

Network Topology of People NEWS

Norhaidah Mohd Asrah*, Rohayu Mohd Salleh and Noor Amiza Zulkifli

Department of Mathematics and Statistics, Faculty of Applied Sciences and Technology,
Universiti Tun Hussein Onn Malaysia, Johor, Malaysia.

Received 30 September 2017; accepted 4 December 2017; available online 12 December 2017

Abstract: The new method in a survey on public opinion called People NEWS will be highlighted. The application of NEWS which stand for needs, expectations, wants and satisfaction will be highlighted in the process of air travel in Malaysia. The passenger's opinions according to their NEWS from the first stage process at the departure airport until the final process at the arrival airport will be discussed based on their network topology. The information from the NEWS network can be filtered by using the minimal spanning tree and the description about the behaviour of the network can be explained by using centrality measures. Some important results and recommendations based on passenger's NEWS for Malaysian commercial flights will be highlighted.

Keyword: Public opinion survey, social network analysis, minimal spanning tree and centrality measures.

1. Introduction

A social network refer to a set of people, or organizations, or other social entities that connected by a set of social relationships. The relationship describe as friendship, co-working or information exchange [1]. The social network research has rapidly developed in socially and communication science since twenty years before. The social network analysis (SNA) is use as a tool for studying the organizational structures [2]. SNA focus more on patterns of relations among people, organizations, states and many more [2-4].

SNA was developed and practiced by social scientist to investigate the interaction among the members of a community [5]. The complex phenomenon and the structure of social worlds can be explained by using SNA. The theory of social network view the social relationship in terms of nodes and links. SNA can also investigate the structure and properties of a network according to three different levels. There are individual node level, subgroup level and the entire network level. It also can be used to investigate the relationships of customers from these three levels to find their preferences. Today, it's widely used in various fields. For example, in the foreign exchange market [6], currency exchange rate [7], financial market [8] and many more.

In studying the social networks, the centrality is a very important concept [9]. Centrality can influence the flow of information and decision making in a group. The high scores in centrality will identify which actors have the greatest structural importance in networks.

For this research, a study on people NEWS for air travel process in Malaysia is conducted. This new method is introduced by Djauhari [13]. It is a new public opinion survey and NEWS is referred to needs, expectations, wants and satisfactions. Needs is refer to a condition or situation in which something is required or wanted, expectations is refer to consider likely or certain, wants is refer to desire greatly, wish for and satisfactions is refer to the fulfilment or gratification of a desire, need, or appetite. The questionnaire used in the survey only asked about people opinions based on NEWS for a services and products by a company. Better understanding about a person's opinion can be done because the respondent is free to express their answer, opinion and criticism without any guided answer.

The air travel process in Malaysia has several procedures. The procedures can be shown in Table 1 below.

Table 1 The Air Travel Process in Malaysia

Purchasing a ticket → Check-in with or without baggage's → Boarding pass checking → Immigration checking (International only) → Airport security checking → Boarding Gate → In the flight → Arrival Gate → Collecting Baggage's → Custom checking

The social network analysis about people NEWS will be discussed using centrality measure and minimum spanning trees.

2. Research Methodology

2.1 Data Collection

One hundred respondents were participated in this study. A set of questionnaire were email to the respondents (73%) after they have agreed to participate. The other 27% of the respondents were interviewed at the Skypark Airport.

2.2 Questionnaire Development: People NEWS

The questionnaire consists of four parts. The four parts are 'Needs', 'Expectations', 'Wants' and 'Satisfactions'. The respondents are asked about their opinion of air travel in Malaysia. The questions are open ended and they are free to give their opinions whether good or bad.

Then, the feedback from every respondents are collected and analysed. The method used in this analysis including the standard approaches in quality improvement. The affinity analysis and Pareto analysis are used to categorize the responses and to check which the important responses. These responses are based on the vital few from the trivial many. Based on the affinity analysis, the respondent's feedback can be grouped into nine categories, namely; safety, tickets, price, foods and drinks, services, facilities, time management, check-in and check-out, and luggage.

2.3 Network Topology

The network analysis start with correlation between foreign exchange rates as the distance [12]. From $n \times n$ matrix of C_{ij} (from the cross-correlation function for all combinations among the given rates), it gives the symmetry $C_{ij} = C_{ji}$. Then, the Minimal Spanning Tree (MST) was constructed from

this correlation matrix. The MST is like currency map and help to construct a stable portfolio of the foreign exchange rates. Kruskal's algorithm is used to construct the MST.

In this study, we will clarify NEWS network using MST. Firstly, the frequency of each category (needs, expectations, wants and satisfactions) were transformed into data matrix. It is a similarity matrix, $S = \{s(i,j)\}$. Then, this similarity matrix S was transformed to dissimilarity matrix $D = \{d(i,j)\}$ where $d(i,j) = \max\{s(i,j)\} - s(i,j)$ for $i \text{ unequal } j$, and $d(i,j) = 0$ for $i = j$.

The matrix D is used as the distance matrix. Then, Kruskal's algorithm is applied to find the MST.

2.4 Centrality Measure

Centrality measures commonly described as indices for the prestige, prominence, importance and power [10]. There are three different concepts of centrality discuss by [11]. The three concepts are degree centrality, closeness centrality and betweenness centrality, while [10] define four measures of centrality. The other one is eigenvector centrality. Below are the measurements used by Hanneman and Riddle [11].

Degree centrality defined as the number of ties that a given node has. The degree of node i is given by: $d_i = \sum_j a_{ij}$ where $a_{ij} = 1$ if the i -th and j -th nodes are linked and 0 otherwise.

Closeness centrality defined as the total graph-theoretic distance of a given node from all other nodes; $c_i = \sum_j d_{ij}$, where d_{ij} is the number of links in the shortest path from i to j . The larger value indicates that the less central while the smaller value indicate more central.

Betweenness centrality is the number of shortest paths that pass through a given node; $b_k = \sum_{i,j} \frac{g_{ijk}}{g_{ij}}$, where g_{ij} is the shortest paths from node i to node j , and g_{ijk} is the shortest path from i to j that pass through k .

In this study, we will only look at the degree centrality for people needs, expectations, wants and satisfactions for air travel process in Malaysia. Based on this centrality, we can determine the people NEWS

for air travel process in Malaysia commercial flights.

3. Results and Discussion

3.1 Network Topology

The distance matrix D as mention in Research Methodology is used to construct the MST by using Kruskal's algorithm. We use Kruskal's algorithm to find the adjacency matrix. Adjacency matrix is a matrix with the elements or scores in the cells of the matrix record information about the ties between each pair of nodes [11]. Fig.1 until Fig.4 in the next section shows the network topology for each needs, expectations, wants and satisfactions. The visualization for each network are using Pajek©.

Needs

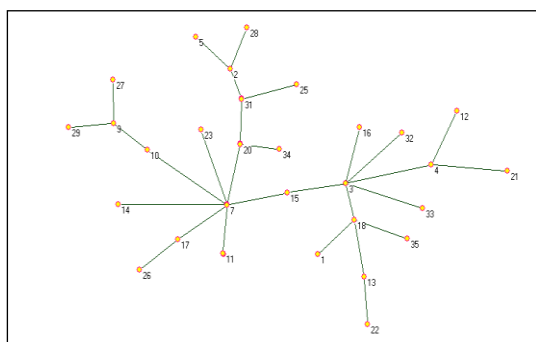


Fig. 1 Network topology of Needs

Based on Fig. 1, nodes 3, 7, 18 and 9 have the highest number of links or connections in the needs network. Node 3 refer to the respondents who prefer the good and delicious menu, node 7 refer to the process of purchasing tickets, node 18 refer to the services provided by the airlines and node 9 refer to the process of check-in and check-out. Based on these results, we can conclude that respondents need delicious menu served on the flight, the process of purchasing tickets are quick and easy, the air crews are friendly and served good services and lastly the smooth process of check-in and check-out.

Expectations

Based on Fig. 2, nodes 3, 20, 12 and 13 have the highest number of links in the expectations network. Node 3 in expectations refer to

respondent who prefer halal and free foods and drinks. Node 20 refer to the time management, while nodes 12 and 13 refer to the services provided by the airlines. Based on these results, we can conclude that respondents expected that halal food and drinks are served on the flight, the airlines practices good time management and lastly good services from the friendly air crew.

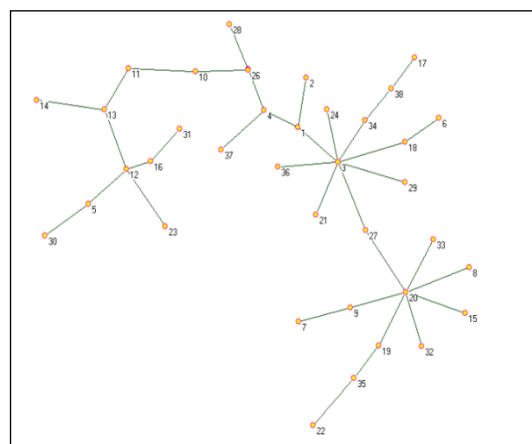


Fig. 2 Network topology of Expectations

Wants

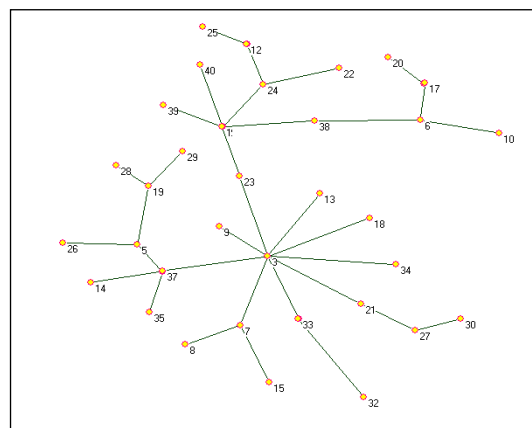


Fig. 3 Network topology of Wants

Based on the Fig. 3, nodes 3, 19, 7, 6, 5 and 2 have the highest number of links in the wants network. Nodes 3, 7, 6, 5 and 2 refers to respondents who prefer foods prepared in the flight are suitable for kids and node 19 refer to the services provided by the airlines. Based on these results, we can conclude that respondents wants foods for kids on the flight and accurate information from the aircrew about flight schedule, documents needed and other important information.

Satisfactions

Based on the Fig. 4, nodes 2, 15 and 17 have the highest number of links in the satisfactions network. Node 2 in satisfactions refer to respondent who prefer halal food while nodes 15 and 17 refers to services provided by the airlines. Based on these results, we can conclude that respondents satisfactions are depends on the halal food served on the flight and toll free lines for customer support for airlines in Malaysia. The halal food is important since majority of Malaysian are Muslim.

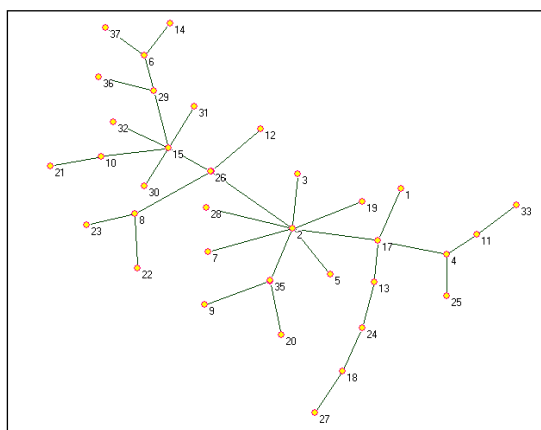


Fig. 4 Network topology of Satisfactions

3.2 Centrality Measures

Table 2 Centrality Measures for NEWS

Centrality Measure/ NEWS	Degree Centrality
Need	1. 6 (3) 2. 5 (7) 3. 4 (18)
Expectation	1. 8 (3) 2. 7 (20) 3. 4 (12)
Want	1. 9 (3) 2. 3 (19, 7, 6, 5 & 2)
Satisfaction	1. 8 (2) 2. 6 (15) 3. 4 (17)

Table 2 shows the results of centrality measures on degree for needs, expectations, wants and satisfactions. The value in this table shows the important result only. The number in the bracket represents the factor for each centrality measure value.

In needs responses, the nodes with higher connections to the other nodes are nodes 3, 7

and 18. These nodes are the nodes related with the needs of good foods and beverages, the process to purchase the flight tickets and services provided by the airlines. These are the most important needs by the passengers and have higher connections with other needs.

Meanwhile in expected responses, the nodes with higher connections are nodes 3, 20 and 12. These nodes refer to foods and beverages again, time management and services provided by the airlines. The passengers expected that the foods and beverages served in the flight are halal and free, if possible. They expected that the services are excellent.

The wants responses show that nodes 3 have the highest connections with other nodes. The second highest connections refers to nodes 19, 7, 6, 5 and 2. Passengers really wants foods and beverages served in the flight are suitable for kids too. Other than that, they wants the right information from the aircrew regarding the flight schedule and the important documents.

Lastly, the satisfactions response show that the most important nodes are nodes 2, 15 and 17. The passengers are satisfied when the foods and beverages served are halal and the aircrew give an excellent service from the beginning until the end of the air travel process.

4. Conclusion

The very convenient way to approach the public opinion compare to the traditional questionnaire is the NEWS method. NEWS method only asked public opinion for their needs, expectations, wants and satisfaction in the questionnaire. Respondents are free to answer and express their opinion without any boundaries. They are free to give their responses without limitation for their ideas. They also free to give critics, suggestions and everything they want to say about the products or services by any industries. These pure and honest responses will minimize the bias answer because the answer is not coming from the researcher. The disadvantage using traditional questionnaires is sometimes the answers are already provided by the researcher. The result will help the industries to perform more quality of product and services because they will get more

information whether the good response or bad response from NEWS method.

Acknowledgements

The authors are gratefully acknowledge the reviewers for their comments and suggestions.

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