Expert Systems with Applications xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Expert Systems with Applications

journal homepage: www.elsevier.com/locate/eswa

Developing a novel Intuitionistic Fuzzy Importance–performance Analysis for evaluating corporate social responsibility in sport tourism event

Fei-Hsin Huang [a,*], Yi-Jin Ye [b], Chin-Hsung Kao [b]

[a] Graduate Institute of Physical Education, National Taiwan Sport University, No. 250, Wenhua 1st Rd., Guishan Township, Taoyuan 33301, Taiwan
[b] Department of Recreation and Leisure Industry Management, National Taiwan Sport University, No. 250, Wenhua 1st Rd., Guishan Township, Taoyuan 33301, Taiwan

ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Intuitionistic Fuzzy Importance–performance Analysis (IFIPA)
Corporate social responsibility (CSR)
Sport tourism

ABSTRACT

The purposes of the study were to evaluate corporate social responsibility (CSR) and developing a novel Intuitionistic Fuzzy Importance–performance Analysis (IFIPA) for sport tourism event. IFIPA implies intuitionistic fuzzy theory to Importance–performance Analysis (IPA) for providing a promising decision-making value when IPA encounters uncertain situations. The results indicated that the proposed IFIPA is more effective and accurate than conventional IPA in two causes. First, the IFIPA can clearly express the real implication under uncertain environment; reversely it is failed from conventional IPA. Second, the IFIPA can provide more credible predictions (membership and non-membership) for decision-makers than the conventional IPA model. Based on the IFIPA, the results indicated that host organization can have the advantages by adopting CSR and promote social concern and sustainable development. The first priority for sport tourism event host organization's concentration were "involving community dwellers as part of this event", "actively donate part of their revenue for public welfare", and "follow environmental regulations". Consequently, the IFIPA successfully offers the promising results than IPA and provides the reference for future sport tourism event analysis and practical suggestions for future sport tourism event organizations.

1. Introduction

Corporate social responsibility (CSR) is a business strategy or approach that enables organizations to act in a socially responsible manner based on their premises (Asif, Searcy, Zutshi, & Fisscher, 2013), and is perceived as an instrument for driving sustainable development (Hamann, 2004; Mutti, Yakovleva, Vazquez-Brust, & Di Marco, 2012) and maximizing long-term benefits for organizations (Mohr, Webb, & Harris, 2001). In addition, CSR is the volitional contribution by organizations to improve the environment, society, and economy based on either altruism or competitive advantage enhancing. CSR has a long history and has developed alongside the business concept, but had not become critical to business strategies until the 1990s (Blowfield & Murray, 2008). Organizations and companies previously considered only on the economic benefits (Anderson, 1989); however, recently companies have begun more focusing on the environment and social effects (Kassinis & Vafeas, 2006; Welford, Chan, & Man, 2008).

Tourism-related industries (e.g., airlines, casinos, hotels, and restaurants) and the sport industry have recently engaged in various CSR activities (e.g., Holcomb, Upchurch, & Okumus, 2007; Inoue & Kent, 2012) including community involvement, customer connections, employee relations, green management (Holcomb et al., 2007), and environmental sustainability (Trendafilova, Babiak, & Heinze, 2013). Recently, tourism has become increasingly unified based on the power of sport attractions and has become a new participant in cross-cultural markets (Cappato & Pennazio, 2006). Sport tourism, travel associated with physical activity and sports, has become one of the fastest growing aspects of tourism (Gibson, 1998), because it transcends the boundaries of culture, society, ethics, and religion.

However, recently developed sport tourism event, stylish road running, had become popular but created social and environmental (Trendafilova et al., 2013), cultural heritage preservation (Gammon, Ramshaw, & Waterton, 2012), economic (Roche, Spake, & Joseph, 2013) issues. Sport tourism event organizations' social responsibility has less likely been studied compare with

* Corresponding author. Tel.: +886 2 82093211x6053.
E-mail addresses: feihsin@hotmail.com (F.-H. Huang), yijinye@gmail.com (Y.-J. Ye), K6129888@ms22.hinet.net (C.-H. Kao).

http://dx.doi.org/10.1016/j.eswa.2015.04.008
0957-4174/

Table 1
The recent IPA literatures.

Author(s)/Year	Technology	Applied problem
Martilla and James (1977)	IPA	Evaluating consumer acceptance
Tonge and Moore (2007)	IPA & service quality gap approach	Evaluating the quality of visitor experiences and protecting the natural environment
Deng (2008)	Fuzzy importance–performance analysis (FIPA)	Determining critical service attributes for achieving superior customer satisfaction
Deng, Chen, and Pei (2008)	Back-Propagation Neural Network based Importance–Performance Analysis (BPNN-IPA) approach	Integrating back-propagation neural network and three factor theory to assist practitioners in determining critical service attributes
Lin, Chan, and Tsai (2009)	IPA & gap analysis	Developing a transformation function of integrating IPA and gap analysis to construct a comprehensive resource distribution model for measuring service quality
Hu et al. (2009)	In conjunction with IPA models established with BPNN and DEMATEL	Evaluating the quality characteristics and identifying the core Order-Winners and Qualifiers problems
Geng and Chu (2012)	New IPA approach (integrating Kano' model and DEMATEL)	Evaluating consumer value and satisfaction based on product-service system
Mikuliæ & Prebežac (2012)	Back-propagation neural network (BPNN)-based IPA approach	Dealing with the problem of asymmetric effects in customer satisfaction formation
Taplin (2012)	Competitive importance–performance analysis (CIPA)	Benchmarking against competitors to determine cross-hair placement, reduce measurement bias and market position for Australian wildlife park
Cheng, Chen, Hsu, and Hu (2012)	Importance–performance & gap analysis (IPGA) model & DEMATEL	Exploring the service quality improvement of fine-dining restaurants and the causal relationship between service quality attributes
Ho et al. (2012)	Modified IPA (using the multiple regression analysis and DEMATEL) techniques	Using supplier quality performance assessment (SQPA) to promote supplier quality for the industrial computer industry
Hu, Horng, Teng, and Yen (2013)	Ridit (relative to an identified distribution) IPA	Identifying the importance and performance of low carbon literacy of tourism and hospitality students
Chen (2014)	New IPA approach (integrating the Kano model)	Elucidating the market competition position of service and product attributes for restaurant chain
Chen (2014)	Constructing an analytical framework- CZIPA (competitive zone of tolerance service quality based IPA)	Evaluating service quality on Taiwanese hot springs hotel

other organizations. The linkage between sport tourism event organizations and the social responsibility must been strengthened. Therefore, one of the purposes of the study was to evaluate the CSR in the tourism sport event organization.

A strategic CSR approach promotes an understanding of organization and company's reputation, competitor differentiation, brand loyalty, competitive advantage, and economic performance (Walters & Tacon, 2010). A previous study elaborated on how the role of CSR affected tourist attitudes and the purchasing behaviors (Smith & Langford, 2009). Despite an increase in CSR activities among sport organizations (Breitbarth & Harris, 2008; Smith & Westerbeek, 2007; Walters & Tacon, 2010), an appropriate technique for evaluating CSR roles in sport tourism event organizations is lacking. Martilla and James (1977) determined that Importance–performance Analysis (IPA) is a simple, effective, and popular customer-driven tool for evaluating the consumer acceptance of market activities. IPA has emphasized the knowledge gaps between customer's perception of importance and the satisfaction, and has enabled organizations and companies to clarify market competition and identify improvement priorities for numerous attributes of products and services (e.g., Tonge & Moore, 2007; Chen, 2014). There were certain IPA-related literatures (Table 1); however, some research variables or attributes might be unpredictable. In line with this, Sampson and Showalter (1999) proposed that the level of Importance–performance was negatively correlated. Matzler, Sauerwein, and Heischmidt (2003) noted that the results of conventional IPA might cause inaccurate company decision-making because the level of customer satisfaction formed a linear structure of quality features. The linear structure may cause the evaluated attributes be coordinated on the cross of axes either into one of the four quadrants. The conventional IPA model must be extended to address these types of problems. Therefore, the fuzzy set and logic proposed by Zadeh (1965) represented another useful tool for managing these uncertainties. The fuzzy set theory is considered a useful technique for solving complex systems because the changeable outcomes are highly unpredictable.

Several studies had extended decision models to fuzzy set/linguistic terms (Deng, 2008; Geng & Chu, 2012; Ho, Feng, Lee, & Yen, 2012; Hu, Lee, Yen, & Tsai, 2009). Furthermore, Atanassov (1986) introduced the intuitionistic fuzzy set (IFS), in which the fundamental characteristics of the values of membership and non-membership functions were vague rather than exact numbers. The IFS is an extremely useful tool for interpreting fuzziness and uncertainty, because IFS can be formed without any data requested in its stimulation for any activities and processes. IFS has recently received wide attention and numerous scholars applied IFS to solve complex problems, such as decision-making (Atanassov, 1999; Banerji & Hiris, 2001; Chaira & Ray, 2008; Chen & Tan, 1994; Holland, 1975; Levis & Papageorgiou, 2005; Lin, Pai, & Yang, 2011), clustering (Akram & Dudek, 2013), pattern recognition (Chaira, 2011; Li, 2005), and medical complications (Burillo & Bustince, 1996; Cui & Yan, 2009; Kennedy, Eberhart, & Shi, 2001).

These studies had applied IFS and achieved high performance in handling uncertain data. However, no research has applied IFS technology to an IPA model to more effectively measure service attributes for industries and organizations. Therefore, this study combined intuitionistic fuzzy sets with IPA to develop a novel intuitionistic fuzzy IPA (IFIPA) for evaluating CSR in the sport tourism event. Specifically, the purposes of this study were 1) to develop a novel IFIPA model for sport tourism event and 2) to verify the benefits of adopting this analysis to serve as a reference index for improving CSR criteria.

2. Developing Intuitionistic Fuzzy Importance–performance Analysis

2.1. Basic definition of the intuitionistic fuzzy set

Fuzzy set theory, originally proposed by Zadeh (1965), has been successfully applied in various fields. This theory proposes that the membership of an element to a fuzzy set is a single value between zero and one. However, it cannot realistically define that the level

Please cite this article in press as: Huang, F.-H., et al. Developing a novel Intuitionistic Fuzzy Importance–performance Analysis for evaluating corporate social responsibility in sport tourism event. *Expert Systems with Applications* (2015), http://dx.doi.org/10.1016/j.eswa.2015.04.008

of non-membership of an element to a fuzzy set is simply equal to one minus the level of membership (i.e., some hesitation level may exist; see the following definition and equation). In order to generalize fuzzy sets, Atanassov (1986) and Bustince and Burillo (1996) proposed that the IFS concept coincided with the notion of vague sets (VSs).

The IFS extends fuzzy sets. An IFS A in a fixed set E is an objective with regard to the expression

$$A = \{\langle x, \mu_A(x), \nu_A(x)\rangle | x \in E\} \quad (1)$$

where the functions $\mu_A : E \to [0,1]$ and $\nu_A : E \to [0,1]$ denote the degree of membership and the degree of non-membership of the element $x \in E$, respectively. For every $x \in E$:

$$0 \leqslant \mu_A(x) + \nu_A(x) \leqslant 1. \quad (2)$$

When $\mu_A(x) + \nu_A(x) = 1$, for every $x \in E$, the IFSs degenerate into a fuzzy set. Hence, we can consider a fuzzy set with its membership function μ_A, having the IFS expression as:

$$A = \{\langle x, \mu_A(x), 1 - \mu_A(x)\rangle | x \in E\}$$

The Operations on two IFSs $\tilde{a} = (u_a, v_a)$ and $\tilde{b} = (u_b, v_b)$ (Xu, 2007; Xu & Yager, 2006)

$$\tilde{a} + \tilde{b} = (\mu_a + \mu_b - \mu_a \times \mu_b, v_a \times v_b) \quad (3)$$

$$\tilde{a} \times \tilde{b} = (\mu_a \times \mu_b, v_a + v_b - v_a \times v_b) \quad (4)$$

where + and − are the logical additive and multiplicative operations.

Example I. Let $\tilde{a} = (0.2, 0.5)$, and $\tilde{b} = (0.4, 0.5)$ be two IFSs. Using two operations Eqs. (3) and (4), we obtain the following values:

$$\tilde{a} + \tilde{b} = (\mu_a + \mu_b - \mu_a \times \mu_b, v_a \times v_b) = (0.2 + 0.4 - 0.08, 0.02) = (0.52, 0.02)$$

$$\tilde{a} \times \tilde{b} = (\mu_a \times \mu_b, v_a + v_b - v_a \times v_b) = (0.08, 0.5 + 0.5 - 0.25) = (0.08, 0.75)$$

2.2. Importance–performance Analysis (IPA)

IPA is a fundamental diagnostic decision tool (Matzler et al., 2003) for identifying improvement prioritization (Sampson & Showalter, 1999), mobilizing and deploying scarce resources to the most needed places (Magal, Kosalge, & Levenburg, 2009), and harmonizing strategic planning efforts to enhance relative competitiveness (Matzler, Bailom, Hinterhuber, Renzl, & Pichler, 2004). IPA identifies the product or service attributes of organizations that should focus on enhancing customer satisfaction. Martilla and James (1977) believed that a firm implementing market research should clarify the level of customer satisfaction with quality characteristics. This involves with two main problems: (a) Survey implementation is only to ascertain the acceptance level of one-way quality characteristics, which is either the level of importance or performance. (b) Statistical analysis makes it difficult to determine the coefficients to clarify the practical importance and level of influence from the research finding.

Therefore, Martilla and James (1977) suggested a method for managing the aforementioned problems of importance and performance level. Simple data processing enables organizations to clarify four categories of quality characteristics and develop a strategy and action plan for every quadrant simultaneously. When a study applies IPA, questionnaires typically require participants to answer two questions pertaining to quality characteristics: (a) What is the extent of the importance level on which you base this quality characteristic? (b) What is the extent of the performance level on which organization base this quality characteristic?

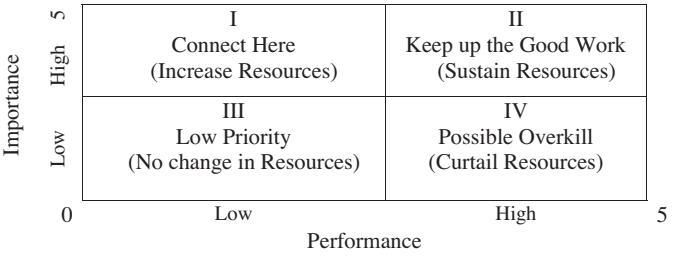

Fig. 1. The original IPA framework (Martilla & James, 1977).

IPA method uses two types of data as listed (a) and (b) to establish a two-dimensional matrix formed from two axes. The median of the central tendency of the level of importance and performance is used as the matrix segmentation value, separating the quality characteristics into four quadrants. Some researchers used mean to replace the median value when measuring the central tendency, which then becomes the main statistic value in the IPA method. The conventional IPA uses a two-dimensional graph model to display the status of the quality characteristics. This method facilitates direct interpretation (Fig. 1). The definitions of the IPA matrix four quadrants were explained as followings:

(1) Concentrate here (I): Participants perceive the importance of the service or quality characteristic is high, but the performance of the organization is low.
(2) Keep up the good work (II): Participants perceive the importance of the service quality characteristic is high, and that the performance of the organization is also high.
(3) Low priority (III): Participants perceive the importance of the service quality characteristic of the organization is low, and the performance is also low.
(4) Possible overkill (IV): Participants perceive the importance of the service quality characteristic of the organization is low, but the performance is high.

2.3. Intuitionistic Fuzzy Importance–performance Analysis (IFIPA)

Researchers examine organization performance by conducting surveys that allowing research subjects to indicate their level of perception to selected linguistic terms. Human determinations of events might differ significantly; however, based on the subjective perceptions or personalities of people, the same linguistic term is used (Chiou, Tzeng, & Cheng, 2005). Because fuzzy numbers are used to represent specific linguistic terms, researchers must consider the differences among research subjects. Thus, the researchers developed the intuitionistic fuzzy set to represent linguistic terms in this study (Fig. 2).

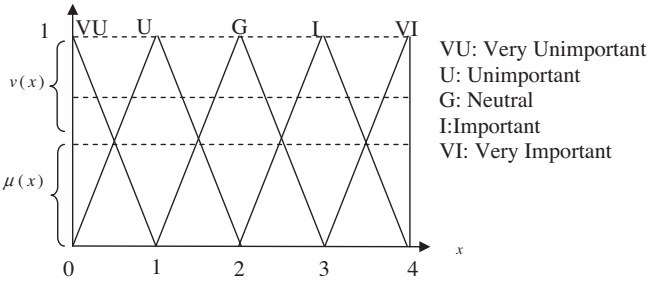

Fig. 2. Linguistic terms of intuitionistic fuzzy set.

Please cite this article in press as: Huang, F.-H., et al. Developing a novel Intuitionistic Fuzzy Importance–performance Analysis for evaluating corporate social responsibility in sport tourism event. *Expert Systems with Applications* (2015), http://dx.doi.org/10.1016/j.eswa.2015.04.008

Table 2
Measurement attributes for sport tourism event's CSR.

Dimensions	Attributes	Cronbach's α	
		Importance	Performance
Social (Gibson et al., 2012; Inoue & Kent, 2012; Liu, 2003)	So1. enhancing community image So2. increasing community visibility So3. providing safe and healthy road running environment So4. participant motivation and satisfaction So5. procedures for meeting emergencies and accidents So6. involving the community dwellers as parts of event So7. Insuring for participants So8. actively donate part of revenue for public welfare	.93	.92
Environment (Gibson et al., 2012; Inoue & Kent, 2012; Liu, 2003)	En1. using existing facilities and city infrastructure En2.following environmental regulations En3.setting up environmental rules in theme running En4.recycling self-plastic bottles after event En5.cleaning environment after event	.93	.93
Economic (Gibson et al., 2012; Inoue & Kent, 2012; Liu, 2003)	Ec1. providing local hotel information Ec2. providing local restaurant information Ec3. providing local shopping information Ec4. providing work opportunity to local residents	.92	.91
Sustainability (Gibson et al., 2012; Truscott et al., 2009)	Su1. good partnership with local community Su2. innovative idea for strengthening participants' willingness Su3. reward system for strengthening participants' willingness Su4. convenient transportation for increasing participants' attendance	.89	.89
Local Culture & Tourism Promotion (Gu et al., 2013; Veltri et al., 2009)	Lc1. heritage and local culture development Lc2. local cultural features launching Lc3. benefits for local tourism development Lc4. tie in local festivals & activities for promotion	.92	.90

IFIPA adopts the intuitionistic fuzzy set to establish a two-dimensional intuitionistic fuzzy matrix formed from two axes. First, linguistic terms (membership function) $\mu_A(x,u,v)$ can be determined as

$$\mu_A(x,u,v)=\begin{cases}0, & x<a_1,\\ (x-a_1)/(a_2-a_1), & a_1\leqslant x\leqslant a_2,\\ (a_3-x)/(a_3-a_2), & a_2\leqslant x\leqslant a_3,\\ 0, & x>a_3,\end{cases}$$

and $A_u=\{x|u_A(x,u,v)\geqslant u\}$, $A_v=\{x|u_A(x,u,v)\geqslant v\}$ which can also be determined as interval $A_u=[a_1^{(u)},a_2^{(u)}]$, $A_v=[a_1^{(v)},a_2^{(v)}]$.

Second, the researchers used the median of the central tendency of the level of intuitionistic fuzzy importance and performance as the intuitionistic fuzzy matrix segmentation value, separating the quality characteristics into four quadrants. The median of the central tendency of the level of intuitionistic fuzzy importance can be determined as

$$E_{I_i}=\frac{\sum u_{AI_i}(x,u,v)}{n},\quad \forall i=1,\ldots,n.$$

where $u_{AI_i}(x,u,v)$ is intuitionistic fuzzy importance, and $E_{I_u}=\{x|E_I(x,u,v)\geqslant u\}$, $E_{I_v}=\{x|E_I(x,u,v)\geqslant v\}$.

The median of the central tendency of the level of intuitionistic fuzzy performance can be determined as

$$E_{P_i}=\frac{\sum u_{AP_i}(x,u,v)}{n},\quad \forall i=1,\ldots,n.$$

where $u_{AP_i}(x,u,v)$ is intuitionistic fuzzy importance, and $E_{P_u}=\{x|E_P(x,u,v)\geqslant u\}$, $E_{P_v}=\{x|E_P(x,u,v)\geqslant v\}$.

Third, the IFIPA method adopts a two-dimensional graph model that can be calculated by $E_{P_i}\times E_{I_i}$ (please refer to Eq. (7)) to display the status of the quality characteristics. This method facilitates direct interpretation. Regarding the IPA method matrix, the definitions of the four matrix quadrants are the same as those of the conventional IPA. Furthermore, the IFIPA provides more credible information (membership and non-membership) for the decision-maker than the conventional IPA model does.

3. Application to the sport tourism event

3.1. Measures

The research tool was a close-ended survey was designed and distributed on-site. The research survey consisted three parts. The first part was socio-demographic information such as gender, age, education, income, and frequency of participating in road-running events. The second part contained questions about the importance of CSR sustainability of host organizations. The third part was the degree of participants' satisfaction for the host organizations' performance of implementing CSR sustainability. The measured dimensions and attributes (Table 2) were generated from previous studies (Gibson, Kaplanidou, & Kang, 2012; Gu, Ryan, Bin, & Wei, 2013; Inoue & Kent, 2012; Liu, 2003; Truscott, Bartlett, & Tywoniak, 2009; Veltri, Miller, & Harris, 2009) and the value of Cronbach's alpha indicated a high internal consistency. The attributes were specifically modified for the road-running event context. Importance attributes were measured by a 5-point Likert-type scale ranging from 1 = *not very important* to 5 = *very important*, and performance attributes were measured by 1 = *strongly disagree* to 5 = *strongly agree*. The survey was pretested on 10 experts from academic and practical fields for testing validity. All attributes were tested by reliability for internal consistency. The value of Cronbach's alpha coefficients of importance dimensions ranged from .93 to .89, and performance dimensions ranged from .93 to .89, which indicated a high internal consistency of measurement (Bagozzi & Yi, 1988).

3.2. Data collection and sample characteristics

Marathon and road-running events have been rapidly gaining in popularity worldwide. Hence, the road-running event is a

Please cite this article in press as: Huang, F.-H., et al. Developing a novel Intuitionistic Fuzzy Importance–performance Analysis for evaluating corporate social responsibility in sport tourism event. *Expert Systems with Applications* (2015), http://dx.doi.org/10.1016/j.eswa.2015.04.008

representative activity in the sport tourism. The researchers conducted the on-site survey to collect data and the research subjects were the participants who participating in the road-running events held by the Chinese Taipei Road Running Association. The convenience sampling process was applied and among 150 participants, 133 completed the survey, for a response rate of 89%. Among the 133 participants, the majority gender was male (77%), age was under 25 (29%), education was university degree (36%) and monthly income was between NT$30,001 and NT$60,000 (33%), and had participated in road-running events above 21 times (43%) (Table 3). The socio-demographic characteristics indicated that more males joined road-running events. Age range indicated that most participants were approximately below 35. Educational level comprised university and postgraduate, the income were above average and considered as experienced runners.

4. Results and discussion

Based on the results, the IFIPA method was constructed and developed (Tables 4–6; Fig. 3). The results and discussion of evaluating CSR were as following:

The attributes that are coordinated in the "concentrate here" quadrant I are items that participants feel important but not satisfy with are "involving community dwellers as part of this event" (So6), "actively donate part of their revenue for public welfare" (So8), and "follow environmental regulations" (En2). These three attributes are the first priority for organization's improvement. Therefore, social welfare feedback can be used for promoting community development and operating sport events based on sustainability. Based on the membership of intuitionistic fuzzy sets, the variable ranking can be expressed as So6 ($\mu = 0.4482$) $\succ$ So8 ($\mu = 0.4285$) $\succ$ En2 ($\mu = 0.4014$). A larger membership means most participants support the attributes that have higher credibility. Therefore, the IFIPA provides more information for decision-makers than the conventional IPA does.

Table 3
Sampled subjects' demographic characteristics $n = 133$.

Demographic characteristics	Frequency	Percentage of sample (%)
Gender		
Male	102	77
Female	31	23
Age		
Under 25 years	38	29
26–35 years	28	21
36–45 years	24	18
46–55 years	22	17
56–65 years	14	10
66 years or above	7	5
Education		
High school or less	43	32
College	17	13
University	48	36
Postgraduate	25	19
Monthly income		
Less than NT$30,000	34	26
NT$30,001- $60,000	44	33
NT$60,001- $100,000	39	29
NT$100,001-$150,000	12	9
More than NT$150,001	4	3
Frequency of participating in road running event		
1 time	17	13
2–5 times	23	17
6–10 times	10	7
11–20 times	26	20
Above 21 times	57	43

The attributes in the "keep up the good work" quadrant II illustrate that the participant are pleased with the organization's performance, which can be the major competitive advantages for an organization. These advantage attributes are "providing a safe and healthy road-running environment" (So3), "procedures for meeting emergencies and accidents" (So5), "insurance for participants" (So7), "using existing facilities and city infrastructure" (En1), "establishing environmental rules in road-running events" (En3), "cleaning environment after an event" (En5), "providing local restaurant information" (Ec2), "good partnership with local community" (Su1), "innovative idea for strengthening participants' willingness" (Su2), and "convenient transportation for increasing participants' attendance" (Su4). Because of increased environmental and social consciousness, participants pay more attention to social care and environmental protection. Using existing facilities and city infrastructures to hold a sport event or activity in a country can benefit local tourism and conserve existing resources. For the sustainable operation of sport tourism event, related host organizations shall provide participants a safe and healthy sport environment; develop a working partnership with the local community, and innovative concepts that can maintain reputation and competitive advantages. According to the membership of intuitionistic fuzzy sets, variable ranking can be expressed as Su1($\mu = 0.4788$) $\succ$ So3 ($\mu = 0.4786$) $\succ$ Su2 ($\mu = 0.4490$) $\succ$ Su4 ($\mu = 0.4340$) $\succ$ Ec2 ($\mu = 0.4297$) $\succ$ So5 ($\mu = 0.4294$) $\succ$ So7 ($\mu = 0.4064$) $\succ$ En3 ($\mu = 0.3972$) $\succ$ En5 ($\mu = 0.3918$) $\succ$ En1 ($\mu = 0.3882$).

The attributes in the "low priority" quadrant III indicate that the organization is rated low performance according to these criteria, but participants do not perceive importance of these features. The attributes include "enhancing community image" (So1), "increasing community visibility" (So2), "recycling plastic bottles after an event" (En4), "providing local hotel and shopping information" (Ec1, Ec3), "providing work opportunities to local residents" (Ec4), "heritage and local culture development" (Lc1), and "launching local cultural features" (Lc2). Most road-running events are half-day activities. Related hotel and shopping information are not a priority for the participants. Furthermore, the road-running event host organization must obtain permission from the government for facilitating community and local characteristics development; thus, those are not significant for them. Fortunately, the participants do not concern about recycling plastic bottles after an event because participants possess potential environmental awareness and most professional runners carry water bottles. Based on the membership of intuitionistic fuzzy sets, the variable ranking can be expressed as So1 ($\mu = 0.5144$) $\succ$ Lc1 ($\mu = 0.4936$) $\succ$ Ec3 ($\mu = 0.4831$) $\succ$ So2 ($\mu = 0.4688$) $\succ$ Ec1 ($\mu = 0.4679$) $\succ$ Lc2 ($\mu = 0.4631$) $\succ$ Ec4 ($\mu = 0.4380$) $\succ$ En4 ($\mu = 0.4064$).

The attributes that are coordinated into "possible overkill" quadrant IV indicate that the organization considers these criteria have to be performed and maintained well, but the participants attach only slight importance to these. These attributes comprise "participant motivation and satisfaction" (So4), "reward system for strengthening participants' willingness" (Su3), "benefits for local tourism development" (Lc3), and "coordinate local festivals and activities for promotion" (Lc4). Participants typically focus on the sport event and rarely regard local tourism. Therefore, these four attributes are considered to be the lowest priority for organizational improvement. Based on the membership of intuitionistic fuzzy sets, the variable ranking can be expressed as Lc4 ($\mu = 0.4835$) $\succ$ Su3 ($\mu = 0.4689$) $\succ$ Lc3 ($\mu = 0.4627$) $\succ$ So4 ($\mu = 0.4528$).

The results find that host organization can have the advantages by adopting CSR and promote social concern and sustainable development (Mutti et al., 2012; Welford et al., 2008). According to findings, the highest rated social concern attributes are providing a safe and healthy environment, preventing emergencies and accidents, and actively establishing environmental rules.

Please cite this article in press as: Huang, F.-H., et al. Developing a novel Intuitionistic Fuzzy Importance–performance Analysis for evaluating corporate social responsibility in sport tourism event. *Expert Systems with Applications* (2015), http://dx.doi.org/10.1016/j.eswa.2015.04.008

Table 4
The level of intuitionistic fuzzy importance.

Attributes	ISo-1	ISo-2	ISo-3	ISo-4	ISo-5	ISo-6	ISo-7	ISo-8	IEn-1	IEn-2
x_I	3.2966	3.3729	3.5593	3.4068	3.6271	3.4661	3.5339	3.5932	3.5085	3.4915
μ	0.7319	0.6957	0.6739	0.6377	0.6304	0.6377	0.6232	0.6159	0.6087	0.6087
v	0.2681	0.3043	0.3261	0.3623	0.3696	0.3623	0.3768	0.3841	0.3913	0.3913
Attributes	IEn-3	IEn-4	IEn-5	IEc-1	IEc-2	IEc-3	IEc-4	ISu-1	ISu-2	ISu-3
x_I	3.5000	3.3644	3.5254	3.4576	3.4661	3.3559	3.4068	3.4661	3.5254	3.3983
μ	0.6159	0.6522	0.5942	0.6522	0.6377	0.6667	0.6232	0.6812	0.6522	0.6812
v	0.3841	0.3478	0.4058	0.3478	0.3623	0.3333	0.3768	0.3188	0.3478	0.3188
Attributes	ISu-4	ILc-1	ILc-2	ILc-3	ILc-4	E_I				
x_I	3.5678	3.4576	3.3983	3.4322	3.3898	3.4627				
μ	0.6304	0.6812	0.6522	0.6449	0.6739	1				
v	0.3696	0.3188	0.3478	0.3551	0.3261	0				

Table 5
The level of intuitionistic fuzzy performance.

Attributes	PSo-1	PSo-2	PSo-3	PSo-4	PSo-5	PSo-6	PSo-7	PSo-8	PEn-1	PEn-2
x_P	3.4831	3.6102	3.7034	3.6949	3.6949	3.6102	3.6780	3.5424	3.6949	3.6186
μ	0.7029	0.6739	0.7101	0.7101	0.6812	0.7029	0.6522	0.6957	0.6377	0.6594
v	0.2971	0.3261	0.2899	0.2899	0.3188	0.2971	0.3478	0.3043	0.3623	0.3406
Attributes	PEn-3	PEn-4	PEn-5	PEc-1	PEc-2	PEc-3	PEc-4	PSu-1	PSu-2	PSu-3
x_P	3.7203	3.6271	3.6525	3.6356	3.6695	3.5169	3.5424	3.6525	3.6949	3.7034
μ	0.6449	0.6232	0.6594	0.7174	0.6739	0.7246	0.7029	0.7029	0.6884	0.6884
v	0.3551	0.3768	0.3406	0.2826	0.3261	0.2754	0.2971	0.2971	0.3116	0.3116
Attributes	PSu-4	PLc-1	PLc-2	PLc-3	PLc-4	E_P				
x_P	3.7373	3.6441	3.6186	3.6949	3.6780	3.6477				
μ	0.6884	0.7246	0.7101	0.7174	0.7174	1				
v	0.3116	0.2754	0.2899	0.2826	0.2826	0				

Table 6
The result of intuitionistic fuzzy importance/performance analysis method.

Attributes	So-1	So-2	So-3	So-4	So-5	So-6	So-7
(x_P, x_I)	(3.2966, 3.4831)	(3.3729, 3.6102)	(3.5593, 3.7034)	(3.4068, 3.6949)	(3.6271, 3.6949)	(3.4661, 3.6102)	(3.5339, 3.6780)
μ	0.5144	0.4688	0.4786	0.4528	0.4294	0.4482	0.4064
v	0.4856	0.5312	0.5214	0.5472	0.5656	0.5518	0.5936
Quadrants	III	III	II	IV	II	I	II
Attributes	So-8	En-1	En-2	En-3	En-4	En-5	Ec-1
(x_I, x_P)	(3.5932, 3.5424)	(3.5085, 3.6949)	(3.4915, 3.6186)	(3.5000, 3.7203)	(3.3644, 3.6271)	(3.5254, 3.6525)	(3.4576, 3.6356)
μ	0.4285	0.3882	0.4014	0.3972	0.4064	0.3918	0.4679
v	0.5715	0.6118	0.5938	0.5794	0.5936	0.5699	0.5321
Quadrants	I	II	I	II	III	II	III
Attributes	Ec-2	Ec-3	Ec-4	Su-1	Su-2	Su-3	Su-4
(x_I, x_P)	(3.4661, 3.6695)	(3.3559, 3.5169)	(3.4068, 3.5424)	(3.4661, 3.6525)	(3.5254, 3.6949)	(3.3983, 3.7034)	(3.5678, 3.7373)
μ	0.4297	0.4831	0.4380	0.4788	0.4490	0.4689	0.4340
v	0.5507	0.5169	0.5212	0.5212	0.5311	0.5311	0.5311
Quadrants	II	III	III	II	II	IV	II
Attributes	Lc-1	Lc-2	Lc-3	Lc-4			
(x_I, x_P)	(3.4576, 3.6441)	(3.3983, 3.6186)	(3.4322, 3.6949)	(3.3898, 3.6780)			
μ	0.4936	0.4631	0.4627	0.4835			
v	0.5064	0.5369	0.5165	0.4957			
Quadrants	III	III	IV	IV			

Although the host organization is encouraged to "keep up the good work" in these aspects, the criteria of social concern and sustainable development have been widely implemented. These include the linkages with innovative concepts (e.g., New Balance combines running with innovation to launch the novel "runnovation" concept), benefits, developing local tourism, and facilitating a disadvantaged minority (e.g., the Ministry of Finance in Taiwan holds a Uniform Invoice Cup running event in different counties each year), providing a nature trail for runners (e.g., the Aerobic Fitness and Health Association hold health-running events). Some host organizations hold charity running events and donate part of the proceeds for public service (e.g., the Rotary Club hosts a 9 k/3 k run and Shin Kong Life Insurance hosts a charity run).

CSR practices identified in both the sport tourism event organization and academic literature are heavily weighted toward social and environmental practices. This reflects a long-term operational strategy of CSR to sustainable efforts. Hence, most organizations have recently focused on the social and environmental strategy to present a more balanced perspective. Furthermore, over 70% of the CSR attributes are coordinated in the "keep up the good work"

Please cite this article in press as: Huang, F.-H., et al. Developing a novel Intuitionistic Fuzzy Importance–performance Analysis for evaluating corporate social responsibility in sport tourism event. *Expert Systems with Applications* (2015), http://dx.doi.org/10.1016/j.eswa.2015.04.008

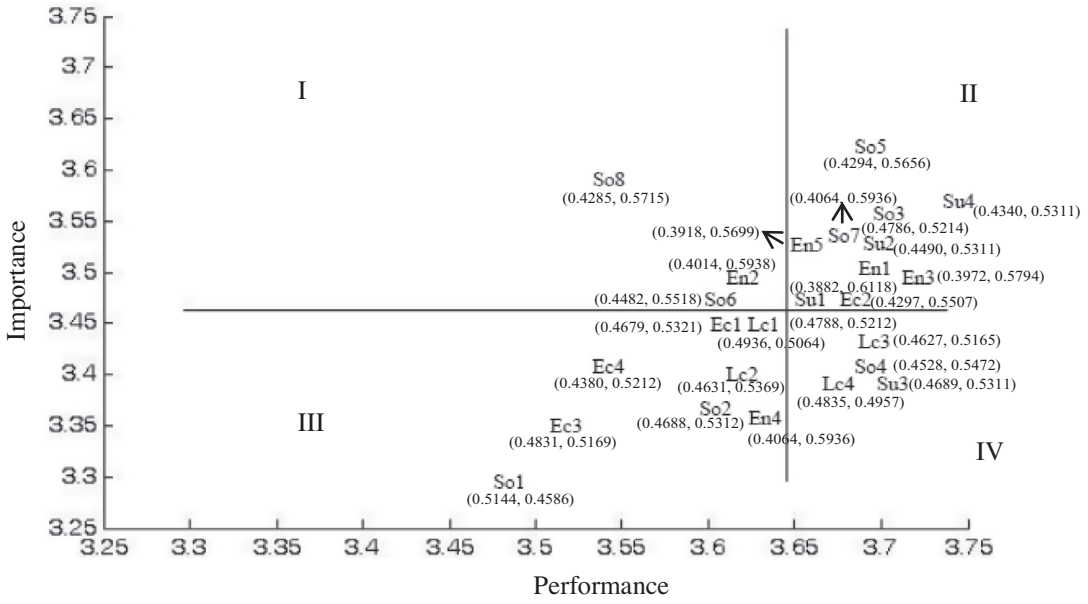

Fig. 3. Intuitionistic fuzzy importance performance analysis (IFIPA) grid with membership and non-membership (Attribute name (μ,ν)).

or "low priority" quadrants, whereas only four attributes are in the "concentrate here" quadrant. This indicates that participants are generally complacent regarding an organization's implementation of CSR practices. In addition, several community and economic-related activities are considered low priority, including increasing community visibility and image, providing local hotel and shopping information, supporting work opportunity to local residents, and launching local cultural features. This might imply that the participants are lack of awareness of the options concerning CSR practices.

5. Conclusions and recommendations

This study developed a novel Intuitionistic Fuzzy Importance–performance Analysis (IFIPA) to accurately evaluate sport tourism events. This study makes certain major contributions.

First, considering the function of importance and performance has a nonlinear relationship, the intuitionistic fuzzy set theory is integrated into IPA. The conventional IPA is viewed as a simple and popular tool to facilitate prioritization of organization's improvements and resource allocation (Deng, 2008). However, the survey results indicated that a nonlinear relationship is existed in between participants' important-performance perspectives. Thus, the proposed IFIPA can clearly express the real implication under uncertain environment; reversely it is failed from conventional IPA.

Second, screening the problems of possible subjective decision-making caused by the conventional IPA results (Sampson & Showalter, 1999), the intuitionistic fuzzy set theory is practically applied in the IPA. Though the advantages of explicitness and effectiveness are, the IPA method ignores the important perspective that human notions are characterized by complexity, subjectivity, and uncertainty. According to the membership, non-membership, and hesitancy degree proposed by intuitionistic fuzzy set theory, the complexity and vagueness of the uncertainty and subjectivity in evaluation process by human notions can be totally quantified. Hence, the IFIPA method can avoid human determinations of events from selecting preferred linguistic terms and the fuzzy numbers represent specific linguistic terms (membership function), which consider the differences among survey respondents. The results indicated that the IFIPA model offers a promising alternative for analyzing CSR initiatives in uncertain situations. Consequently, IFIPA obtains the same evaluated results direction as conventional IPA does. However, IFIPA can obtain exactly membership and non-membership, which easily explains the important-performance factors under uncertain environment and provides more credible prediction in decision-making process.

Furthermore, this study builds up an evaluation framework with multi-dimensions in accordance with CSR concept for road running events. Through the participants' survey, this study organizes CSR related evaluation attributes and dimensions, and develops a more effective evaluation method for the sport tourism event hosting organizations. The CSR evaluation is a set of dimensions to the subjective and vagueness data. In addition, current measurements on CSR usually rely on statistical analysis method. Hence, for overlooking human complexity, subjectivity and environmental uncertainty, an effective evaluation method is required to improve the clarity of computational process. The novel IFIPA is proposed by exploiting the unique strength of the intuitionistic fuzzy set theory to solve this problem.

The proposed IFIPA method worked smoothly in seizing the issue of segmented 25 CSR dimensions into meaningful sections and makes the evaluation result be more reasonable. While IFIPA method serves as a managerial tool for avoiding human errors in judgment from respondent's preferences to gain CSR insight in host organizations. On the contrary, it is likely to have alternatives to strengthen the linguistic terms, and that seems the more it goes, the better it reflected in the core of questions. In addition, the subjects should be from the experts of such professional field and hence they can provide more precise directions when making decisions. It is suggested that in-depth investigation to identify high-importance and low-performance CSR activities from experts can enhance host organizations efforts in practices.

Implementation of CSR activities is found to have beneficial to local community development and environmental protection. The proposed IFIPA method allows host organization leaders more thoroughly to understand participants' perceptions in accordance with CSR dimensions. Generally, host organization leaders need to be aware of environmental initiatives to coordinate with local government and design regulations with regards to environmental practices. In relation to local development, this study recommends

Please cite this article in press as: Huang, F.-H., et al. Developing a novel Intuitionistic Fuzzy Importance–performance Analysis for evaluating corporate social responsibility in sport tourism event. *Expert Systems with Applications* (2015), http://dx.doi.org/10.1016/j.eswa.2015.04.008

that host organizations can integrate local hotel and restaurant information and cultural features into their event programs for providing more information to participants.

Finally, sport tourism has become a new participant in cross-cultural markets (Cappato & Pennazio, 2006); therefore, it shall be strengthened up the link of organizational and participant perceptions of CSR in cross-cultural cooperation of the sport tourism field. As organizations continue to contribute to society, CSR practices in the sport tourism organization will benefit organizations and gain prominences.

IFIPA method can be regarded as a flexible tool that offers several strengths for evaluating customer acceptance of a program. The IFIPA grid can effectively facilitate managers to interpret the important indicators on marketing strategy and obtains an appropriate action plan to improve organization's quality through decision-making process. The methods can be applied in different industries and organizations. However, this study has limitations. First, the CSR perception in participants might be biased because the related stakeholder's perspectives can exist. Therefore, the subjects sampling and screening are important, and the findings could be extended. Second, the study adopts participants' linguistic information in CSR dimensions might be prejudged. Hence, the identification of experts' perception on CSR perspectives is essential to better up by tailored decision-making efforts to meet market demand in future. Third, the results indicate that IFIPA model offers an effective tool for evaluating participants' perspectives in uncertainty. However, the values of membership may be lower by IFSs operators because of multiplicative operations. The values of membership should be tuned based on actual analysis. Thus, the proper IFSs operators for IFIPA should be developed in further research. Moreover, applying different fuzzy Algorithm (Lin, 2014) into IPA model to assess customer perspectives or evaluating CSR data with other analytic method (Pai, Hung, & Lin, 2014) may be addressed in future researches.

Acknowledgements

The researchers would like to thank the editor and anonymous reviewers for the very helpful comments on ways to improve the study, and Prof. Dr. Kuo-Ping Lin of Department of Information Management at Lunghwa University of Science and Technology for his proof reading.

References

Akram, M., & Dudek, W. A. (2013). Intuitionistic fuzzy hypergraphs with applications. *Information Sciences, 218*, 182–193.
Anderson, J. W. (1989). *Corporate social responsibility*. Connecticut: Greenwood Press Inc.
Asif, M., Searcy, C., Zutshi, A., & Fisscher, O. A. M. (2013). An integrated management systems approach to corporate social responsibility. *Journal of Cleaner Production, 56*, 7–17.
Atanassov, K. T. (1986). Intuitionistic fuzzy sets. *Fuzzy Sets and Systems, 20*(1), 87–96.
Atanassov, K. T. (1999). *Intuitionistic fuzzy sets: Theory and applications*. Heidelberg: Physica-Verlag.
Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16*(1), 74–94.
Banerji, A., & Hiris, L. (2001). A framework for measuring international business cycles. *International Journal of Forecasting, 17*(3), 333–348.
Blowfield, M., & Murray, A. (2008). *Corporate responsibility: A critical overview*. Oxford: Oxford University Press.
Breitbarth, T., & Harris, P. (2008). The role of corporate social responsibility in the football business: Towards the development of a conceptual model. *European Sport Management Quarterly, 8*(2), 179–206.
Burillo, P., & Bustince, H. (1996). Entropy on intuitionistic fuzzy sets and on interval-valued fuzzy sets. *Fuzzy Sets and Systems, 78*(3), 305–316.
Bustince, H., & Burillo, P. (1996). Vague sets are intuitionistic fuzzy sets. *Fuzzy Sets and Systems, 79*(3), 403–405.
Cappato, A., & Pennazio, V. (2006). Corporate social responsibility in sport: Torino 2006 Olympic Winter Games. *University of Turin*.
Chaira, T. (2011). A novel intuitionistic fuzzy C means clustering algorithm and its application to medical images. *Applied Soft Computing, 11*(2), 1711–1717.
Chaira, T., & Ray, A. (2008). A new measure using intuitionistic fuzzy set theory and its application to edge detection. *Applied Soft Computing, 8*(2), 919–927.
Chen, K. Y. (2014a). Improving importance–performance analysis: The role of the zone of tolerance and competitor performance. The case of Taiwan's hot spring hotels. *Tourism Management, 40*, 260–272.
Chen, L. F. (2014b). A novel framework for customer-driven service strategies: A case study of a restaurant chain. *Tourism Management, 41*, 119–128.
Chen, S. M., & Tan, J. M. (1994). Handling multicriteria fuzzy decision-making problems based on vague set theory. *Fuzzy Sets and Systems, 67*(2), 163–172.
Cheng, C. C., Chen, C. T., Hsu, F. S., & Hu, H. Y. (2012). Enhancing service quality improvement strategies of fine-dining restaurants: New insights from integrating a two-phase decision-making model of IPGA and DEMATEL analysis. *International Journal of Hospitality Management, 31*(4), 1155–1166.
Chiou, H. K., Tzeng, G. H., & Cheng, D. C. (2005). Evaluating sustainable fishing development strategies using fuzzy MCDM approach. *Omega, 33*(3), 223–234.
Cui, W., & Yan, X. (2009). Adaptive weighted least square support vector machine regression integrated with outlier detection and its application in QSAR. *Chemometrics and Intelligent Laboratory Systems, 98*(2), 130–135.
Deng, W. J. (2008). Fuzzy importance–performance analysis for determining critical service attributes. *International Journal of Service Industry Management, 19*(2), 252–270.
Deng, W., Chen, W., & Pei, W. (2008). Back-propagation neural network based importance–performance analysis for determining critical service attributes. *Expert Systems with Applications, 34*(2), 1115–1125.
Gammon, S., Ramshaw, G., & Waterton, E. (2012). Examining the Olympics: heritage, identity and performance. *International Journal of Heritage Studies, 19*(3), 119–124.
Geng, X., & Chu, X. (2012). A new importance–performance analysis approach for customer satisfaction evaluation supporting PSS design. *Expert Systems with Applications, 39*(1), 1492–1502.
Gibson, H. J. (1998). Sport tourism: A critical analysis of research. *Sport Management Review, 1*(1), 45–76.
Gibson, H. J., Kaplanidou, K., & Kang, S. J. (2012). Small-scale event sport tourism: A case study in sustainable tourism. *Sport Management Review, 15*(2), 160–170.
Gu, H., Ryan, C., Bin, L., & Wei, G. (2013). Political connections, guanxi and adoption of CSR policies in the Chinese hotel industry: Is there a link? *Tourism Management, 34*, 231–235.
Hamann, R. (2004). Corporate social responsibility, partnerships, and institutional change: The case of mining companies in South Africa. *Natural Resources Forum, 28*(4), 278–290.
Ho, L. H., Feng, S. Y., Lee, Y. C., & Yen, T. M. (2012). Using modified IPA to evaluate supplier's performance. Multiple regression analysis and DEMATEL approach. *Expert Systems with Applications, 39*(8), 7102–7109.
Holcomb, J. L., Upchurch, R. S., & Okumus, F. (2007). Corporate social responsibility: What are top hotel companies reporting? *International Journal of Contemporary Hospitality Management, 19*(6), 461–475.
Holland, J. H. (1975). *Adaptation in natural and artificial system*. Oxford: University of Michigan Press.
Hu, H. Y., Lee, Y. C., Yen, T. M., & Tsai, C. H. (2009). Using BPNN and DEMATEL to modify importance–performance analysis model – A study of the computer industry. *Expert Systems with Applications, 36*(6), 9969–9979.
Hu, M. L. M., Horng, J. S., Teng, C. C. C., & Yen, C. D. (2013). Assessing students' low carbon literacy by Ridit IPA approach. *Journal of Hospitality, Leisure, Sport & Tourism Education, 13*, 202–212.
Inoue, Y., & Kent, A. (2012). Investigating the role of corporate credibility in corporate social marketing: A case study of environmental initiatives by professional sport organizations. *Sport Management Review, 15*(3), 330–344.
Kassinis, G., & Vafeas, N. (2006). Stakeholder pressures and environmental performance. *Academy of Management Journal, 49*(1), 145–159.
Kennedy, J., Eberhart, R. C., & Shi, Y. (2001). *Swarm intelligence*. San Francisco: Morgan Kaufmann Publishers.
Levis, A., & Papageorgiou, L. (2005). Customer demand forecasting via support vector regression analysis. *Chemical Engineering Research and Design, 83*(8), 1009–1018.
Li, D. F. (2005). Multiattribute decision making models and methods using intuitionistic fuzzy sets. *Journal of computer and System Sciences, 70*(1), 73–85.
Lin, K. P. (2014). A novel evolutionary kernel intuitionistic fuzzy *c*-means clustering algorithm. *IEEE Transactions on Fuzzy Systems, 22*(5), 1074–1087.
Lin, K. P., Pai, P. F., & Yang, S. L. (2011). Forecasting concentrations of air pollutants by logarithm support vector regression with immune algorithms. *Applied Mathematics and Computation, 217*(12), 5318–5327.
Lin, S. P., Chan, Y. H., & Tsai, M. C. (2009). A transformation function corresponding to IPA and gap analysis. *Total Quality Management & Business Excellence, 20*(8), 829–846.
Liu, Z. (2003). Sustainable tourism development: A critique. *Journal of Sustainable Tourism, 11*(6), 459–475.
Magal, S. R., Kosalge, P., & Levenburg, N. M. (2009). Using importance performance analysis to understand and guide e-business decision making in SMEs. *Journal of Enterprise Information Management, 22*(1/2), 137–151.
Martilla, J. A., & James, J. C. (1977). Importance–Performanc Analysis. *Journal of Marketing, 41*(1), 77–79.
Matzler, K., Bailom, F., Hinterhuber, H. H., Renzl, B., & Pichler, J. (2004). The asymmetric relationship between attribute-level performance and overall

Please cite this article in press as: Huang, F.-H., et al. Developing a novel Intuitionistic Fuzzy Importance–performance Analysis for evaluating corporate social responsibility in sport tourism event. *Expert Systems with Applications* (2015), http://dx.doi.org/10.1016/j.eswa.2015.04.008

customer satisfaction: A reconsideration of the importance–performance analysis. *Industrial Marketing Management, 33*(4), 271–277.
Matzler, K., Sauerwein, E., & Heischmidt, K. (2003). Importance–performance analysis revisited: The role of the factor structure of customer satisfaction. *The Service Industries Journal, 23*(2), 112–129.
Mikulić, J., & Prebežac, D. (2012). Accounting for dynamics in attribute-importance and for competitor performance to enhance reliability of BPNN-based importance–performance analysis. *Expert Systems with Applications, 39*(5), 5144–5153.
Mohr, L. A., Webb, D. J., & Harris, K. E. (2001). Do consumers expect companies to be socially responsible? The impact of corporate social responsibility on buying behavior. *Journal of Consumer Affairs, 35*(1), 45–72.
Mutti, D., Yakovleva, N., Vazquez-Brust, D., & Di Marco, M. H. (2012). Corporate social responsibility in the mining industry: Perspectives from stakeholder groups in Argentina. *Resources Policy, 37*(2), 212–222.
Pai, P. F., Hung, K. C., & Lin, K. P. (2014). Tourism demand forecasting using novel hybrid system. *Expert Systems with Applications, 41*(8), 3691–3702.
Roche, S., Spake, D. F., & Joseph, M. (2013). A model of sporting event tourism as economic development. *Sport, Business and Management: An International Journal, 3*(2), 147–157.
Sampson, S. E., & Showalter, M. J. (1999). The performance-importance response function: Observations and implications. *Service Industries Journal, 19*(3), 1–25.
Smith, A. C., & Westerbeek, H. M. (2007). Sport as a vehicle for deploying corporate social responsibility. *Journal of Corporate Citizenship, 25*, 43–54.
Smith, V., & Langford, P. (2009). Evaluating the impact of corporate social responsibility programs on consumers. *Journal of Management and Organization, 15*(1), 97.
Taplin, R. H. (2012). Competitive importance–performance analysis of an Australian wildlife park. *Tourism Management, 33*(1), 29–37.
Tonge, J., & Moore, S. A. (2007). Importance–satisfaction analysis for marine-park hinterlands: A Western Australian case study. *Tourism Management, 28*(3), 768–776.
Trendafilova, S., Babiak, K., & Heinze, K. (2013). Corporate social responsibility and environmental sustainability: Why professional sport is greening the playing field. *Sport Management Review, 16*(3), 298–313.
Truscott, R. A., Bartlett, J. L., & Tywoniak, S. A. (2009). The reputation of the corporate social responsibility industry in Australia. *Australasian Marketing Journal, 17*(2), 84–91.
Veltri, F. R., Miller, J., & Harris, A. (2009). Club sport national tournament: Economic impact of a small event on a mid-size community. *Recreational Sports Journal, 33*(2), 119–128.
Walters, G., & Tacon, R. (2010). Corporate social responsibility in sport: stakeholder management in the UK football industry. *Journal of Management & Organization, 16*(4), 566–586.
Welford, R., Chan, C., & Man, M. (2008). Priorities for corporate social responsibility: A survey of businesses and their stakeholders. *Corporate Social Responsibility and Environmental Management, 15*(1), 52–62.
Xu, Z. (2007). Intuitionistic preference relations and their application in group decision making. *Information Sciences, 177*(11), 2363–2379.
Xu, Z., & Yager, R. R. (2006). Some geometric aggregation operators based on intuitionistic fuzzy sets. *International Journal of General Systems, 35*(4), 417–433.
Zadeh, L. A. (1965). Fuzzy sets. *Information and Control, 8*(3), 338–353.

Please cite this article in press as: Huang, F.-H., et al. Developing a novel Intuitionistic Fuzzy Importance–performance Analysis for evaluating corporate social responsibility in sport tourism event. *Expert Systems with Applications* (2015), http://dx.doi.org/10.1016/j.eswa.2015.04.008