Evaluating Chinese Tourists' Service Quality Criteria under Uncertainty

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Abstract

Previous studies on tourist service quality (TSQ) involved various data to represent objective and reliable outcomes as references to explain customers' preference, but different stage of sentences understanding from the respondents could have misled the results. The Fuzzy Decision Making Trial and Evaluation Laboratory (Fuzzy DEMATEL) was applied in this study to testify TSQ criteria from tourists' viewpoint, producing a service quality causal model for the industry and the academics. Fuzzy DEMATEL converted the interrelationships of criteria into a cause and effect model, and also handle the inner dependences within a set of criteria. This study used literature review to attribute the twenty-two evaluation criteria to compose the survey instrument. Purposive sampling method was employed for collecting the TSQ. We found safety and considerate tourist arrangement, appropriate hardware and facilities at tourist attractions, and travel agency's service quality comprise the priority of TSQ in those of Chinese customers. The results and managerial implications are discussed. The post survey is further proved the validity of result.

Key Words: Fuzzy Decision Making Trial and Evaluation Laboratory, tourists' service quality, Evaluation criteria.

Introduction

In recent years, there has been a stable growth in the tourism demands in Taiwan. According to Cross Strait Economic Statistics Monthly, an estimation showed there were more than 4.83 million Chinese tourists have visited Taiwan since July 2008 to the end of 2012, equal to a NTD$243.3 billion foreign income for Taiwanese economy, which is a positive result of Taiwan tourism promotion to Chinese tourists (Tourism Bureau, 2012). Statistics from Tourism Bureau and National Immigration Agency has also pointed out a 22% increase number of Chinese tourist comparing January to March of 2012 and 2013, combining with the 1.17 million Chinese tourists in 2010, the Taiwanese tourist market had received 91 billion foreign income and other prosperous opportunities. National Immigration Agency revealed that from July 2008 to February 2012, the number of Chinese tourists had reached 3.4 million (Tourism Bureau, 2014).Geographic advantage and tourists' service quality (TSQ) in Hong Kong attract most of the Chinese tourists. There is no doubt that Chinese tourist has become a critical role of Taiwanese tourism. Taiwan needs to enhance the tourists' service quality to its strength.

Service quality is a fuzzy and difficult to measure (Chen, 2014). The subjective recognition of customers and uncertain environment also makes it difficult to obtain a consistent result in the service evaluation criteria. Recent studies on service quality were focused on the relationship between organizational commitment (Burgers, de Ruyter, Keen & Streukens, 2000；Jacob, Guéguen & Boulbry, 2014), job satisfaction (Zeithaml & Bitner, 2000; Jung & Yoon, 2013), job performance (Boshoff & Allen, 2000；Jacob, Guéguen & Boulbry, 2014), service quality (Burgers, de Ruyter, Keen & Streukens, 2000；Jacob, Guéguen & Boulbry, 2014), or defining service quality model differences (Carrillat, Jaramillo & Mulki, 2007; Landrum, Prybutok & Zhang, 2007; Brandon-Jones & Silvestro, 2010), very few researches were conducted to examine the mutual relationships and cause-effect relations among the variables. Although previous studies helped clarify relationship between service quality and related factors, limited resources were provided for tourism to apply evaluation criteria of service quality as a decision making tool.

In order to take everything into account and have a complete service quality evaluation criteria result, this study uses the Decision Making Trial and Evaluation Laboratory (DEMATEL) method as the research tool. The DEMATEL method mainly analyzes the relationships among the various factors in the social sciences, as well as the cause-effect relations among various factors. DEMATEL is not like the Intuitive method of nonlinear system, we quantify the complexes and observe direct and indirect correlation (Wang, 2011), decreasing the bias from subjective perception of the respondent. At the same time, this method can sort out the different cause and effect relations based on the evaluation criteria and differentiate the factors based on the degree of effect amongst other criteria. The factors with the maximum cause are known as the cause criteria and the criteria that are largely affected do not possess any influences, and are known as effect criteria. Therefore, the application of this method can make up for the above deficiency and provide the target with ample information to measure TSQ and assist in understanding the evaluation processes of service quality, the degree of importance and mutual influences among various cause factors.

At present, tourism industry between the two straits has already opened up. Establishing service quality evaluation criteria of Chinese tourists and understanding cause-effect relations and association of the criteria are important and urgent issues. In short, this study aims to examine the connotations of service quality evaluation criteria of Chinese tourists and to discover the direct cause and effect relations among evaluation criteria.

Literature Review

The quality of tourism service industry has an intangibility characteristic (Juneja, Ahmad, & Kumar, 2011) and produces instable quality. When the intangibility of the quality is higher, its variability is also increasing (Pride & Ferrell, 2012). Current studies of service quality in various industries are mostly described the structural relationship during public service process, such as service quality and financial performance (Chen, 2014; Rhou & Koh, 2014), service quality and customer satisfaction (Jacob, Guéguen & Boulbry, 2014), service quality and customer retention (Ponnam & Balaji, 2014), service quality and repurchasing behavior (Sharma, Moon & Strohbehn, 2014; Park & Jang, 2014) and service quality and differentiated competitive advantage (Chen, 2014). These researches represent that industries have an inconsistent trend in the evaluation structure and connotations of service quality (Bhaskar & Shekhar, 2011; Lenka, Suar & Mohapatra, 2010; Sharma, Moon & Strohbehn, 2014).

Five common service quality evaluation criteria aspects include tangibles, reliability, responsiveness, assurance and empathy. These aspects have received suspicions and criticisms by many scholars (Campos & Marodin, 2012; Juneja, Ahmad & Kumar, 2011). The research of Chen (2014) pointed out that these five aspects are fluctuant when evaluating different industries. Campos and Marodin (2012) considered that the P.Z.B. service quality concept and SERVQUAL operational models are not adequate and cannot evaluate

the customers' purchasing desire. Bhaskar & Shekhar (2011) criticized that the overall explanations of the measured results from these aspects are inadequate. This study tested the applicability of this scale using these mentioned service quality evaluation criteria. According to the "SERVQUAL" scale developed by Parasuraman, Zeithaml and Berry (1985), the contents of 10 factors were used and combined with the tourists' service quality needs and are generalized into 22 items of evaluation criteria, which are then applied as the basis of developing the questionnaires and analyzing the discussions. These include: (1) Accessibility: friendly environment and personnel, and easy to use facilities (Parasuraman et al., 1985); (2) Communication: exchanging opinions with customers and problem solving assistance (Parasuraman et al., 1985); (3) Competence: the expertise skills needed during the service process (Parasuraman et al., 1985); (4) Courtesy: well groomed and proper attitude of service personnel (Parasuraman et al., 1985); (5) Credibility: well trained service personnel as credited by customers (Parasuraman et al., 1985; Juran, 1986; Martin, 1986); (6) Reliability: the ability to provide committed services to customers precisely (Parasuraman et al., 1985; Zimmerman, 1985; Martin, 1986; Parasuraman et al., 1988); (7) Responsiveness: the will of helping customers and provide service rapidly (Parasuraman et al., 1985; Zimmerman, 1985; Parasuraman et al., 1988); (8) Security: assuring the safety of customers' life and finances(Parasuraman et al., 1985); (9) Tangibles: the actual service facilities and personnel (Parasuraman et al., 1985; Juran, 1986; Parasuraman et al., 1988); (10) Understanding/knowing customers: being considerate and providing individual caring during the service (Parasuraman et al., 1985; Zimmerman, 1985; Parasuraman et al., 1988). These are the demanding criteria when customers evaluate the service quality. The overall service quality performance can be measured by tourism industries using these evaluation criteria.

Taiwan's tourism researches are mostly discussing the differences between expectations and receptions of customers towards service (Parasuraman et al., 1985；Campos & Marodin, 2012; Chen, 2014), or the relationship between service quality and degree of loyalty as the basis of study comparisons (Jung & Yoon, 2013; Läikkö-Roto & Nevas, 2014; Park & Jang, 2014). The above studies did not state about the connotations of related evaluation criteria of TSQ and lacks of the degree of importance and related association among various criteria. This study reviewed the contents of the mentioned articles and based on the service quality criteria model, 22 items of evaluation criteria were generalized for the study questionnaire and the discussion developing. We then examined the above literatures with a pilot test, a Fuzzy DEMATEL l questionnaire was taken out to further discuss the connotation of TSQ evaluation criteria and the related associations among each criterion.

Methodology

We designed the "Chinese tourists' service quality Fuzzy DEMATEL scale", the reliability and validity of the scale were assured by item analysis after summarizing information from previous literature review. Study data and result interpretation were collected and analyzed by the scale. During the process, the fuzzy concepts are incorporated into the criteria performance value. The weights and fuzzy performance value of each criterion are then integrated to obtain the strategic matrix, and fuzzy DEMETAL method is used to evaluate the cause-effect relations and associations among each criterion.

Respondents

Politics blocks communications, including tourism. However, ever since the government proposed the plan of increasing tourists in 2002, there were 3.71 million people in 2007, compared to 2.62 million in 2000, the growth rate has increased by 41.83%. In December 2007, the highest monthly visitor number of 363.9 thousand people was recorded (National Archives Administration, 2008). Statistics from Tourism Bureau and National Immigration Agency has also pointed out a 22% increase number of Chinese tourist comparing January to March of 2012 and 2013, combining with the 1.17 million Chinese tourists in 2010. The Taiwanese tourist market had received 91 billion foreign income and other prosperous opportunities. There is no doubt that Chinese tourist has become a critical role of Taiwanese tourism. National

Immigration Agency revealed that from July 2008 to February 2012, the number of Chinese tourists had reached 3.4 million (Tourism Bureau, 2014). There is no doubt that Chinese tourist has become a critical role of Taiwanese tourism.

Therefore, this study cooperates with two travel agencies in north Taiwan, the Chinese tourists' service quality Fuzzy DEMATEL scale was used to collect Chinese tourists' perception of TSQ during their visit. 89 questionnaires were gathered from May 1 to June 30, 2013.

Questionnaire Design

The research tool of this study is a DEMATEL methodology questionnaire to examine the direct/indirect effects of Chinese tourists' service quality evaluation criteria, and DEMATEL is applied to discover association between indicators. The procedure includes question defining, data collecting and the analysis of validity and reliability to assure that the questionnaire quality meets the standard. The development of the questionnaire is explained as below.

(1) Research Questions

In order to assure the validity of the "Chinese tourists' service quality Fuzzy DEMATEL scale", we invited 2 travel agent employees with more than five years work experience (1 human resources department manager, 1 tour guide) to discuss each of the questions and check if they match with the 17 items of evaluation criteria which confirmed by experts. Table 1 shows the questions left after pilot test.

Table 1. Evaluation Criteria of Airlines Service Quality

Original Items	New Items
C1. Reachable assistance	C1. Reachable assistance
C2. Mutually communications	C2. Mutually communications
C3. Conversation using customers' language	Deleted
C4. Glad to receive feedback from customers	C3. Glad to receive feedback from customers
C5. Proper skills and knowledge for the given services	C4. Proper skills and knowledge for the given services
C6. Good service manner	C5. Good service manner
C7. Well groomed staff	C6. Well groomed staff
C8. Friendly attitude	C7. Friendly attitude
C9. Ability to give customers the feeling of trust	C8. Ability to give customers the feeling of trust
C10. Your happiness is our priority	C9. Your happiness is our priority
C11. Keep the promise	C10. Keep the promise
C12. Fast and proper service	C11. Fast and proper service
C13. Active and initiative service attitude	Deleted
C14. Safe travel itinerary	Deleted
C15. Safe transactions	C12. Safe transactions
C16. Services match with your needs	C13. Services match with your needs
C17. Trendy facilities	C14. Trendy facilities
C18. Famous attractions	C15. Famous attractions
C19. Concern about your needs	C16. Concern about your needs
C20. Problem solving	C17. Problem solving
C21. Customized package provided	Deleted
C22. Customized tour arrangement	Deleted

(2) Data collection

Pilot test was carried out after the questionnaire editing for the validity and reliability. Chinese tourists were recruited in the study. The Purposive Sampling method was used and the questionnaire was distributed under the cooperation with two airlines- China Airlines and Eva Airlines, at the time the Chinese tourists' arrival. A total of 100 questionnaires were sent out and 38 were retrieved. The retrieval rate was 38% from April 1 to April 30, 2013.

On the aspect of the reliability and validity analyses, the Cronbach's α coefficient was used to measure the consistency of each dimension. The α coefficient of assurance was 0.78. The α coefficient of reliability was 0.72. The α coefficient of responsiveness, tangibility and empathy was 0.72, 0.76, and 0.81, respectively. The α coefficient of the overall questionnaire was 0.82. The Cronbach's α coefficient of the various aspects were all higher than 0.7. This shows that a high internal consistency of the questionnaire (Nunnally & Bernstein, 1994). This research also used factor analysis to obtain the factor matrix of the various items in the scale. The size of the factor load in the matrix was used to determine validity and appropriateness of the structure. All the questions with a load factor higher than 0.3 (Bluman, 2008) was used as the basis of determination to assure the validity of the questionnaire.

(3) Implementation

This study cooperates with two travel agencies in north Taiwan, 200 questionnaires were distributed and 89 were retrieved. The effective retrieval rate was 44.5%. Among the samples retrieved, the first time visitors occupied 68%. The formal testing duration (May 1 to June 30, 2012) and the pilot test (April 1 to April 30, 2013) were separated to avoid repeated respondent. Moreover, considering the differences in the perception of service quality by various customers in these two travel agencies, t-test was conducted for all the data collected. The t-test value was not significant (p value = .83>.05), showing that these tourists had similar perception of service quality. The Microsoft Excel (2007) was employed to analyze the statistical calculations, so as to examine the service quality evaluation criteria of the Chinese tourists. The calculated results are shown in appendix 1, 2, 3.

Discussions and Conclusions

In this research, D+R value (prominence) was obtained by adding total rows and total columns. The greater D+R value and those higher than the total mean (4.122) represent significant importance in the overall evaluation criteria, and play a critical role in the evaluation criteria of Chinese tourist service quality. The 13 critical evaluation criteria were sorted as: "C17.Trendy facilities", "C12.Fast and proper service", "C14.Safe travel itinerary", "C9.Ability to give customers the feeling of trust", "C15. Safe transactions", "C16. Services match with your needs", "C22. Customized tour arrangement", "C19.Concern about your needs", "C20.Problem solving", "C21. Customized package provided", "C18. Famous attractions", "C5.Proper skills and knowledge for the given services", and "C13. Active and initiative service attitude" (Table 2).

Table 2. Summary of Chinese tourist service quality effect relations

Sum of rows(D)		Sum of columns(R)		D + R		D - R	
item	value	item	value	item	value	item	value
C16	3.7730	C1	2.2679	**C4**	4.8070	C17	3.5454
C17	3.7394	C2	2.1863	**C3**	4.6518	C16	3.3839
C14	3.6857	C3	2.0692	**C6**	4.5527	C14	3.0163
C13	3.1802	C4	1.9418	**C8**	4.4782	C13	2.3654
C11	3.1628	C5	1.8183	**C5**	4.4218	C15	2.1139
C8	3.0199	C6	1.6979	**C14**	4.3550	C11	2.0722

C12	3.0057	C7	1.5713	**C1**	4.2914	C12	2.0593
C4	2.8652	C8	1.4583	**C11**	4.2534	C8	1.5616
C6	2.8548	C9	1.2910	**C16**	4.1622	C10	1.3935
C15	2.6260	C10	1.2037	**C7**	4.1409	C6	1.1569
C5	2.6036	C11	1.0906	C2	4.0802	C7	0.9984
C10	2.5972	C12	0.9464	C13	3.9949	C4	0.9234
C3	2.5826	C13	0.8147	C12	3.9521	C5	0.7853
C7	2.5697	C14	0.6693	C17	3.9334	C3	0.5134
C1	2.0235	C15	0.5121	C10	3.8009	C9	0.4844
C2	1.8939	C16	0.3891	C15	3.1381	C1	-0.2444
C9	1.7754	C17	0.1940	C9	3.0664	C2	-0.2924

Note: the evaluation criteria D+R value higher than the total mean (4.122)

Discussions

In this research, D+R value (prominence) was obtained by adding total rows and total columns. The greater D+R value and those higher than the total mean (4.122) represent significant importance in the overall evaluation criteria, and play a critical role in the evaluation criteria of Chinese tourist service quality. The 13 critical evaluation criteria were sorted as: "C17.Trendy facilities", "C12.Fast and proper service", "C14.Safe travel itinerary", "C9.Ability to give customers the feeling of trust", "C15. Safe transactions", "C16. Services match with your needs", "C22. Customized tour arrangement", "C19.Concern about your needs", "C20.Problem solving", "C21. Customized package provided", "C18. Famous attractions", "C5.Proper skills and knowledge for the given services", and "C13. Active and initiative service attitude"

Generalizing the above research findings we found that customized package, trendy facilities and proper service are the most concerning evaluation criteria perceived by Chinese tourists. We sort the D+R value (prominence value) of these evaluation criteria, the top three are C5.

DEMETAL Causal Diagram

Proper skills and knowledge for the given services, C3. Glad to receive feedback from customers, and C6. Well groomed staff. This shows that these 3 evaluation criteria were given the most importance by the Chinese tourists with regards to service quality. However, criteria C9. Your happiness is our priority, C15. Famous attractions, and C10. Keep the promise were the last three in the sorting. We suggest other more appropriate items of evaluation criteria to be developed to enhance the TSQ of Chinese tourists. These three lowest D+R value evaluation criteria have also pointed out most of the Chinese tourists are familiar with Taiwanese attractions and are satisfied with the tourist services, so criteria C9 and C10 are not as required as other evaluation criteria.

Conclusions

Two major conclusions were obtained in this research:

(1) The connotations of service quality evaluation criteria of Chinese tourists include 10 items: Proper skills and knowledge from the staff, good service manner, well groomed staff, glad to receive feedback from customers, and ability to give customers the feeling of trust, etc.

Ten service quality evaluation criteria of Chinese tourists were selected according to data analysis of the research as following: C4. Proper skills and knowledge for the given services, C3. Glad to receive feedback from customers, C6. Well groomed staff, C8. Ability to give customers the feeling of trust, C5. Good service manner, C14. Trendy facilities, C1. Reachable assistance, C11. Fast and proper service, C16. Care about your needs, and C7. Friendly attitude. These ten connotations involve five service quality dimensions by Parasuraman et al.(1988), such as C3, C1, C7 for empathy; C14 for tangibles; C11, C16 for responsiveness; C4, C6 for reliability; C8, C5 for assurance. Besides the appropriateness of the scale, these information also show that proper skills and knowledge from the staff, good service manner, well groomed staff, ability to give customers the feeling of trust, providing information to customers for further discussion have increased efficiency of the service quality.

(2) The most important service quality evaluation criteria for Chinese tourists is proper skills and knowledge of the staff

There are three items of evaluation criteria directly affect the service quality evaluation criteria of Chinese tourists, which include: C17. Problem solving, C16. Concern about your needs and C14. Trendy facilities. In other words, Chinese tourists give importance to the attraction facilities, and concerning about customers' needs makes emphasis on the quality of service process. Another important topic for Taiwanese travel agencies is how to obtain the feeling of trust from Chinese tourists. Having conversation with customers to fulfill their needs may be an effective strategy. If the criteria has not satisfied, other evaluation criteria could be influenced, even the TSQ value could be worsen.

The managerial implications of this research revealed that besides good scenic spots, Chinese tourists measure their tourists' service quality by the professional service processes which at the same time affect their perception of TSQ. In other words, the connotations of tourists' service quality evaluation criteria that travel agencies in Taiwan must give importance to, not only includes appropriate itinerary, but the service attitude and professional behavior of service personnel should show empathy, which will directly affect the entire TSQ.

Moreover, communication plays a critical role in service quality. Understanding the needs before the tour sets out shows greater importance. Once the conflict has occurred during the trip, conversation with customers will not be helpful. However, safety issue was not that much as expected, but concerning and having the ability to deal with their needs affect the decision whether Chinese tourists are booking Taiwan for the next visit. Recommendation to include empathy into on job training program for the tourism staffs as a practical managerial implication for the industry.

On the aspect of tourism personnel, current certificates emphasize professional knowledge, service attitude and tour guide skills. However, to testify the great service manner needs more practical and comprehensive system to establish adding value of tourism professionals (Harte & Dale, 1995). Another possible solution is that travel agencies apply personality traits scale to recruit tourism personnel(Judge, Heller & Mount, 2002；Jung & Yoon, 2013), and use customer satisfaction or complaints as evaluation criteria of TSQ.

Implications and Limitations

The communications between the two straits are experiencing a big leap. Chinese visitors are playing a critical role to Taiwan's economy. Taiwan's economic achievements are no doubt of a developed country, but the recent recession has caused the market unable to expend to greater scale, promoting tourism thus has become a policy that is so popular in the public sector. To fully understand the ideal service quality among Chinese visitors is so important for a resource limiting country which is promoting its tourism. Our results are some of the examples for those countries aiming on tourist business. Chinese visitors are nearly 20% of the general visitors in Taiwan (Tourism Bureau, 2014), the representativeness is believed with a sufficient quality for the academia and the tourism.

Implications

This paper attempted to contribute to the development of the holistic framework that effectively investigates the causal relationship and the degree of association between each criterion. The causal diagram produced from our study provides assessment criteria for the quality assessment for Chinese visitors' itinerary arrangement when visiting Taiwan. The findings of this study, moreover, provide a foundation for further research, with the goal of more deeply investigating issues surrounding the quality of tourism. Meanwhile, provide a valuable framework to describe service solutions.

The findings also offer a meaningful basis for tourism industry managers to deepen their understanding with regard to tourists' service quality. From the industry's view point, we have confirmed that the tourism service quality is more likely to enhance customers' satisfaction than the environmental quality in our study. In other words, customized itinerary could be the priority for the agencies. Especially nowadays visitors are more familiar with destination's attractions due to widely spread information. Travel agencies will not earn recognitions from customers unless showing expertise and high service quality.

Limitations

We have reviewed the framework for tourist service quality perception, the information provides certain contribution for Taiwan's future tourist development, and serves as a reference for other island countries that are willing to promoting tourist with limiting resource.

However, this study has some limitations. The respondents are Chinese visitors. Cultural and service quality perceptions are differ between countries (Johnson, 2014). We suggest further study to figure out customers' preference to identify the needs of different types of customer and the key to improve tourists' satisfaction. Moreover, External validity of study findings and outcomes is also suggested.

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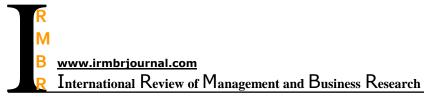
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Appendix 1 Producing Direct-Relation Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
C1	0.1000	0.8658	0.2618	0.2618	0.2618	0.2233	0.2363	0.6532	0.2566	0.2363	0.8679	0.4753	0.4666	0.1922	0.1922	0.6735	0.6735
C2	0.6839	0.0857	0.2618	0.2618	0.2618	0.4333	0.2566	0.8606	0.2566	0.2566	0.6839	0.4753	0.2566	0.2513	0.8273	0.2566	0.2566
C3	0.5150	0.2618	0.0857	0.8658	0.2618	0.1922	0.8606	0.8606	0.6735	0.2566	0.8679	0.8424	0.8606	0.7962	0.2233	0.2566	0.2566
C4	0.3055	0.2618	0.8658	0.0857	0.8658	0.6401	0.8606	0.4666	0.2363	0.2566	0.6839	0.8627	0.8606	0.8273	0.2513	0.6735	0.6735
C5	0.3715	0.2618	0.2618	0.8658	0.0857	0.2513	0.2566	0.4666	0.2566	0.2566	0.6714	0.8627	0.8606	0.8553	0.2513	0.8606	0.8606
C6	0.3646	0.6787	0.6787	0.6787	0.2618	0.0143	0.2566	0.4666	0.6532	0.8606	0.8679	0.8424	0.8403	0.7962	0.7962	0.4463	0.4463
C7	0.3055	0.2493	0.6787	0.6787	0.2618	0.2513	0.0500	0.6735	0.8606	0.2566	0.8679	0.8627	0.8403	0.7962	0.2233	0.4666	0.4666
C8	0.8679	0.8658	0.8658	0.4718	0.2618	0.6682	0.2566	0.0500	0.8606	0.8606	0.8679	0.8627	0.8606	0.8553	0.8553	0.2566	0.2566
C9	0.3365	0.2618	0.2618	0.2618	0.2618	0.4614	0.6735	0.8606	0.0500	0.8606	0.3055	0.3313	0.2566	0.2513	0.2513	0.2566	0.2566
C10	0.3055	0.2618	0.2493	0.2618	0.2618	0.6682	0.4666	0.8606	0.8606	0.0500	0.8679	0.8627	0.8606	0.7962	0.8553	0.2566	0.2566
C11	0.4805	0.2618	0.8658	0.8658	0.8658	0.8553	0.8606	0.8606	0.2566	0.8606	0.1000	0.8627	0.8606	0.8273	0.8553	0.2566	0.2566
C12	0.3646	0.6787	0.8658	0.8534	0.4718	0.4958	0.8606	0.8606	0.2566	0.8606	0.8679	0.0643	0.8606	0.8273	0.8273	0.2566	0.2566
C13	0.4805	0.6787	0.8658	0.8658	0.6787	0.8273	0.8606	0.8606	0.2566	0.8606	0.8679	0.8627	0.0500	0.8273	0.8553	0.2566	0.2566
C14	0.3646	0.8658	0.8658	0.8658	0.8658	0.6682	0.8606	0.8606	0.8606	0.8606	0.8679	0.8627	0.8403	0.0143	0.7962	0.8403	0.8403
C15	0.3996	0.6787	0.2618	0.2844	0.2618	0.8273	0.2566	0.2566	0.2566	0.8606	0.8679	0.8627	0.4463	0.6091	0.0143	0.8606	0.8606
C16	0.8679	0.8534	0.8658	0.8658	0.8658	0.6682	0.8606	0.8606	0.6735	0.8606	0.8679	0.8627	0.8403	0.7962	0.8553	0.0500	0.8606
C17	0.8679	0.8534	0.8534	0.8658	0.8658	0.6682	0.8403	0.8403	0.6735	0.8403	0.8679	0.8112	0.8403	0.7962	0.8553	0.8606	0.0500

Appendix 2 Standardized Direct-Relation Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
C1	0.0075	0.0647	0.0196	0.0196	0.0196	0.0167	0.0177	0.0488	0.0192	0.0177	0.0649	0.0355	0.0349	0.0144	0.0144	0.0504	0.0504
C2	0.0511	0.0064	0.0196	0.0196	0.0196	0.0324	0.0192	0.0643	0.0192	0.0192	0.0511	0.0355	0.0192	0.0188	0.0619	0.0192	0.0192
C3	0.0385	0.0196	0.0064	0.0647	0.0196	0.0144	0.0643	0.0643	0.0504	0.0192	0.0649	0.0630	0.0643	0.0595	0.0167	0.0192	0.0192
C4	0.0228	0.0196	0.0647	0.0064	0.0647	0.0479	0.0643	0.0349	0.0177	0.0192	0.0511	0.0645	0.0643	0.0619	0.0188	0.0504	0.0504
C5	0.0278	0.0196	0.0196	0.0647	0.0064	0.0188	0.0192	0.0349	0.0192	0.0192	0.0502	0.0645	0.0643	0.0639	0.0188	0.0643	0.0643
C6	0.0273	0.0507	0.0507	0.0507	0.0196	0.0011	0.0192	0.0349	0.0488	0.0643	0.0649	0.0630	0.0628	0.0595	0.0595	0.0334	0.0334
C7	0.0228	0.0186	0.0507	0.0507	0.0196	0.0188	0.0037	0.0504	0.0643	0.0192	0.0649	0.0645	0.0628	0.0595	0.0167	0.0349	0.0349
C8	0.0649	0.0647	0.0647	0.0353	0.0196	0.0500	0.0192	0.0037	0.0643	0.0643	0.0649	0.0645	0.0643	0.0639	0.0639	0.0192	0.0192
C9	0.0252	0.0196	0.0196	0.0196	0.0196	0.0345	0.0504	0.0643	0.0037	0.0643	0.0228	0.0248	0.0192	0.0188	0.0188	0.0192	0.0192
C10	0.0228	0.0196	0.0186	0.0196	0.0196	0.0500	0.0349	0.0643	0.0643	0.0037	0.0649	0.0645	0.0643	0.0595	0.0639	0.0192	0.0192
C11	0.0359	0.0196	0.0647	0.0647	0.0647	0.0639	0.0643	0.0643	0.0192	0.0643	0.0075	0.0645	0.0643	0.0619	0.0639	0.0192	0.0192
C12	0.0273	0.0507	0.0647	0.0638	0.0353	0.0371	0.0643	0.0643	0.0192	0.0643	0.0649	0.0048	0.0643	0.0619	0.0619	0.0192	0.0192

C13	0.0359	0.0507	0.0647	0.0647	0.0507	0.0619	0.0643	0.0643	0.0192	0.0643	0.0649	0.0645	0.0037	0.0619	0.0639	0.0192	0.0192
C14	0.0273	0.0647	0.0647	0.0647	0.0647	0.0500	0.0643	0.0643	0.0643	0.0643	0.0649	0.0645	0.0628	0.0011	0.0595	0.0628	0.0628
C15	0.0299	0.0507	0.0196	0.0213	0.0196	0.0619	0.0192	0.0192	0.0192	0.0643	0.0649	0.0645	0.0334	0.0455	0.0011	0.0643	0.0643
C16	0.0649	0.0638	0.0647	0.0647	0.0647	0.0500	0.0643	0.0643	0.0504	0.0643	0.0649	0.0645	0.0628	0.0595	0.0639	0.0037	0.0643
C17	0.0649	0.0638	0.0638	0.0647	0.0647	0.0500	0.0628	0.0628	0.0504	0.0628	0.0649	0.0607	0.0628	0.0595	0.0639	0.0643	0.0037

Appendix 3 Direct/Indirect Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
C1	0.0816	0.1438	0.1125	0.1124	0.0934	0.0993	0.1059	0.1530	0.0920	0.1115	0.1773	0.1464	0.1394	0.1157	0.1076	0.1159	0.1159
C2	0.1171	0.0831	0.1048	0.1043	0.0858	0.1088	0.0989	0.1580	0.0872	0.1074	0.1575	0.1395	0.1176	0.1130	0.1445	0.0833	0.0833
C3	0.1274	0.1210	0.1268	0.1816	0.1136	0.1192	0.1769	0.1959	0.1430	0.1383	0.2086	0.2037	0.1977	0.1872	0.1311	0.1052	0.1052
C4	0.1236	0.1330	0.1955	0.1427	0.1674	0.1608	0.1893	0.1829	0.1234	0.1510	0.2134	0.2226	0.2146	0.2057	0.1466	0.1464	0.1464
C5	0.1203	0.1249	0.1423	0.1851	0.1052	0.1259	0.1369	0.1697	0.1137	0.1410	0.1972	0.2074	0.2000	0.1936	0.1372	0.1516	0.1516
C6	0.1266	0.1615	0.1786	0.1791	0.1226	0.1185	0.1453	0.1825	0.1507	0.1946	0.2244	0.2188	0.2091	0.2000	0.1862	0.1281	0.1281
C7	0.1130	0.1200	0.1687	0.1687	0.1139	0.1234	0.1197	0.1831	0.1557	0.1394	0.2075	0.2042	0.1954	0.1865	0.1317	0.1194	0.1194
C8	0.1673	0.1815	0.1969	0.1703	0.1259	0.1704	0.1504	0.1608	0.1707	0.2012	0.2336	0.2278	0.2174	0.2100	0.1964	0.1197	0.1197
C9	0.0873	0.0894	0.0995	0.0989	0.0807	0.1050	0.1239	0.1532	0.0715	0.1435	0.1241	0.1233	0.1129	0.1084	0.0985	0.0776	0.0776
C10	0.1131	0.1234	0.1376	0.1381	0.1120	0.1553	0.1471	0.1956	0.1567	0.1279	0.2096	0.2058	0.1969	0.1873	0.1791	0.1058	0.1058
C11	0.1442	0.1439	0.2063	0.2079	0.1746	0.1886	0.1988	0.2232	0.1357	0.2063	0.1888	0.2394	0.2295	0.2203	0.2012	0.1270	0.1270
C12	0.1316	0.1663	0.1991	0.1986	0.1418	0.1582	0.1925	0.2163	0.1299	0.1988	0.2339	0.1735	0.2199	0.2112	0.1933	0.1203	0.1203
C13	0.1454	0.1734	0.2065	0.2076	0.1618	0.1873	0.1990	0.2246	0.1361	0.2066	0.2439	0.2396	0.1721	0.2200	0.2027	0.1268	0.1268
C14	0.1573	0.2064	0.2292	0.2310	0.1942	0.1969	0.2225	0.2521	0.1964	0.2309	0.2713	0.2666	0.2534	0.1873	0.2214	0.1843	0.1843
C15	0.1229	0.1547	0.1400	0.1424	0.1156	0.1670	0.1346	0.1566	0.1157	0.1851	0.2124	0.2078	0.1711	0.1762	0.1230	0.1504	0.1504
C16	0.1951	0.2102	0.2326	0.2343	0.1970	0.1999	0.2253	0.2562	0.1861	0.2339	0.2770	0.2711	0.2577	0.2460	0.2287	0.1323	0.1895
C17	0.1940	0.2089	0.2301	0.2328	0.1959	0.1985	0.2224	0.2530	0.1848	0.2309	0.2750	0.2658	0.2559	0.2443	0.2271	0.1885	0.1313