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A theoretical framework of the dynamic property of the tourism destination network

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Abstract

This paper gives an analytical framework to investigate a dynamic property of the tourism destination network, which has various patterns from time and space perspectives. A development pattern of tourism destination network should be a factor to determine the growth of each tourism destination, whereas the co-evolution of the tourism destination network would be fixed by development patterns of tourism destinations and their mutual relationship. Giving an imaginary network leads to a widely applicable analytical framework to explain how the tourism destination network develops and how it works for the tourism development. Analytical procedures include not only the general tools for network analysis but a fuzzy grading function to evaluate the performance of tourism destination network as well.

Keywords; Networks; Destination management; Tourism development;
Dynamic property of networking;

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A Theoretical Framework of the Dynamic Property of the Tourism Destination Network

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1. Introduction

The major aim of the paper is to give a theoretical framework of the development pattern of tourism destination network and its outcomes, which allow us to investigate the dynamic property of the tourism destination network and various patterns from time and space perspectives. A development pattern of tourism destination network should be a factor to propel the growth of each tourism destination, whereas the co-evolution of the tourism destination network would be fixed with development patterns of tourism destinations and their mutual relationship. A specific feature of the paper is to include not only a static analytical aspect of tourism network but also its dynamic aspect. Many researchers of the network analysis have mainly developed a static analysis by traditional tools of social network analysis, such as distance, centrality and structural equivalence, which have been cohesively developed by the Social Network Analysis since 1970s (SNA, see Freeman (1979))[1], though few papers are published on tourism development from the social network perspectives. As far as the tourism network is concerned, some papers have been developed and also gave empirical aspects, such as Shin (2006) and Scott et al. (2007, 2008), which recognized a strategic role of the network analysis on tourism development. A formation process of the tourism site would compose a structure of the regional network among areas and its development pattern should affect the economic development. Though the development path always includes a dynamic property due to its time dependency, almost papers of the tourism network were mainly conducted to the static analysis to focus on the structural characteristics of the network. It should be indispensable for the tourism network analysis to incorporate analytical measures from the long-run perspective.

Many preceding papers on the tourism network mainly have focused on a tourism site in which a tourism network has been developing with the spreading and deepening

[1] A conceptual explanation and mathematical procedures of social network analysis are given by Knoke and Yang (2008).

social relationships. After analyzing the network structure, they mentioned the improvement of networking conditions as measures of regional development. In particular, their analysis of the weakness or insufficiency of the tourism networking in terms of human relationships or business marketing leads to worthwhile proposals for tourism development in a tourism site.

In this paper, however, we shall analyze a tourism destination network, focusing our attention on the relationship among tourism sites rather than inside of a tourism site. Geographically, tourism sites compose a specific pattern of their relationship, which concerns administrative agreements, transportation infrastructures, complement or substitute properties of tourism services, and business activities (see Part 1 in Scott et al. (2008)). Various patterns of the relationship among tourism sites perform a tourism destination network, whose development might be fixed historically and geographically. Local businesses and organizations at each tourism site, for example, can join and promote a cooperative marketing to make their tourism services more fascinating to visitors in the aggregate. Then the visitors can be contended with their visit to the tourism sites that should be linked together effectively through networking. Accordingly, it becomes essential for these tourism sites to design a strategic pattern of the tourism destination network, along which tourists can visit and enjoy attractions. In this regard, not only the transportation network but also the information network, mainly transmitted by human relationships, should determine the situation and the pattern of tourism development of each tourism site. Within a tourism destination network, each tourism area can develop but its development pattern may be different each other not only because of the divergence in the position of each area in the tourism destination network but the difference in its capacity of the tourism growth as well. It should be notable that once a tourism site is integrated into a tourism destination network, the development pattern of the tourism site would be affected not only by its own development but through changes of tourism business at other areas as well. This externality, or interdependency, of the tourism destination network should become a decisive factor to determine a development pattern of the tourism sites. Let us give an example. Kyoto, Kobe and Osaka are the three major tourism sites in Japan. Each of them has something different atmosphere each other and many tourists visit there. They are independent tourism sites but are connected each other through various means of interchange[2]. Using the words of the network analysis, each of three cities can be the

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[2] Since 1990, West Japan Railway Company has carried on a campaign of the link among them, called 'the tale of the three medieval cities'.

node as an independent tourism site, and measures for interchanging them can be the link. Therefore, node and link perform a basic structure of the network among regions or organizations as well when we focus our attention not on the regional relationship but on the functional relationship of organizations in the region. Network Analysis (NA hereafter) is an analysis of finding the structure and its effectiveness of the systematic relationship of node and link, and a dynamic NA should be an analysis of investigating a changing pattern of NA and its outcomes in the tourism site.

Our paper about the tourism destination network has the following analytical propositions. Firstly, it is assumed that the tourism destination network to be analyzed should be well-defined within a small area, where a small number of tourism sites are located and visitors can access them by a one-day trip, that is two or three-hour journey by cars or trains. Secondly, each tourism site is assumed to be a tourism complex, which includes various multiple tourism attractions, such as accommodation, restaurants, amusement parks and natural parks. Therefore, our attention would be directed towards not only each development plan of the attractions in each node but also the comprehensive development plan in a tourism destination network.

The composition of the paper is as follows: Giving a imaginary hypothetical network, we shall show a widely applicable framework to explain how the tourism destination network develops and how it works for the tourism development. Analytical procedures include not only the general tools for network analysis but a fuzzy grading to evaluate the performance of tourism destination network as well (Section 2). In this regard, some technical aspects about dynamic pattern of the tourism destination network will be investigated. Then, in Section 3, we shall introduce a performance function of the tourism destination network and apply a factor-decomposition analysis to an outcome that should be attributable not only to the externality of tourism destination network but also to the effects by its own growth. Finally, in Section 4 summarizes the conclusions and further remarks.

2 Tourism destination network and its Performance

2.1 Network Analysis and the Dynamic Property

NA and its application to tourism destinations have been developed with various dimensions of social network analysis (SNA). Actors (or node) and relations (or link) must be the two indispensable elements in SNA (Knoke and Yang (2008, p6)), which should influence both individual behaviour and systemic performance (p7). Therefore, SNA explains both variations in structural relations and their consequences. Accordingly, tourism network composed by actors and relations has been also focused on relations between actors such as tourism businesses, governments and residents and their outcomes, such as cooperative activities to establish management plans and policies and destination development (Pavlovich (2003), Dredge (2006a, 2006b)), or keeping tourism development sustainable (Halme (2001), Gibson et al. (2005), Erkus-Oztruk and Eraydin (2010)). Halme (2001) applied NA to confirm the effects of tourism destination network on learning process. Gibosn et al. (2005) gave a dynamic aspect of tourism destination network from the destination lifecycle perspectives and showed the outcome indicators related to learning and exchanging, business activities and community. Erkus-Oztruk and Eraydin (2010) analysed the environmental sustainable tourism development focusing on governance networks, which consists of action oriented networks and policy & planning networks.

In the tourism network literatures, nodes include all (or a part of) stakeholders and relations can be composed by various links such as human relationship (including attitudes, regulations, partnership and participation), information and physical connections. Scale of the nodes and strength of the link should prescribe the structure of network. In this regard, it is notable that a target of tourism development should develop the welfare of the whole community, not a part of business, without deteriorating the environmental resources. Although the overall target must include such macro or aggregated aspects, it should be important to regard the tourism network as the effective tools for attaining such goals in the tourism destination. From the SNA perspectives, developing human relations or deepening public-private partnership should increase the community's welfare. However, as many researches admitted, the main incentive for stakeholders to join in the network is still economic one. Not only business people but also government, or related organizations, tend to think that the tourism development in terms of income is important and the tourism destination network should be a tool for economic development. Even if economy is the most important goal, total welfare of the tourism destination should be targeted, which would include various factors such as community development, quality of life, environment, jobs, businesses and profits, or sustainability. Then, the tourism destination network should be examined whether and how much it can contribute producing these benefits.

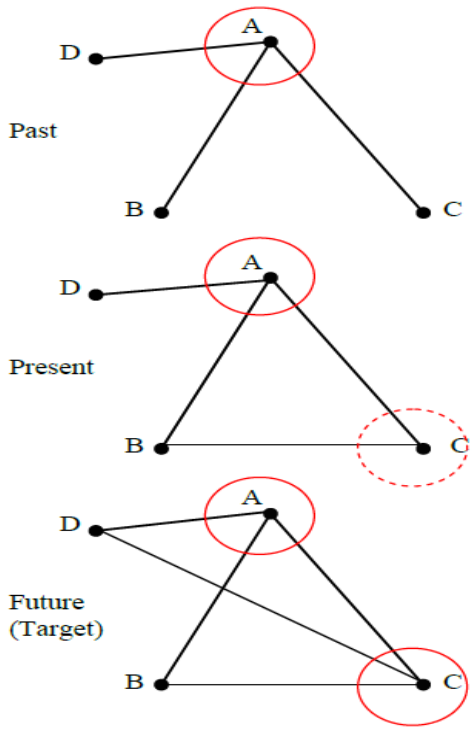
Baggio (2007), Scott et al. (2007, 2008) and Baggio et al. (2010) proved the effectiveness of NA and its applicability to the tourism network. Their procedure of empirical research on tourism sites in Australia or Italy followed an extensive NA, including the structural quantitative methods by NA, such as density, closeness and cohesiveness. Connections between nodes, mainly key stakeholders in organizations, include not only physical or Internet Communication Technology (ICT) measures but also human relationships of information flows. On the other hand, Chan et al. (2003) and Pyo (2010) showed an applicability of tourism chain analysis to special tourism sites where some attractions (or node) are connected (linked) in different means and intensities. Their method was a prototype of NA but without a structural analysis. One major point they captured is that there are some inefficiently achieved sites and they should be improved from some viewpoints, including transportation and tie-ups with educational activities. The method concerning a kind of dynamic aspects, however, is notable, which includes special questions of the situations of past, present and future. Easy access to understand the changing pattern of situations must also be good for NA to be dynamic although their statistical procedure to use a fuzzy set could enable them to have a small sized sampling. In this paper, we shall integrate the ordinary method of NA with these tourism chain analyses in order to develop a dynamic aspect of NA. The step of the analysis is as follows: firstly, a virtual hypothetical site is assumed to give a NA analysis in order to clarify their network structure. Secondly, to see a dynamic pattern of network development, incorporate a changing pattern of past-present-future (target) of efficacy of networking. In this regard, to handle a small sample size, a fuzzy performance grading is introduced. Then, a quantitative measure of the benefit from tourism destination networks (or chains) will be analysed and their policy implications will be investigated.

2.2 A Simple Pattern of Network Development (From Mono-polar to Bi-polar)

At the beginning, we shall assume a virtual example of the tourism destination network, shown in Figure 1. This is a case where a new sub-centre was developed in a tourism site though initially only single centre of the tourism site exists. The example indicates a development process that the area 'C' transits from a periphery towards a centre and the area 'A' loses its special position in the tourism site. Network development should be strengthened through various factors; increase in the number of 'node', increase in the number of 'link', increase in the value which each 'link' has, increase in the 'direction' which each 'link' has, and changing pattern of the structure of network, that is a formation of 'nodes' and 'links' or a changing pattern of the shape of networking. These factors may affect the overall outcome in a network region and also affect the outcome to be attained in each 'node'. Outcomes should be valued from various aspects such as income (or revenue), number of tourists, happiness of people in the network, density of human relationship, effectiveness, fairness, etc. Therefore, for an actual pattern of the network development, many steps should be needed to complete

NA. As far as this simple case in Figure 1 is concerned, however, we shall focus only our attention on the changing pattern of links between nodes. As shown in Figure 1, the network is developing due to an increase in links among B, C and D but its structure seems to be changing drastically. To make the analysis simpler, only binary values and non-directed links are used.

Figure 1 A Development of the Tourism destination network



The data concerning the network pattern, given as Figure 1, can be collected by asking the evaluators who have professional knowledge about the situation not only of their network around but also of the development pattern of their activities. The questions should include such as, “Do you think there was (is or will be) a network relationship with others?” and “If any, how effective do you think the network worked (work or will work)? Please evaluate the overall effectiveness of the performance of your activities, by scoring from 0, when no result, to 100, if perfect results. Questions about other performance attributes of network should be considered. They include both factors of ‘links’ and ‘nodes’. The factors of ‘links’ include cooperative promotion and marketing, transportations, ICT-related network, human network, and the factors of ‘node’ may include attractions, service quality, efficiency and fairness in each ‘node’. For a numerical example, we shall assume the data Table 1 shows, in which the overall performances are measured by money term. In this regard, we need to ask evaluators in a node the weights that show relative importance (or contribution) in networking to compare with other nodes. Specifically, each evaluator in the network would be asked how much important role your node plays in the network on a scale of hundred. Then the weight of the performance can be calculated as a ratio of its score to total scores at each of time (Table 2).

Table 1 Overall performance

	Past	Present	Future
A	50	70	80
B	40	50	70
C	40	60	80
D	30	50	80

Table 2 Weights of the performance

	Past	Present	Future
A	65	50	35
B	10	15	15
C	15	25	35
D	10	10	15

Arrangements for NA have now been completed. Following the ordinary procedures of NA, the adjacency matrix and the distance matrix for the network development in Figure 1 can be given by Table 3 and Table 4. The adjacency matrix shows if there is a link between two nodes or not, and we can easily find in the present, for example, A and B has a link, indicated as ‘1’ in (*1,2*)th element, but B and D has no link, indicated as ‘0’ in (*2,4*)th element (or equivalently ‘0’ in (*4,2*)th element for D and B). However, the evaluator in C or D is expecting a new link to be established in the future. On the other hand, the distance matrix shows a length of the trip between two nodes. From D to C in the past, we need to trip at least along two links from D to A and from A to C. However, we can use a shortcut thanks for a newly developed link between D and C, only tripping along one direct link. Then the (*4,3*)th element of the distance matrix will be ‘1’ in the future whereas it was ‘2’ in the past, meaning that it becomes easier for tourists to access to C from D, or inversely, to D from C. The tendency of shortening distance among nodes in a tourism site can contribute a tourism development, leading to a more favourable evaluation at each node for the future, as expected in Table 1.

Table 3 Adjacency matrix

Past

	A	B	C	D
A	0	1	1	1
B	1	0	0	0
C	1	0	0	0
D	1	0	0	0

Present

	A	B	C	D
A	0	1	1	1
B	1	0	1	0
C	1	1	0	0
D	1	0	0	0

Future (Target)

	A	B	C	D
A	0	1	1	1
B	1	0	1	0
C	1	1	0	1
D	1	0	1	0

Table 4 Distance matrix

Past

	A	B	C	D
A	0	1	1	1
B	1	0	2	2
C	1	2	0	2
D	1	2	2	0

Present

	A	B	C	D
A	0	1	1	1
B	1	0	1	2
C	1	1	0	2
D	1	2	2	0

Future (Target)

	A	B	C	D
A	0	1	1	1
B	1	0	1	2
C	1	1	0	1
D	1	2	1	0

Then, NA provides a basic structure of this tourism destination network summarized in Table 5. In Table 5, density means a proportion of actual ties in a network relative to the maximum number of ties. In general, average distance among nodes decreases when density increases.

Table 5 Basic structure of the tourism destination network

	Diameter	Average distance	Density
Past	2.0	1.5	0.5
Present	2.0	1.33	0.67
Future	2.0	1.17	0.83

Centrality is a key concept of NA to know about what position a node is in the network. In a group with human network, for example, we can find a leader who actually plays a central role in the group though it is hard to ascertain that he or she is in position as a true leader or close to a leader. NA gives a rigorous definition of what status of each person, or node, shares in the network. In NA, some prototypes of the centrality are provided, such as degree centrality, between centrality, closeness centrality and eigenvector centrality. Among them, closeness centrality, for example, shows the degree an individual is near all other individuals in a network. In Table 6, the closeness certainty of each node shows the standardized one. Centralization for closeness centrality shows the difference between the numbers of links for each node divided by maximum sum of difference, which shows how much variation there is between the numbers of links each node has (See Table 6).

Mathematical formula of closeness centrality is given by

$$(1) \quad Cc(i) = \frac{1}{\sum_{j=1}^{g} d(i,j)} \quad or \quad Cc^{g}(i) = \frac{g-1}{\sum_{j=1}^{g} d(i,j)},$$

where $d(i,j)$ is the distance between node i and j, and g is the total number of nodes. As for Figure 1, g=4 and i, or j, is A, B, C or D. $C_c^g(i)$ shows a standardized closeness centrality. In this regard, centralization for closeness centrality is given by

$$(2) \quad Cc = \frac{\sum_{i=1}^{g} [Cc^{g}(i*) - Cc^{g}(i)]}{[(g-2)(g-1)]/(2g-3)},$$

where $C_c^n(i*)$ shows the maximum value of closeness centrality for all nodes in the network.

In the past case in Table 6, only the node ‘A’ has one so that links are dispersed around just one node ‘A’, which is classified as the case of star structure (Also see Figure 1). Due to a bipolarization strategy in the tourism site, closeness centrality in both ‘A’ and ‘C’ will be 1.0 in the future. In ‘C’, closeness centrality has been and will be increasing sharply. Closeness centrality in ‘B’ has already increased and that in ‘D’ will be expected to increase from 0.6 to 0.75. These changes occur due to a newly constructed relationship with another node. On the other hand, the bipolarization strategy has reduced the centralization from 1.0 to 0.75 and will reduce it from 0.75 to 0.42. As shown in Table 6, in the past, there was only one node to which all links were directed from other nodes when the network had a star structure, then centralization becomes one, meaning that a bias of centrality is the largest. In this regard, it is notable that the centralization could be zero when all nodes in the network are completely linked together, namely when there is a link between D and B in the future period in a case of Figure 1.

Table 6 Evolution of centralization

	Past	Present	Future
A	1.0	1.0	1.0
B	0.6	0.75	0.75
C	0.6	0.75	1.0
D	0.6	0.6	0.75
Centralization	1.0	0.75	0.42

2.3 Evaluation of Outcomes

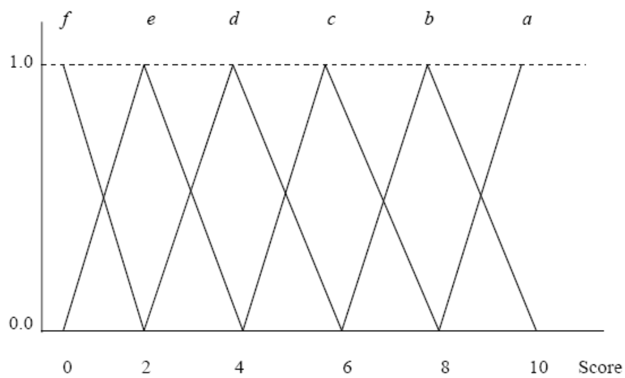
Next step is to evaluate the performance of tourism destination network and outcomes of each actor. Through interviews to valuators of each node, some quantitative data to evaluate the performance of tourism development would be collected like as Table 1 which gives a hypothetical example of evaluations only for overall performance of the tourism activities. Except for the overall performance, there would be a number of dimensions of outcomes concerning the tourism destination network, such as a quality of tourism services, number of tourists, employment level, cooperative atmosphere and brand image in the region, environmental conservation and so on. These data may be given by the officially published data or by a questionnaire survey, both of which, however, should include the expected values for the future time of each outcome. As is in the case of Figure 1, a drastic change may be observed when we look at a small scope of tourism destination network, where the construction of a link between nodes can strongly influence the performance not only of each node but also of tourism site entirely. Then, the method of numerical analysis extended by Chan et al. (2003) might be useful for NA whereas it was originated for a supply chain management (SCM). Chan et al. (2003) and Font et al. (2008) provide us a measurement method of cross-organisational performance that also can be applicable to NA. Researches on SCM or its application to tourism management (TSCM) naturally include the network perspectives because they mentioned the relationships among stakeholders, such as cooperation, competition and channels (Zhang et al. (2009)). The measurement method of the performance at each node follows the next steps:

(Step1) Evaluate the performance by evaluators: e_i = (E_{i1};past, E_{i2};present, E_{i3};target), i=A,B,C,D which are given by Table 1. For example, E_{i1}= (50,40,40,30).

(Step2) Calculate the Performance Score (PS), which is defined by $\mu_i = \frac{E_{i2} - E_{i1}}{E_{i3} - E_{i1}} \times 10$, where $\mu_i \in [0,10]$, i=A,B,C,D. In the case of A, for example, $\mu_A = (20/30) \times 10 = 6.67$. Therefore, each PS shows only an achievement rate of the present performance to compare with the future target.

(Step3) Estimate the Performance Grades. Evaluations given in Table 1 imply many ambiguities or incorrect information because each evaluator's judgement may be subjective and arbitrary. Then, applying a fuzzy set theory to re-estimating the performance scores should become a possible and useful procedure to avoid these ambiguities and to reach unbiased evaluations. A typical method is to calculate the expected value of PS by using both the probability named the degree of belongingness and a specified fuzzy grade (Figure 2).

Figure 2 Triangular Fuzzy Grades



For example, the PS of B is reported as 3.33. As mentioned above, this data might be ambiguous. The true PS of B, if any, might be larger (or less) than 3.33. Then, we shall introduce the 'triangular fuzzy grade' given as Figure 2. Each triangle has an apex from *a* to *f*, and constitutes a membership to which the PS should belong. Then, 3.33 is outside the range of membership of *a*, *b*, *c* and *f*, however, it is inside the range of membership both of *d* and *e*. Using these memberships, the performance grades of B are given by P_a=0,P_b=0,P_c=0,P_d=(3.33-2)/(4-2)=0.665, P_e=(4-3.33)/(4-2)=0.335, P_f=0, or in the form of row vector, $(0,0,0,0.665,0.335,0)^T$. With other calculations of the performance grades, the fuzzy performance grade matrix becomes

$$FP_G = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0.33 & 0 & 0 & 0 \\ 0.67 & 0 & 0.5 & 0 \\ 0 & 0.67 & 0.5 & 1 \\ 0 & 0.33 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

(Step4) To calculate the Performance Index (PI): Multiply a measurement result matrix given by FP_G with the weight vector, W^T.

$$FP_G \times W^T = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0.33 & 0 & 0 & 0 \\ 0.67 & 0 & 0.5 & 0 \\ 0 & 0.67 & 0.5 & 1 \\ 0 & 0.33 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \times \begin{bmatrix} 0.65 & 0.5 & 0.35 \\ 0.1 & 0.15 & 0.15 \\ 0.15 & 0.25 & 0.35 \\ 0.1 & 0.1 & 0.15 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0.22 & 0.17 & 0.12 \\ 0.51 & 0.46 & 0.41 \\ 0.24 & 0.33 & 0.43 \\ 0.03 & 0.05 & 0.05 \\ 0 & 0 & 0 \end{bmatrix} = [x_1, x_2, x_3]$$

Then, the performance measure (Performance Index = PI) can be given by

$$PI_i = \frac{s\,x_i}{\sum_{j=1}^{6} x_{ij}}, \; s = (10,8,6,4,2,0)$$

where x_{ij} (i=1(past), 2(present) and 3(future), j=1,2,…,6) is the jth element of the ith row vector, $\boldsymbol{x_i}$, of $FP_G \times W^T$. Each element of vector $\boldsymbol{s}$ shows the scores that correspond to apexes from a to f. In a numerical example of Table 2, PIs are given in Table 7, which .

Table 7 Overall Performance Index

	Past	Present	Future	PS
A	50	70	80	6.67
B	40	50	70	3.33
C	40	60	80	5.00
D	30	50	80	4.00
PI	5.81	5.48	5.18	

(Step 5) Evaluate the outcome. Applying these steps to the numerical example leads to the following outcomes: firstly, PI as an aggregate measurement crucially depends on the weight vector. The difference in relative weights among actors is due to the difference in viewpoints of how important the individual actor or social actor (government) are about each node. Their evaluations about nodes might change from time to time, meaning that the weight vector should be changed due to changing network structure. Moreover, this changing pattern of relative weights or network structure should be the key to determine the PI itself. Secondly, although PI is estimated by using scores at three points in time, i.e. past, present and future (target), it is corresponding only to performance at present because PS merely indicates a present situation towards a target. If the target of a node is set lower to compare with another node, PS in the node should be large. Moreover, if every actor in all nodes keeps the target low, then PI will become large. However, this does not necessarily imply that the performance is excellent. Thirdly, PS is estimated by using scores which actors graded for each period. PS indicates not an absolute score but a relative score because it only shows a change rate in scores. This procedure may be preferable when performance should be calculated with various units.

2.4 Technical extensions

In this section, we shall provide some technical aspects to induce PIs. One is to introduce an expected performance score in addition to the ordinary performance score mentioned above. The other is to adjust measures to evaluate outcomes of the network. Both of them might contribute to a further analysis of NA.

Tourism development or its trend should be important for all stakeholders, among which investors most seriously watch the performance of each node. In particular, future performance must be an essential consideration of investment. In this regard, an expected PS (EPS) should be estimated and compared with (realized) PS. The following method is to calculate both PSs and PIs, and to compare them each other.

In addition to Performance Score (PS), we shall define the EPS by

$$\mu_i = \frac{E_{i3} - E_{i2}}{E_{i3} - E_{i1}} \times 10, \mu_i \in [0,10], i = A, B, C, D$$

Accordingly, EPS means a potential development that each site will be expected to attain. Then, as for the numerical example about Table 1 and 2, PSs and EPSs are given in Table 8 to follow the five steps explained above. PIs in the lower line of Table 8 how EPIs in terms of the weight at each period[3], which are computed based on EPSs. A merit of the procedure is that the potential performances of each node can be estimated and compared with realized past performances. In the sample model, the past-present performance of B is very low, around 3.3, whereas its EPS becomes larger to about 6.7, indicating a prosperous future development. As mentioned above, the evaluator's weight to show the relative importance of the node in the network should vary as time elapses. In this regard, it should be re-conformed that PIs are the performance scores to indicate the situation of development process from the past to the present from the long-term, which is from the past to the future, perspectives, whereas EPIs are performance scores to indicate the situation of development process from the present to the future from the long-term perspective. In this sense, investors or actors at each tourism site may consider the growth pattern from past to future to be more important. This will explain why PIs and EPIs show a different changing pattern with respect to the weights.

[3] To reach PIs, there might be various ways to use the weights, such as the average weight for two points of time, or, simply the weights at present.

As for the numerical example of the weights in Table 2, the relative weight of A is decreasing but these of other nodes are increasing. After changing the network structure from mono-polar to bi-polar, the weights, indicating how much each evaluator attaches importance to each node, tend to change so that a newly developed centre becomes more important in the network. Moreover, increases of the links between nodes also contribute to an increasing pattern of EPI. Accordingly, the better performance with increasing weight at B, C and D leads to offset the less performance with decreasing weight at A, and this will lead the EPI to change from 4.21 to 4.82.

Table 8 Extended Overall Performance Index

<table>
<tr><th></th><th colspan="2">Past-Present</th><th colspan="2">Present-Future</th><th>EPS/PS</th></tr>
<tr><td>A</td><td colspan="2">6.67</td><td colspan="2">3.33</td><td>0.50</td></tr>
<tr><td>B</td><td colspan="2">3.33</td><td colspan="2">6.67</td><td>2.00</td></tr>
<tr><td>C</td><td colspan="2">5.00</td><td colspan="2">5.00</td><td>1.00</td></tr>
<tr><td>D</td><td colspan="2">4.00</td><td colspan="2">6.00</td><td>1.50</td></tr>
<tr><td rowspan="2">PI</td><td>5.81</td><td colspan="2">5.48</td><td>5.18</td><td></td></tr>
<tr><td>4.21</td><td colspan="2">4.52</td><td>4.82</td><td></td></tr>
</table>

Instead of an ordinal procedure of PS, growth rate of performance also can be used for estimating PIs. This should be preferable when scores are measured in various units such as money income, number of tourists and so on. In the growth rate term, it is clear that with changing weights, both realized PI and expected PI are increasing upwards. This is an outstanding outcome compared with the ordinal measures of PI or PS. This is indicated by Table 9.

Table 9 Extended Overall Performance Index by growth rate

<table>
<tr><th></th><th colspan="2">Past-Present</th><th colspan="2">Present-Future</th><th>EPS/PS</th></tr>
<tr><td>A</td><td colspan="2">4.00</td><td colspan="2">1.43</td><td>0.36</td></tr>
<tr><td>B</td><td colspan="2">2.50</td><td colspan="2">4.00</td><td>1.60</td></tr>
<tr><td>C</td><td colspan="2">5.00</td><td colspan="2">3.33</td><td>0.67</td></tr>
<tr><td>D</td><td colspan="2">6.66</td><td colspan="2">6.00</td><td>0.90</td></tr>
<tr><td rowspan="2">PI</td><td>4.27</td><td colspan="2">4.29</td><td>4.52</td><td></td></tr>
<tr><td>2.43</td><td colspan="2">2.74</td><td>3.16</td><td></td></tr>
</table>

3 A Performance Function and Networking

Aforementioned procedure is based on the subjective value judgment to evaluate the performance both of each node and of the entire network, meaning that some unreliable information should be included even if the use of fuzzy set could adjust the actor's evaluation of the performance. This procedure, however, can be easily applied to various types of performance and network structure to confirm the pattern of tourism development at each tourism site. Figures of PI or EPI should include a mixed effect of the node's own development with the development of network among nodes. On the other hand, as long as the patterns of links of a tourism destination network could be recognized, a traditional procedure to estimate outcomes, which is the production function, would be also applicable to NA although some technical issues of the data collection remain. This section devotes to analyse the procedure by production function and to compare the two approaches.

3.1 A hypothesis

A major aim to apply NA to tourism development is to give some policy recommendations in order to improve the structure of a tourism destination network. Recommendations about location and type of tourist facilities, for example, should be based on the results of NA (Shin (2006)). However, there must be another aim of NA to be considered; that is to estimate and analyse the relationship between the development of the network structure and its effect on the tourism development. In general, tourism development in the region should be supported by the development of the network as if the network composed by nodes and links is an infrastructure. Like other inputs to contribute to producing products and services, the network will also play the same role as a contributor. If this is the right conclusion, it can be confirmed that encouraging investment on improving network in a tourism site will cause the site's welfare to increase.

This leads to a hypothetical logic that improving network or network expansion should contribute an increase in welfare at each node. Welfare can be estimated by various data such as the level of tourism income, the volume of employment and other relevant figures. The following procedure is an attempt to quantify the effect of a changing pattern of the network on the overall outcome in terms of income at a tourism site.

3.2 An Analytical Framework

Various inputs contribute outputs. To make analysis simple, the outcomes of tourism sector in a tourism site is assumed to be measured by income, or equivalently, production. The income level is hypothetically determined by

(3) $$y_i = f_i(n_i, \sum_{j \neq i} l_{ji} n_j, \sum_j n_j),\ l_{ij} = 1\ when\ j\ directly\ tied\ to\ i, or\ l_{ij} = 0\ otherwise$$

where y_i is income, n_i is total inputs at node *i*, such as employment. It is assumed that there are two layers of effects from network; one is the direct effect which is stemmed from other nodes that link directly to node *i*, and the other is the overall externality of the network[4]. In fact, it might be hard to estimate (1) within the non-linear type of formation. Following the Taylor expansion, an evolutional process of the tourism destination network can be given by a liner function;

(4) $$\Delta y_i = f_{i1}\Delta n_i + f_{i2}\sum_{j\neq i}(\Delta l_{ij}n_j + l_{ij}\Delta n_j) + f_{i3}\sum_{j}(\Delta n_j) + \varepsilon_i \ .$$

In this equation, each partial derivative f_{i1}, f_{i2} *and* f_{i3} mean the effect of change in the size of node *i* itself, change in other node's size and additional links with node *i*, and change in total network, on outcome at node *i*, respectively. ε_i is the reminder of linear approximation, but hereafter no notice is taken.

In the matrix expression, (2) will become

(5) $$\begin{aligned}\Delta Y &= F_1\Delta N + [F_2\Delta L^t N + F_2 L^t \Delta N] + F_3\Delta N^0 \\ &= \{[F_1 + F_2 L^t]\Delta N + F_3\Delta N^0\} + F_2\Delta L^t N\end{aligned},$$

where F_k is a diagonal matrix whose components consist of f_{ik}. L is a matrix whose elements consist of l_{ij}. ΔL is a matrix whose components are Δl_{ij}. ΔN is a vector whose elements are an increment of capacity of each node and ΔN^0 is a vector whose elements are the sum of all node's increments of capacity. N is a vector whose elements are n_i.

The first expression in r.h.s of (5) proves that an increment of output can be decomposed by three factors: the first one is a 'direct effect' of changes in the size of capacity of node itself; the second one is a 'network effect' via linkage among nodes through which a changing pattern of network can influence output; and the third one is a 'overall effect' of a network site. The second expression in (5) separates effects into two parts; one is the effects due to changes in nodes' capability and another is the effects due to changes in linkage pattern. In this regard, the former might be named as 'scale effects' and the latter might be named 'linkage effects'. A change in output at each node should occur due to both scale effects and linkage effects.

On the other hand, it is clear that a change in links of the network area is corresponding to a developing pattern of the network structure because it causes various

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[4] In (3), only the case of new links with bi-direction is considered. However, it is possible to incorporate a deepening of the link by setting l_{ij} to be more than 1. Moreover, it is also possible to think about one-way directional link between nodes, for example, by setting l_{ij} =1 but l_{ii} =0. According to this procedure, we can introduce the valued directed graph into NA.

centralities such as the closeness centrality to change. Next step is to clarify the relationship between ΔL and a changing pattern of the centrality. As far as the numerical example in Figure 1 is concerned, we only focused our attention on 'closeness centrality', which is formulated by (1) and (2). Numerical results of an example have already been given in 2.2. From (1), as far as a change in the network structure do not include a new entry of the nodes into the network, a change of centralization index can be induced by

$$(6)\ \Delta C_c^{\,g}(i) = \frac{1-g}{(\sum_{j=1}^{g} d(i,j))^2}[\sum_{j=1}^{g} \Delta d(i,j)].$$

In this formula, it should be notable that, as far as our simple case is concerned, the difference of adjacency matrix between two points of time, which is indicated by ΔL, is the same as the difference of distance matrix at each point of time. In a matrix formula, this equation can be given by

$$(7)\ \Delta C' = \Delta D G = \Delta L G.$$

where $\Delta C'$ is a vector whose elements are $\Delta C'(i)$ and G is also a vector whose elements are $\frac{1-g}{(\sum_{j=1}^{g} d(i,j))^2}$. In this regard, ΔD is a matrix whose components are $d(i,j)$. By definition, $\Delta D = \Delta L$. Therefore, factors that affect a changing pattern of the network, in particular a change in linkages among nodes have the influence on a changing pattern of various outcomes at each node in the network.

3.3 Calculation and Considerations

A specific pattern of network development is examined using the model framework developed above. It is necessarily for the estimation to give additional information about the size of each node, which is represented by various data such as employment, income, capacity of accommodation or attractions and so on. A representative data about size of node is assumed to be given by the table below.

The question is what made (or will make) the overall performance, for example, develop. Theoretically, there are two driving forces of development, which are 'scale effects' and 'linkage effects'. To answer this question, we need to estimate parameters in (4) or elements of various matrixes in (5). In the special case, assume that there is no difference in derivatives f_{i1}, f_{i2} *and* f_{i3} at each node, meaning that there should be a common multiplier effect of various factors which affect on outcome.

Then a process of the estimation should have the following steps;

(i) Collect data properly. Even if we could have a good data set about current income and inputs to produce tourism service, still we need their expectations, which might be predicted in a master plan with social-economic aspects. In (3), only the investment to develop a new linkage by transportation or ITs is considered. Therefore, the investment to increase connectivity between nodes is excluded[5].

(ii) Calculate the values in matrixes and vectors in (4) or (5). This procedure should be applied to both changing pattern from the Past to the Present and from the Present to the Future, repeatedly.

(iii) In general, a procedure to estimate equation (5) for each period should be followed. For the specific numerical example, all data are collectively used for estimating equation (5). By using the estimated equations, the factors that cause a change in outcomes are decomposed into two or three parts as given in (5).

It is notable that before following steps from (i) to (iii), we should know the structure of the tourism destination network and its development pattern. In other words, we need the data to draw the network graph like Figure 1 though the weights of each node in Table 2 are unnecessary. In this paper, a method to analyse a small sized network, which would have a small number of nodes and links, or a small part of the entire network is investigated. The procedures should be applicable to the network designs in which an investment to enforce linkages among nodes is planned.

For the simple example given by Figure 1 and Table 1, it should be notable that only the estimation process is meaningful because the estimates includes various statistical issues mainly related to the degree of freedom due to a shortage of the sample data. In this regard, it is assumed that there is no structural change in the production functions between two periods, Past-Present and Present-Future, so that the data of both periods can be used for a panel analysis[6].

Assume that the input at each node is given by Figure 2 Table, which also shows matrixes or vectors related to (4) and (5).

Then, the equation (4), or (5), can be estimated by the ordinary least square method and its result can be expressed as

$$\Delta y_i = -16.08 + 2.19\Delta n_i + 0.23\sum_{j\neq i}(\Delta l_{ij} n_j + l_{ij}\Delta n_j) + 0.75\sum_{j}(\Delta n_j),\ s = 2.43, r^2 = 0.855, F = 14.79 \qquad (8)$$

(6.48) (2.01) (0.41) ,

[5] As already noted in footnote 2, the connectivity between nodes can be considered.

[6] As shown in Figure 2, the averaged values of inputs for each period are used to estimate.

or the result of OLS without intercept is given by

$$\Delta y_i = +2.20\Delta n_i + 0.24\sum_{j\neq i}(\Delta l_{ij} n_j + l_{ij}\Delta n_j) + 0.05\sum_j(\Delta n_j),\ s = 2.22, r^2 = 0.789, F = 208.1 \quad (9)$$

(7.21) (2.42) (0.39) ,

where *t*-values are in parenthesis. All parameters are statistically significant except for the parameters of total network effect. As far as this example is concerned, it should be clear that the network effects positively affect the performance of a node thorough both an increase in the size of other nodes and a newly developed linkage between nodes.

Figure 2 Summary Tables of the Data

Outout performance

	Past	Present	Future
A	50	70	80
B	40	50	70
C	40	60	80
D	30	50	80

Input (Size of Node)

	Past	Present	Future
A	20	25	27
B	15	17	24
C	13	20	25
D	10	19	29

From Past to Present

dy_1		20	dn_1		5		0	0	0	0		0
dy_2	=	10	dn_2	=	2	dL=	0	0	1	0	dL^t*n=	16.5
dy_3		20	dn_3		7		0	1	0	0		16
dy_4		20	dn_4		9		0	0	0	0		0

n_1		22.5		0	1	1	1		18
n_2	=	16	L=	1	0	0	0	L^t*dn=	5
n_3		16.5		1	0	0	0		5
n_4		14.5		1	0	0	0		5

From present to Future

dy_1		10	dn_1		2		0	0	0	0		0
dy_2	=	20	dn_2	=	7	dL=	0	0	0	0	dL^t*n=	0
dy_3		20	dn_3		5		0	0	0	1		24
dy_4		30	dn_4		10		0	0	1	0		22.5

n_1		26		0	1	1	1		22
n_2	=	20.5	L=	1	0	1	0	L^t*dn=	7
n_3		22.5		1	1	0	0		9
n_4		24		1	0	0	0		2

Moreover, it is also possible to estimate the individual effect of each factor on the total outcome by the factor decomposition analysis. Applying (9) to the numerical example leads to a summary table of the factor decompositions as shown by Table 10. The total outcome can be thoroughly decomposed into three parts except for residuals because (9) includes no intercept.

Looking at not only the tourism development given in Figure 2 but the development of tourism destination network given in Figure 1 as well, Table 10 also indicates us some noteworthy points as follows: first, the direct effects are relatively large at nodes where there was (or will be) no development of network-linkages with respect to their own nodes. In fact, from the present to the future, for example, it is predicted that the situation of the network around the area 'B' will never change. Secondly, the overall effects are relatively large at the area 'B' and the area 'A' for each period of time. At the nodes where the overall effects are relatively large, the network effects are also large. This is mainly because the numerical example deals with a small sample case where there is only a little difference between the network effects and the overall effects. Thirdly, the network effects can be decomposed into two parts as (4) indicates; the effects via additional links (link effects) and the effects via changes in other node's size (node effects). They are shown by Table 11. In this regard, the area 'B' and the area 'C' had the same structural change in the network each other (see Table 6) so that there is little difference in the network effect in terms of output except for the direct effects. On the other hand, as far as the area 'A' is concerned, there is no linkage effects for both periods because no new linkage was (will be) established. However, the area 'A' has played (will play) a role as a centre of tourism site so that a closer linkage of 'A' with other nodes has contributed (will contribute) to the tourism development at the area 'A'. Fourthly, it predicts us a policy recommendation for a future strategy of the networking building for the tourism development. A development plan to build the new linkage between the area 'C' and the area 'D' aiming at the bi-polar structure will contribute to the tourism development in terms of output, from 9.2% at the area 'B' to 48.4% at the area 'A', or 26.6% in average. In this stage, introducing the cost-benefit analysis to compare the total network effects with the total investment cost of the networking will help the governments (or the planners) to make a decision if they invest or not, or how much they should invest.

Table 10 Factor Decomposition

	From Past to Present								
	Output	Estimates	Residuals	Direct Effect		Network Efeect		Overall Effect	
A	20	16.56	3.44	11.01	66.5%	4.35	26.2%	1.20	7.2%
B	10	10.80	-0.80	4.41	40.8%	5.19	48.1%	1.20	11.1%
C	20	21.69	-1.69	15.42	71.1%	5.07	23.4%	1.20	5.5%
D	20	22.23	-2.23	19.83	89.2%	1.21	5.4%	1.20	5.4%
	From Present to Future								
	Output	Estimates	Residuals	Direct Effect		Network Efeect		Overall Effect	
A	10	10.97	-0.97	4.41	40.2%	5.31	48.4%	1.25	11.4%
B	20	18.36	1.64	15.42	84.0%	1.69	9.2%	1.25	6.8%
C	20	20.24	-0.24	11.01	54.4%	7.97	39.4%	1.25	6.2%
D	30	29.20	0.80	22.03	75.4%	5.92	20.3%	1.25	4.3%

As mentioned in (5), there is another explanation about the decomposition formula. Whereas the first expression of (5) decomposes the total effect into three parts, such as the direct effects, the network effects and the overall effects, the second formation of (5) decomposes into two parts; one is the 'scale effects' due to changes in nodes' capability and another is the 'linkage effects' due to changes in linkage pattern. Hence, a change in output at each node should occur due to both the scale effects and the linkage effects. The linkage effects are shown in Table 11 and the rest of the effects are classified as the scale effects. Therefore, as shown in Table 11, it is clear that the linkage effects appears when a linkage between nodes is newly established and that they might be 17% to 37%, depending on the network structure. This means that establishing a new linkage or deepening the linkages between nodes can play important role to the tourism development although the scale effects should be its major driving force.

Table 11 A decomposition of the Network Effect

	From Past to Present					
	Network Efeect		Linkage Effect		Node Effect	
A	4.35	26.2%	0.00	0.0%	4.35	26.2%
B	5.19	48.1%	3.98	36.9%	1.21	11.2%
C	5.07	23.4%	3.86	17.8%	1.21	5.6%
D	1.21	5.4%	0.00	0.0%	1.21	5.4%
	From Present to Future					
	Network Efeect		Linkage Effect		Node Effect	
A	5.31	48.4%	0.00	0.0%	5.31	48.4%
B	1.69	9.2%	0.00	0.0%	1.69	9.2%
C	7.97	39.4%	5.80	28.6%	2.17	10.7%
D	5.92	20.3%	5.43	18.6%	0.48	1.7%

4. Conclusion and Further Remarks

It is clear that tourism in a region where the nodes of stakeholders are related to each other can be developed thorough various factors. The factors of the tourism development mainly come from investment or improvement of capacity building at each node. Continual self-evolution of each node must be the most important factor towards a sustainable development in the region. However, it is also true that in society no node or no stakeholder exists alone. Nodes or stakeholders are tied each other in a network and the network, socially or technically, promotes and shares the public benefits among nodes it actually produces. This means that the external effects by networking in a tourism site should be a vital factor leading to tourism development.

In this paper, following NA, we have provided some technical procedures that enable us to give a quantitative analysis not only from statistic but also dynamic perspectives. In particular, the paper is characterized by a dynamic analysis of the tourism destination network, which assumes the two development stages of periods; one is the period from the past to the present and another is the period from the present to the future (or the target). Incorporating two stages of periods, it becomes possible to analyse the relationship between the network development and the tourism development. Although the numerical example for the network analysis is too simple, the analytical methods predicted here must contribute to evaluate the development plans in the tourism sites, meaning that the policy measures related both to tourism development and to network development can be also recommended.

As the typical analytical measures, this paper introduces two methods; one is the method to use the quantitative data, which the actors at each node answer and, therefore, might be subjective and depending on their personality, memories and expectations. In this regard, it was proved that incorporating a Fuzzy analysis enabled us to avoid some degree of ambiguity of the data and the overall performance of the network should be estimated though there were some prototypes. This method might be easiest way to evaluate the dynamic process of networking and tourism development. However, it is still in the black box about what factors, including networking, promoted (or will promote) the tourism development. To analyse the possible factors to promote tourism development, an output function including not only inputs but also factors of networking development was introduced. Hence, it was proved that there are three major factors to produce tourism development in a network site, such as the self-capacity building of nodes, the total effect of tourism sites and the network effect on each node through changing pattern of network structure. This procedure utilizes the official data, such as income, employment and lands, at each period of time, meaning that we should include the data that are predicted in the master plans for the future at each node. Moreover, it should be also predicted how the network structure will be in the future. These procedures and data allow us to develop a dynamic analysis of the tourism destination network. From a research perspective, these two analytical ways should be applied depending on tourism sites because the possibility of the data collection may be different from site to site. Although the framework was only applied to a virtual numerical example, the procedures seem to be useful and feasible, meaning that the network analysis developed here can be applicable to the real tourism destination network.

The main findings of this research note are as follows. First, a feasible theoretical framework was given in order to estimate a changing pattern of network structure and of performance in the tourism site. Relationship between the changing pattern of networking and its performance was analysed. A numerical example proved that the network effect might be large in the node which has a large closeness centrality like ‘A’, a centre of network site, but linkage effects might be larger in the periphery of the centre of the network like ‘B’ or ‘D’. This means that newly developed linkages among nodes could contribute more to develop the periphery nodes than centre nodes. Secondly, it might be proposed from a policy perspective that as far as the virtual case is concerned, the linkage effect at each node was not so large, probably around from 18 to 29 %. Therefore, it might imply that scale effect was still the key to tourism development and every stakeholder should do everything in their respective fields although strengthening linkages among nodes might have positive effects on the tourism performance.

Many points, including a methodological procedure, yet remain to be discussed. In this paper, the outcome from the tourism destination network was simply assumed to be measured by economic variables, such as income, employment and production. In this regard, it should ask what the goal or policy target for the society to develop the tourism destination network is. The outcomes should be derived from various causes or inputs. The papers about the inputs, as the driving forces of the tourism development, via promoting networks include the followings. Properties of nodes or actors in the links are investigated from the businesses and organizations perspectives in Lemmetynen and Go (2009), Tinley and Lynch (2001), Oztruck (2009), and Novelli et al. (2006). On the other hand, Briedenhann and Wickens (2004), Nash (2006), March and Wilkinson (2009) were focused on the measures to link including some physical measures as roads or human-related sources of the partnership and cooperative or value-creation process. In the preceding research, broad perspectives of outcomes include mainly the society, economics, governance and environmental perspectives. Sustainability was analyzed by Oztruck and Eraydin (2010), Fadeeva (2005), and Halme (2001). Transformation and evolution patterns of relationship between organizations were investigated by Pavlovich (2003), and Scott and Cooper (2007). Moreover, Larsen, et al. (2007), and Gibson et al. (2005) mentioned the importance of the social life of the people and their connectivity in the society towards sustainable tourism. The role of the network in the community on the policy planning and its designs was stressed by Dredge (2006a, 2006b), and Pforr

(2006). From the tourism development perspectives, the final object, the society targets should be the sustainable economic prosperity because the social structure is basically maintained by the businesses which employ people and support a family in the community. However, if the network development is enforced by the development of nodes and links, and if this leads to the development of the human relationships or other relationships among organizations in the tourism network, it can be proven that the development of the tourism network should lead to a better economic situation of the tourism sites. In this sense, any observations about these positive effects of the network development on the human relationship, the policy planning and the sustainable aspects can lead to a conclusion that they should indirectly affect an economic or business development. Therefore, these intermediate effects, or outcomes, may be classified as the efficient cause, which Adam Smith once mentioned to explain the important role of division of the labor. Though this task may be beyond us, we should take the relationship between the efficient cause and the final outcomes, though A. Smith named it the final cause.

There are some technical issues. As already mentioned, a small number of sample data should be efficiently analysed by using a fuzzy function and by estimating the performance scores (PS) for each node or the performance index for entire network site (PI), though there might be some prototypes of them. A problem is if it can be confirmed how PS or PI is related to a changing pattern of network structure of the tourism destination network site. Unfortunately, it cannot be estimated in the paper mainly due to an insufficient degree of freedom of the sample data. Of course, the main target of this research is to estimate the performance of the tourism sites and investigate its cause and effects from the network analysis perspectives. The next step is clearly to put the methods developed here to practical, not virtual, use.

References

Baggio, R.,Scott,N. and Cooper,C. (2010) “Network Science A Review Focused on Tourism,” *Annals of Tourism Research*, doi.10.1016/J.annals,2010.02.008.

Briedenhann, J. and Wickens, E. (2004) “Tourism routes as a tool for economic develop ment of rural areas – vibrant hope or impossible dream?” *Tourism Management*, 25, 1, 71-79.

Chan,F.T.S., Qi,H.J..,Chan,H.K., Lau,H.C.W. and Ip R.W.L (2003) “A conceptual model of performance measurement for supply chains,” *Management Decision*, 41/7, 635-641.

Dredge, D. (2006a) “Policy networks and the organisation of tourism,” *Tourism*

Management, 27, 2, 269-280.
Dredge, D. (2006b) “Networks, conflict and collaborative communities,” *Journal of Sustainable Tourism*, 14, 6, 562-581.
Fadeeve,Z. (2005) “Translation of sustainability ideas in tourism networks: Some roles of cross-sectional networks in change towards sustainable development,” *Journal of Cleaner Production*, 13,2,175-189.
Freeman, L.C. (1979) “Centrality in social networks conceptual clarification,” *Social Networks, Volume 1, Issue 3, 215-239.*
Gibson, L., Lynch, P. and Morrison, A. (2005), “The local destination tourism network: Development issues,” *Tourism and Hospitality Planning and Development*, 2, 2, 87-99.
Halme (2001) “Learning for sustainable development in tourism networks,” *Business Strategy and the Environment*, 10, 100-114.
Knoke, D. and Yang, S (2008), *Social Network Analysis*, 2nd edititon, SAGA Publications.
Larsen,J, Urry, J. and Axhausen, K.W. (2007) “Networks and tourism: Mobile Social Life,” *Annals of Tourism Research*, 34, 1, 244-262.
Lemmetyinen,A. and GO, F.M. (2009) “The key capabilities required for managing tourism business networks,” Tourism Management, 30,1,31-40.
March, R. and Wilkinson, I. (2009) “Conceptual tools for evaluating tourism partner-ship,” *Tourism Management*, 30, 3, 455-462.
Nash, R. (2006) “Causal network methodology: Tourism research applications,” *Annals of Tourism Research*, 33, 4, 918-938.
Novelli, M. Schnitz, B. and Spencer, T. (2006) “Networks, clusters and Innovation in tourism :A UK experience,” Tourism Management, 27, 6, 1141-1152.
Oztruck,E and Eraydin, A.(2010), “Environmental governance for sustainable tourism development: Collaborative networks and organisation building
Pavlovich, K. (2003) “The evolution and transformation of a tourism destination network: the Waitomo Caves, New Zealand,” Tourism Management, 24, 2, 203-216.
Pforr, C. (2006) “Tourism policy in the making: An Australian network study,”*Annals of Tourism Research*, 33, 1, 87-108.
Pyo, S. (In press) “Measuring tourism chain performance,” Service Industries Journal.
Scott,N. and Cooper, C. (2007) “Network analysis as a research tool for understanding tourism destinations,” *Development in Tourism Research*, Chapter 14, 199-219.
Scott, N., Cooper, C. and Baggio, R. (2007) “Destination Networks: Four Australian

Cases," *Annals of Tourism Research*, 35,169-188

Scott, N., Baggio, R. Cooper, C. (2008) *Network Analysis and Tourism; From theory to practice*, Channel View Publications.

Selin, S. and Beason, K. (1991) "Interorganizational relations in tourism," *Annals of Tourism Research*, 18, 4, 639-652.

Shin, H-Y. (2006) "Network characteristics of drive tourism destinations: An application of network analysis in tourism," *Tourism Management*, 27, 1029-1039.

Tinsely,R. and Lynch,P. (2001) "Small tourism business networks and destination development," *International Journal of Hospitality Management*, 20,4,367-378.

Zhang,X., Song, H. and Huang, G.Q. (2009) "Tourism supply chain management: A new research agenda," *Tourism Management*, 30, 345-358.