain the anticipated effect of cooperation forecasted when different partner compositions are formed. To this end, we adopt our previously developed image model mixing API to integrate the image elements of two image models and form a new one. After a new image model is formed, image model similarity analysis is executed to compare the goal images with the new image model. Based on the results of image model similarity analysis, the fulfilled images can then be identified. Then, a goal fulfilment score can be computed according to Equation (1). The denominator is the number of goal images and the numerator is the number of goal images which are fulfilled. A higher score indicates a higher level of goal fulfilment; the value will be between 0 and 1. The output of the candidate generation module is then the candidates list with the highest goal fulfilment score:

$$\text{Goal fulfillment score} = \frac{\text{the number of goal images that can be fulfilled}}{\text{the number of goal images}} \tag{1}$$

3.4 NAM

When the candidate generation process in the previous module is completed, several partner choices are generated. To decide which a partner set is suitable for cooperation, NAM provides about preliminary evaluation information about the cooperation. Niche assessment here involves attractiveness analysis and uniqueness analysis. Attractiveness analysis measures the consumer desirability and uniqueness analysis examines the degree of differentiation (Yü ksel and Akgü, 2007). The true meanings behind the attractive and unique analysis components are to evaluate how attractive or unique the predicted images are for possible new alliances. For the sake of assessing attractiveness and uniqueness, we have to predict the image configuration of a new alliance when a new partnership is built. Therefore, the attractiveness score is computed as in Equation (2). In simpler terms, the system calculates the percentage of customer preferences that can be matched based on the new alliance image model:

$$\text{Attractiveness score} = \frac{\text{the number of matched image models}}{\text{the total number of customer image model in the system}} \tag{2}$$

On the other hand, uniqueness here signifies the extent of image differences between a new alliance and existing business entities (Cracolici and Nijkamp, 2009). An alliance image model is determined as "unique" when its image configuration substantially varies from those of other image models in its designated business region. In other words, uniqueness analysis indicates the difference between the new alliance's image model and the current companies in a given region, while attractiveness analysis measures how many customer image models are similar to the new alliance's image model.

To address the extent of difference between the existing business image models in a business region and the new alliance image model, dissimilarity indexes are computed against different business image classes. The dissimilarity index (Equation (3)) indicates the degree of dissimilarity between two given image models. The formula of the dissimilarity index is that the sum of the intensity of differences among the same image elements between two image models divided by two. To attain a conservative estimate, the uniqueness score of the new alliance's image model is set as the minimum value of the dissimilarity index against different business image classes:

$$\text{Dissimilarity index of a new alliance image model A in the business cluster j} = \frac{\sum_{i=1}^{\text{the number of image element}} \left|\text{AIntensity}_{\text{i}} - \text{Intesity}_{\text{ij}}\right|}{2} \tag{3}$$

Note: AIntensity_i = the intensity value of the image element i in the image model of the new alliance; and Intensity_{ij} = the intensity value of the image element i in the image model of the business image cluster j.

After computing the attractiveness and uniqueness scores, the alliances are ranked into five categories as five (TOP 20 percent among all businesses), four (TOP 21-40 percent), three (TOP 41-60 percent), two (TOP 61-80 percent) and one (81-100 percent). By appraising the niche of each possible partner composition, this module is able to identify novel partnerships with high desirability and differentiation.

3.5 Image classification module

For the purpose of reducing computation complexity in the NAM, the image classification module is developed because the NAM involves intensive computation and comparison processes. For example, when evaluating the level of uniqueness, it is possible to compare the image configuration of a new alliance to those of all existing business entities. This process takes considerable time due to the magnitude of data entries. Hence, this module processes the required inputs in advance (e.g. the preferences of tourists and the images of companies) for the NAM. SOM cluster analysis (Kohonen, 1990; Samsonova *et al.*, 2006) is adopted to classify both the needs of tourists and the images of companies. After image classification, MAPRS needs not to compute all the data entries in the database but only needs to compare the characteristics of several identified classes when computing the uniqueness.

4. Evaluation of MAPRS

4.1 Simulation data

To carry out MAPRS evaluation without loss of generality, we use a regional tourism sector as the application scenario to demonstrate the utility of our approach's alliance partner selection. Tourism brings together people of different interests and creates bonds between various actors. Alliances for tourism are crucial for tourism development (OECD, 2008). According to the destination image theory, tourism development in a region is highly related to its destination images which include the perceptions, beliefs, impressions, ideas and understandings that a person has about a destination (Tuohino, 2001; Echtner and Ritchie, 2003). Thus, finding alliance partners to create alliances with unique and attractive destination images may positively affect perceived service experiences and regional tourism development. Identifying gaps existing between perceived and expected services experienced by customers enables tourism companies to improve regional development and overall destination images. To present a destination image in tourism, we assume that image models which capture human emotional perceptions in MAPRS can also represent destination images. The goal of MAPRS is to improve the effectiveness of the partner selection process.

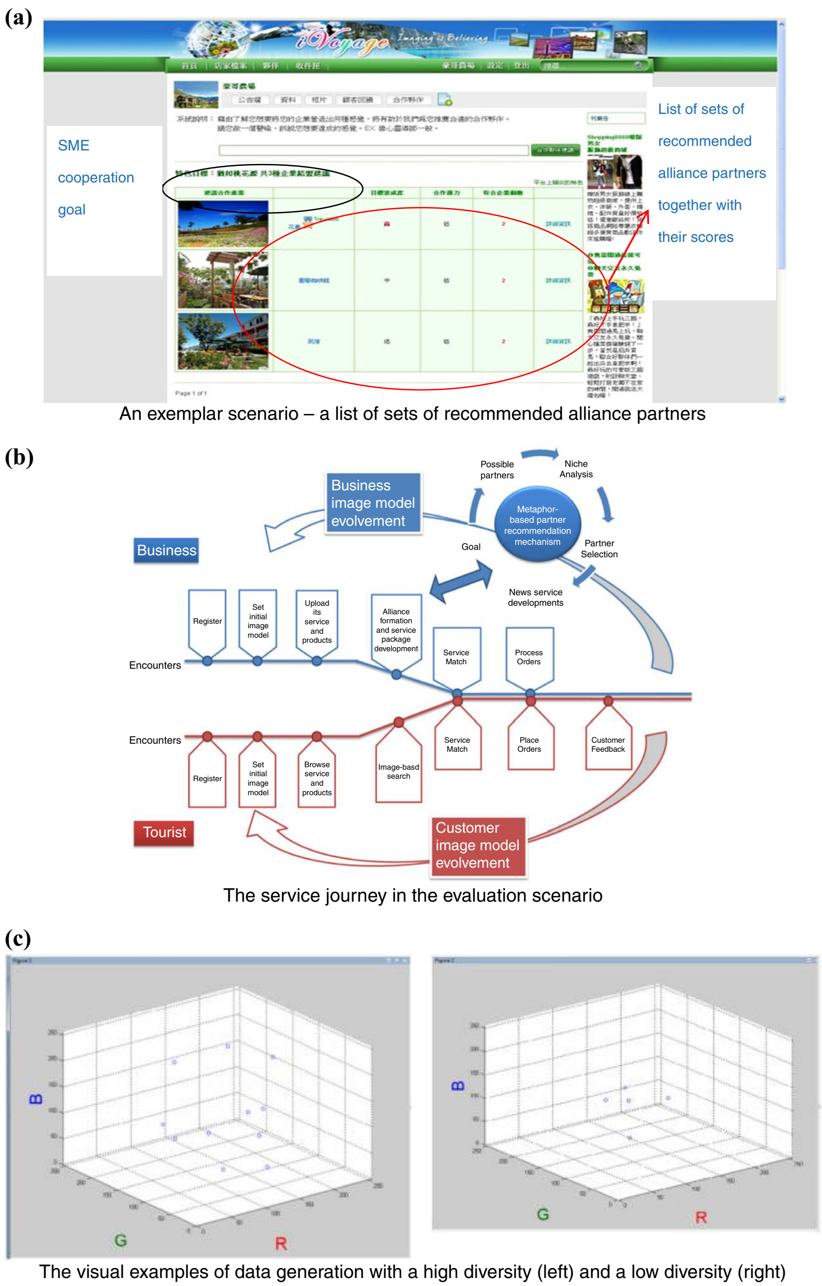
A simple exemplar scenario is briefed as follows. A SME owner, an agritourism service provider, wants to build an attractive and unique image for customers through the effort of cooperation. First, the owner provides a goal image in the form of metaphorical statement to our system as "just like a gramma's house in the countryside." This image represents the feelings of pastoral, nostalgic and boisterous in our local culture. Second, through the goal comprehension process, the metaphorical statement is comprehended and the gap was identified as the elements, such as the feelings of nostalgic and boisterous. Third, the metaphor generation and comprehension processes are executed to yield a series of vehicles that can be depicted as nostalgic and boisterous and those vehicles would be mapped to real business entities. It then gets sets of business entities, such as ox-wagon transportation service and Hakka traditional beverage service. The goal fulfillment analysis is conducted to examine how the different sets of recommended alliance partnerships vary in fulfilling the goal of SME owner. Fourth, the system evaluates the level of uniqueness and attractiveness of candidate alliance partnerships. In the end, the alliance partner recommendation is generated with scores (Figure 3(a)). This scenario demonstrates how MAPRS can help SME owners to develop their specific images with niche potential and find appropriate partners to cooperate.

Figure 3(b) then demonstrates the service journey of the evaluation scenario in MAPRS. To make the simulation environment closely resemble the real world, we take into consideration that the diversity of companies in a region may have a significant impact on the level of difficulty in goal achievement. The term "diversity" in this study is used to describe how diverse business images are in a tourism region. Considering partner selection, forming a new promising alliance is inherently limited to a partner search base. The more multifarious the partner search base, the more innovative opportunities the service experience will be. This suggests that a given destination involves numerous companies with diverse images. In this way, it is much easier for companies to find the appropriate partners for cooperation because the basic goal of this study is to find partners who have the image elements that a company wants.

In addition to finding alliance partners, we also consider whether MAPRS can help companies create a market niche based on the recommended alliance. The levels of uniqueness and attractiveness for a given alliance mentioned in Section 3.4 are regarded for market niche assessment. We then have the following performance indicator, as shown in Equation (4). If the coefficient is greater than 1, the result means our proposed mechanism can effectively help companies find appropriate partners to create a market niche for regional development:

$$\text{Market Nichi Coefficient} = \frac{\begin{array}{c}\text{the level of uniqueness} + \text{the level of attractiveness}\\ \text{(after cocoperating with other SMEs)}\end{array}}{\begin{array}{c}\text{the level of uniqueness} + \text{the level of attractiveness}\\ \text{(before cocoperating with other SMEs)}\end{array}} \quad (4)$$

Our exploratory study adopts the simulation method to do the evaluation since this is first study to use image models of service experience evaluations for alliance partnership. The simulation data are randomly generated given that it is nearly impossible to acquire real company data to generate image models, in the simulated experiments, we randomly generate different sets of distinct business image models and customer image models (e.g. 140 business image models and 140 customer image models). For the purpose of evaluation, two different levels (high and low) of diversity contexts are formulated. We can understand the influences of diversity by examining the number of image classes and the distance between image classes. Given that an image model is represented with one RGB value, it can be projected to a three-dimensional RGB space to perform cluster analysis. Additionally, the number of classes implies the variety of image models. More image classes reflect a wide difference between image models. On the other hand, if there is a tendency for the image classes to flock together, the image models are relatively homogeneous (i.e. lower diversity). If the



An exemplar scenario – a list of sets of recommended alliance partners

The service journey in the evaluation scenario

The visual examples of data generation with a high diversity (left) and a low diversity (right)

Figure 3.
Evaluation scenario

image classes in the three-dimension space are distributed in a scattered fashion, it represents that the image models are relatively heterogeneous (i.e. higher diversity). We hypothesize that a healthy tourism ecosystem should exhibit high-image diversity in order to offer comprehensive service experiences.

Figure 4 exhibits the results of image classes analysis of the 140 business image models under different context settings. The blue circles represent the centers of the image classes. In the lower image diversity context on the right side of Figure 3(c), the number of image classes is relative few (e.g. five image classes) and the distance between the centers of the image classes is relatively short. On the contrary, the left side of Figure 3(c) demonstrates the results of a higher image diversity context (e.g. 11 image classes) in a similar manner. With different context settings, the proposed approach is able to examine the impact of context diversity.

4.2 The evaluation results

In the experiments, we use various metaphors as the input goals of partner selection (e.g. 14 metaphors including heaven, fascinating game, shining fireworks, romantic wedding, childhood fantasy, magical show, nostalgic village, blockbuster movie, Olympics, dreamy island, Bali Island, cultural festival, Hawaii, Paris). For instance, the

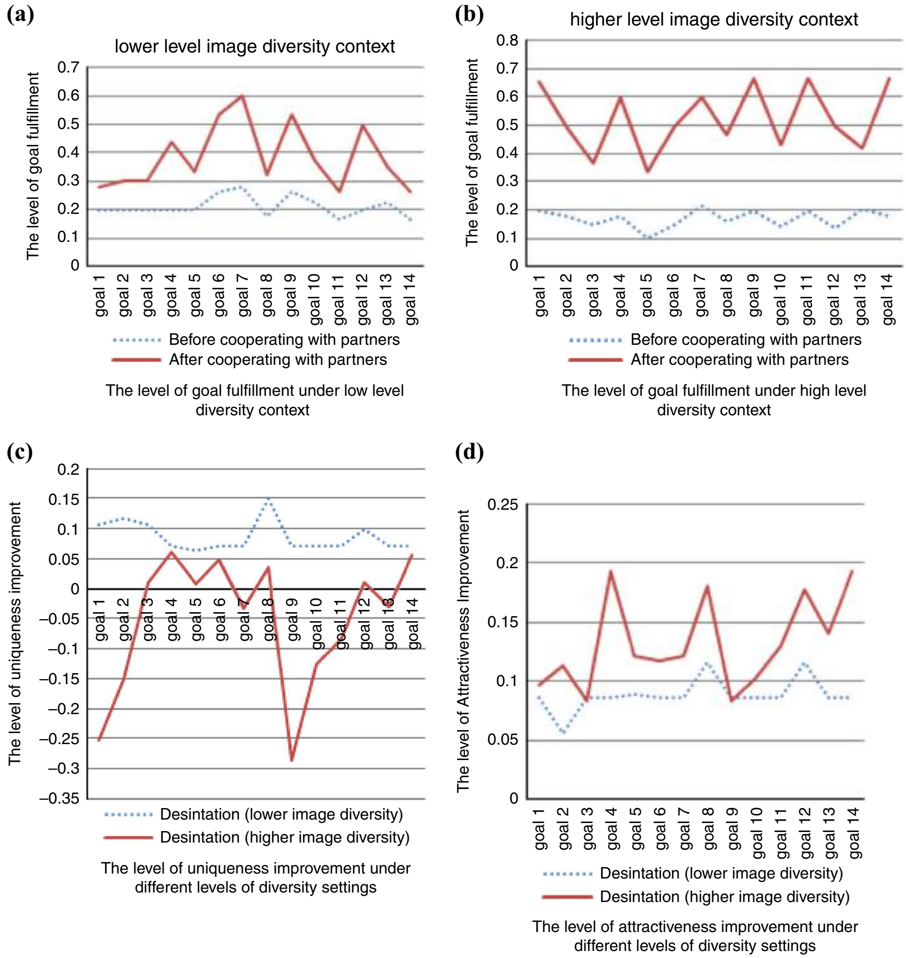


Figure 4.
Evaluation results

romantic wedding goal means the service experience is just like attending a romantic wedding, and the dreamy island indicates the service experience is just like being on a dreamy island. In the experiments, after the goal is comprehended in GCM, at most eight gap images are set to be fulfilled when generating metaphors. We set eight as the number of metaphors to generate, because over 90 percent of the gap images can be included within the dynamically generated metaphors from our preliminary tests.

Figure 4(a) and (b) show alliance goal fulfilment in different diversity contexts. In the two figures, the solid line indicates the level of goal fulfillment after the target company cooperates with our approach's recommended partners and the dotted line refers to the level of goal fulfillment before the target company cooperates with a partner. The goal fulfillment scores are averaged based on the different goal settings. Obviously, in both contexts, goal fulfilment is improved by using MAPRS, especially in the tourism region with a high level of diversity. Therefore, MAPRS can help companies find appropriate partners by improving the level of goal achievement in image building.

Figure 4(c) and (d) demonstrate the improvements of uniqueness and attractiveness under different levels of diversity contexts. Notably, the improvement of uniqueness is better in a low-diversity context than that in a high-diversity context. In contrast, the improvement of attractiveness in a high-diversity context is greater than it is in a low-diversity context. In other words, only the improvement of attractiveness is obvious and some of uniqueness improvement results are unclear in a high-diversity context.

As for the market niche coefficient of the recommended alliance, we investigate the 11 business image classes for attaining our test cases (because there are 11 business image clusters in our testing data). We randomly and separately pick one business image model from each image class which means that 11 different companies are picked as the targets. The basic idea here is to prove that the business image type is irrelevant when it comes to getting the benefits of the proposed approach. Any kind of company can create a market niche by employing our approach. On the other hand, the experiments use 14 different goal settings for 11 companies and then choose the best of partner recommendation results for each company as the final decision.

If the market niche coefficient is greater than one, it indicates that the possibility of creating a market niche is improved by forming a new alliance relationship. Table II(a) shows the market niche coefficients in every case. From the results of Table II(a), the results imply that MAPRS can efficiently help tourism companies with alliance partner selection to improve the attractiveness of destination images and create market niches for regional development.

Overall, simulation results show that MAPRS performs well in attractiveness image building. However, it seems to be more difficult to improve the level of uniqueness for

(a) Market niche coefficient in each test cluster

Business ID	1	2	3	4	5	6	7	8	9	10	11
Market niche coefficient	1.65	1.29	1.00	1.37	2.22	1.01	1.37	1.88	0.996	1.63	1.29

(b) The distribution of uniqueness scores before cooperating with partners in different image diversity context

The interval of uniqueness score	Lower image diversity (%)	Higher image diversity (%)
0 ~ 0.25	20	18
0.25 ~ 0.5	60	0
0.5 ~ 0.75	20	18
0.75 ~ 1	0	64

Table II. Market niche evaluation results companies in high-diversity contexts. A partial explanation for this may lie in the fact that a company in a high-diversity context is already unique enough. In a high-diversity context, the coverage of images within different companies should be greater than that in a low-diversity context. When comparing the images of new alliances, only a few differences between the images of current companies may emerge. To further investigate this, Table II(b) shows the distribution of uniqueness scores before cooperating with partners in different image diversity contexts. The uniqueness scores are above 0.5 account for 82 percent (18+64 percent) of the companies in a higher diversity context. Accordingly, this makes it challenging to further improve the uniqueness given that the companies are already unique. Additionally, if a company is really unique, new images gained through alliances which import missing elements for goal achievement decrease the previous intensity of its unique image elements. However, it is worth noting that context diversity is not the only factor influencing the level of uniqueness. Sometimes goal setting matters, especially when the goal is too common. That is, if the images created are already commonly seen, it becomes harder to build unique features through a common goal.

4.3 Discussion

The aforementioned evaluation results can be summarized as follows: first, the proposed mechanism has the ability to help companies improve their levels of goal achievement in image building; second, the image diversity of a context influences goal achievement, and attractive and unique image building; and third, any kind of company can create a market niche by employing the MAPRM approach.

In addition, we analyze both attractiveness and uniqueness as different indicators in alliance partner selection and separately compare them with customers' images and other companies' images. If these companies cooperate with partners with common image attributes, they may suffer from the abatement of uniqueness level owing to the common images brought into their services. In contrast, if these companies seek to improve their uniqueness level, there may be a chance to create special services in their region. Our market NAM provides both indicators (i.e. attractiveness and uniqueness) for companies to reference. Hence, companies need to consider all the possible results before taking actions.

5. Conclusion

In this study, MAPRM is proposed to deal with the problem of how to assist companies to find appropriate alliance partners which offer potential innovation opportunities for service value provision. We incorporate a computing metaphor and information technology from a customer-centric perspective open up a new avenue of investigation for the problem of alliance partner selection. The simulation results show that by using with the computing metaphor technique, MAPRS has the abilities to facilitate the alliance partner selection process and assess customers' needs at the same time. Therefore, in the era of rapid social community development, MAPRS can provide a valuable solution for finding and evaluating alliance partners via the social interactions of cooperation. Thus, the proposed approach is very different from traditional alliance partner selection methods.

A limitation of this study is that MAPRS currently uses only simulation data to test performance, rather than data from a real world context. Future practical field experiments in which participants can gain more realistic experiences using MAPRS will certainly produce more meaningful results. That is, this study mainly focusses on the technical aspects and has not investigated the issue of digital business ecosystem management that can be conducted in the future. In addition, the niche assessment of alliance partners could use different metrics other than attractiveness and uniqueness to serve as the differentiation strategy. Further development of MAPRS will also encourage companies to discover innovative opportunities for fulfilling their service innovation gaps. This will include other service industries (e.g. creative cultural or design) other than regional tourism development. In addition, the emotion factors in metaphors currently is processed and evaluated indirectly through the image model. The future work can explore the potentials of directly using metaphors to model the emotion factors.

References

Abe, K. and Nakagawa, M. (2006), "A computational model for metaphor generation process", *Proceedings of the 28th Annual Conference of the Cognitive Science Society*, *Vancouver*, pp. 937-942.

Baccianella, S., Esuli, A. and Sebastiani, F. (2010), "SentiWordNet 3.0: an enhanced lexical resource for sentiment analysis and opinion mining", *LREC*, Vol. 10, pp. 2200-2204.

Basole, R.C. and Rouse, W.B. (2008), "Complexity of service value networks: conceptualization and empirical investigation", *IBM System Journal*, Vol. 47 No. 1, pp. 53-70.

Baumer, E.P., Tomlinson, B., Richland, L.E. and Hansen, J. (2009), "Fostering metaphorical creativity using computational metaphor identification", *Proceeding of the Seventh ACM Conference on Creativity and Cognition*, pp. 315-324.

Beach, L.R. (1990), *Image Theory: Decision Making in Personal and Organizational Contexts*, Wiley & Sons.

Bierly, P.E. III and Gallagher, S. (2007), "Explaining alliance partner selection: fit, trust and strategic expediency", *Long Range Planning*, Vol. 40 No. 2, pp. 134-153.

Brouthers, K.D., Brouthers, L.E. and Wilkinson, T.J. (1995), "Strategic alliances: choose your partners", *Long Range Planning*, Vol. 28 No. 3, pp. 2-25.

Casakin, H. (2007), "Metaphor in design problem solving implications for creativity", *International Journal of Design*, Vol. 1 No. 2, pp. 21-33.

Cracolici, M.F. and Nijkamp, P. (2009), "The attractiveness and competitiveness of tourist destinations: a study of Southern Italian regions", *Tourism Management*, Vol. 30 No. 3, pp. 336-344.

Dacin, M.T., Hitt, M.A. and Levitas, E. (1997), "Selecting partners for successful international alliances: examination of US and Korean firms", *Journal of World Business*, Vol. 32 No. 1, pp. 3-16.

D'Hanis, I. (2002), "A logical approach to the analysis of metaphors", *Logical and Computational Aspects of Model-Based Reasoning*, Springer, pp. 21-37.

Echtner, C. and Ritchie, B. (2003), "The meaning and measurement of destination image", *Journal of Tourism Studies*, Vol. 14 No. 1, pp. 37-48.

Esuli, A. and Sebastiani., F. (2006), "Sentiwordnet: a publicly available lexical resource for opinion mining", *Proceedings of LREC*, Genoa, May 22-28, pp. 417-422.

Gentner, D. and Wolff, P. (2000), "Metaphor and knowledge change", in Districh, E. and Marbnau, A. (Eds), *Cognitive Dynamics: Conceptual Change in Humans and Machine*, Lawrence Erlbaum Associates, Publishers, Hillsdale, NJ, pp. 295-342.

Hill, R.C. and Levenhagen, M. (1995), "Metaphors and mental models: sensemaking and sensegiving in innovative and entrepreneurial activities", *Journal of Management*, Vol. 21 No. 6 pp. 1057-1074.

Holmberg, S.R. and Cummings, J.L. (2009), "Building successful strategic alliances: strategic process and analytical tool for selecting partner industries and firms", *Long Range Planning*, Vol. 42 No. 2, pp. 164-193.

Ireland, R.D., Hitt, M.A. and Vaidyanath, D. (2002), "Alliance management as a source of competitive advantage", *Journal of Management*, Vol. 28 No. 3, pp. 413-446.

Jones, M.A. (1992), "Generating a specific class of metaphors", *Proceedings of the 30th Annual Meeting on Association for Computational Linguistics, Association for Computational Linguistics*, pp. 321-323.

Keller, K.L. (1993), "Conceptualizing, measuring, and managing customer-based brand equity", *Journal of Marketing*, Vol. 57 No. 1, pp. 1-22.

Kobayashi, S. (1981), "The aim and method of the color image scale", *Color Research & Application*, Vol. 6 No. 2, pp. 93-107.

Kobayashi, S. (1992), *Color Image Scale*, Kodansha International Ltd., Tokyo.

Kohonen, T. (1990), "The self-organizing map", *Proceedings of the IEEE*, Vol. 78 No. 9, pp. 1464-1480.

Kolb, P. (2008), "DISCO: a multilingual database of distributionally similar words", *Proceedings of KONVENS-2008, Berlin, September 30-October 2*.

Lakoff, G. and Johnson, M. (1980), *Metaphors We Live By*, University of Chicago Press, Chicago, IL and London.

Li, Z., Huang, G.Q., Fang, J. and Qu, T. (2014), "Ontology-based dynamic alliance services (ODAS) in production service system", *International Journal of Computer Integrated Manufacturing*, Vol. 27 No. 2, pp. 148-164.

Lin, Z., Yang, H. and Arya, B. (2009), "Alliance partners and firm performance: resource complementarity and status association", *Strategic Management Journal*, Vol. 30 No. 9, pp. 921-940.

Lubart, T.I. and Getz, I. (1997), "Emotion, metaphor, and the creative process", *Creativity Research Journal*, Vol. 10 No. 4, pp. 285-301.

McGlone, M.S. and Manfredi, D.A. (2001), "Topic-vehicle interaction in metaphor comprehension", *Memory & Cognition*, Vol. 29 No. 8, pp. 1209-1219.

Martin, J.H. (1990), *A Computational Model of Metaphor Interpretation*, Academic Press Professional, Inc., San Diego, CA.

Mason, Z.J. (2004), "CorMet: a computational, corpus-based conventional metaphor extraction system", *Computational Linguistics*, Vol. 30 No. 1, pp. 23-44.

Medcof, J.W. (1997), "Why too many alliances end in divorce", *Long Range Planning*, Vol. 30 No. 5, pp. 718-732.

Nelson, K.A. (2004), "Consumer decision making and image theory: understanding value-laden decisions", *Journal of Consumer Psychology*, Vol. 14 Nos 1-2, pp. 28-40.

Nijdam, N.A. (2005), *Mapping Emotion to Color*, University of Twente, Enschede.

OECD (2008), *Tourism in OECD Countries 2008: Trends and Policies*, Organisation for Economic Co-operation and Development, Paris.

Ou, L., Luo, M.R., Woodcock, A. and Wright, A. (2004), "A study of colour emotion and colour preference. part i: colour emotions for single colours", *Color Research & Application*, Vol. 29 No. 3, pp. 232-240.

Paavola, S. and Hakkaaraine, K. (2005), "The knowledge creation metaphor – an emergent epistemological approach to learning", *Science & Education*, Vol. 14 No. 6, pp. 535-557.

Pine, B.J. and Gilmore, J.H. (2011), *The Experience Economy*, Harvard Business Press, Boston.

Samsonova, E.V., Kok, J.N. and IJzerman, A.P. (2006), "TreeSOM: cluster analysis in the self-organizing map", *Neural Networks*, Vol. 19 Nos 6-7, pp. 935-949.

Shah, R.H. and Swaminathan, V. (2008), "Factors influencing partner selection in strategic alliances: the moderating role of alliance context", *Strategic Management Journal*, Vol. 29 No. 5, pp. 471-494.

Suk, H. and Irtel, H. (2010), "Emotional response to color across media", *Color Research & Application*, Vol. 35 No. 1, pp. 64-77.

Tuohino, A. (2001), "The destination image of Finnish lake districts", *10th Nordic Tourism Research Symposium*, *Vasa, October 18–20*.

Vargo, S.L., Maglio, P.P. and Akaka, A.M. (2009), "On value and value co-creation: a service systems and service logic perspective", *European Management Journal*, Vol. 26 No. 3, pp. 145-152.

Veale, T. and Hao, Y. (2007), "Comprehending and generating apt metaphors: a web-driven, case-based approach to figurative language", *AAAI*, Vol. 2007, pp. 1471-1476.

Wang, H.H. and Liao, W.J. (2009), "Applications of metaphor theory to product design", *Proceedings of IASDR 2009*, *Seoul, October 18-22*.

Weick, C.W. (2003), "Out of context: using metaphor to encourage creative thinking in strategic management courses", *Journal of Management Education*, Vol. 27 No. 3, pp. 323-343.

Wu, W.Y., Shih, H.A. and Chan, H.C. (2009), "The analytic network process for partner selection criteria in strategic alliances", *Expert Systems with Applications*, Vol. 36 No. 3, pp. 4646-4653.

Xin, J.H., Cheng, K., Chong, T., Sato, T., Nakamura, T., Kajiwara, K. and Hoshino., H. (1998), "Quantifying colour emotion – what has been achieved", *Research Journal of Textile and Apparel*, Vol. 2 No. 1, pp. 46-54.

Yang, C.Y. and Yuan, S.T. (2010), "Color imagery for destination recommendation in regional tourism", *2010 Pacific Asia Conference on Information Systems*, *Taipei, Taiwan*, pp. 1274-1285.

Yü ksel, A. and Akgü l.O. (2007), "Postcards as affective image makers: an idle agent in destination marketing", *Tourism Management*, Vol. 28 No. 3, pp. 714-725.

Zhou, C.L., Yang, Y. and Huang, X.X. (2007), "Computational mechanisms for metaphor in languages: a survey", *Journal of Computer Science and Technology*, Vol. 22 No. 1, pp. 308-319.

Further reading

Camprub Í.R., Guia, J. and Comas, J. (2008), "Destination networks and induced tourism image", *Tourism Review*, Vol. 63 No. 2, pp. 47-58.

Ding, J.F. and Liang, G.S. (2005), "Using fuzzy MCDM to select partners of strategic alliances for liner shipping", *Information Sciences*, Vol. 173 Nos 1-3, pp. 197-225.

Hamel, G., Doz, Y.L. and Prahalad, C.K. (1989), "Collaborate with your competitors and win", *Harvard Business Review*, Vol. 67 No. 1, pp. 133-139.

Jain, A.K. and Etgar, M. (1976), "Measuring store image through multidimensional scaling of free response data", *Journal of Retailing*, Vol. 52 No. 4, pp. 61-70.

Kotler, P., Asplund, C., Rein, I. and Haider, D. (1999), *Marketing Places Europe: Attracting Investments, Industries, Residents and Visitors to European Cities, Communities, Regions and Nations*, Financial Times Prentice-Hall, Harlow.

Mat, N.A., Cheung, Y., Melbourne, V. and Scheepers, H. (2009), "Partner selection: criteria for successful collaborative network", available at: www.aisel.aisnet.org (accessed February 2015).

Smeral, E. (1998), "The impact of globalization on small and medium enterprises: new challenges for tourism policies in European countries", *Tourism Management*, Vol. 19 No. 4, pp. 371-380.

Tung, W.F., Yuan, S.T., Wu, Y.C. and Hung, P. (2014), "Collaborative service system design for music content creation", *Information Systems Frontiers*, Vol. 16 No. 2, pp. 291-302.

Vargo, S.L. and Lusch, R.F. (2008), "Service-dominant logic: continuing the evolution", *Journal of the Academy of Marketing Science*, Vol. 36 No. 1, pp. 1-10.

Woodside, A.G. and Lysonski, S. (1989), "A general model of traveler destination choice", *Journal of Travel Research*, Vol. 27 No. 4, pp. 8-14.

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