

**FACEBOOK USERS BEHAVIOR ANALYSIS USING
CENTRALITY MEASURES WITH FACEBOOK PAGE INSIGHTS**

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Thesis
entitled
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CENTRALITY MEASURES WITH FACEBOOK PAGE INSIGHTS**

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**FACEBOOK USERS BEHAVIOR ANALYSIS USING CENTRALITY MEASURES
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ABSTRACT

This study presents the application of centrality measures to analyze the behavior of Facebook users by using interactions with Page posts using a Facebook Fan Page in Thailand as an example. The multiple regression analysis was used to measure the individual users from the centrality measures against the overall Facebook Page Insights of the Page to find the influence of users affecting the overall popularity of the Page provided by the Facebook Page Insights. This method can strengthen the results from centrality measurement alone which does not give relative information regarding the popularity of the Page at each particular time. In summary, this paper suggests an approach to find out the influence on users engaging with a particular Facebook Fan Page.

The experimental results showed users to have the characteristics of leaders or trendsetters with high levels of interaction with Page posts and high Beta values from the multiple regression analysis. In the users with characteristics of Page followers, there were few interactions with Page posts and high Beta values. The experiments can increase understanding of trendsetting user groups capable of disseminating news and information giving other users more interest in the Facebook Fan Page.

**KEY WORDS: CENTRALITY MEASURES / FACEBOOK USER BEHAVIOR /
BEHAVIOR ANALYSIS / FACEBOOK FAN PAGE / FACEBOOK
PAGE INSIGHTS**

121 pages

การวิเคราะห์พฤติกรรมผู้ใช้เฟซบุ๊ก โดยใช้ตัววัดความเป็นศูนย์กลางร่วมกับข้อมูลของเฟซบุ๊กเพจ
อินไซด์

FACEBOOK USERS BEHAVIOR ANALYSIS USING CENTRALITY MEASURES WITH
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บทคัดย่อ

งานวิจัยนี้นำเสนอการประยุกต์ใช้ตัววัดความเป็นศูนย์กลาง ในการวิเคราะห์พฤติกรรมผู้ใช้
เฟซบุ๊กที่เข้ามาปฏิสัมพันธ์กับโพสต์ของเพจ (เพจ โพสต์) ในกลุ่มตัวอย่างของเฟซบุ๊กแฟนเพจใน
ประเทศไทย และวิเคราะห์ความสัมพันธ์ของข้อมูลจากการวัดความเป็นศูนย์กลาง ซึ่งเป็นข้อมูลของ
ผู้ใช้งานบุคคลกับข้อมูลเชิงสถิติของเฟซบุ๊กแฟนเพจจากเฟซบุ๊กเพจอินไซด์ โดยใช้การวิเคราะห์
ความถดถอยเชิงพหุ เพื่อช่วยในการวิเคราะห์ข้อมูลของผู้ใช้งานบุคคลที่ได้จากการวัดความเป็น
ศูนย์กลาง ซึ่งเป็นข้อมูลในการเข้ามามีส่วนร่วมในโพสต์ของเพจที่สามารถส่งผลกระทบต่อกลุ่มผู้ใช้กลุ่ม
ใหญ่จากข้อมูลทางสถิติของเฟซบุ๊กเพจอินไซด์ เพื่อเพิ่มประสิทธิภาพในการวิเคราะห์ความสัมพันธ์ให้ดี
ขึ้น ซึ่งจะช่วยให้สามารถวิเคราะห์ผู้นำในการกระจายข่าวได้อย่างแท้จริงโดยไม่วิเคราะห์เพียงแค่
ความถี่ในการเข้ามามีส่วนร่วมแต่เพียงอย่างเดียว โดยมีจุดประสงค์เพื่อเสนอแนะวิธีการในการหา
ผู้ใช้งานที่มีอิทธิพลในเครือข่ายได้อย่างแท้จริง

ผลการทดลองพบว่าผู้ใช้งานที่มีลักษณะเป็นผู้นำจะเป็นผู้ใช้งานที่เข้ามาปฏิสัมพันธ์กับโพสต์
ของเพจ จำนวนหลายครั้งและมีค่าสัมประสิทธิ์ความถดถอยมาตรฐานที่สูง และผู้ใช้งานที่มีลักษณะเป็น
ผู้ตามจะเป็นผู้ใช้งานที่เข้ามาปฏิสัมพันธ์จำนวนน้อยครั้ง แต่มีค่าสัมประสิทธิ์ความถดถอยมาตรฐานที่
สูง จากการทดลองจึงทำให้ทราบถึงกลุ่มผู้ใช้งานที่เป็นผู้นำ ที่จะสามารถช่วยในการกระจายข้อมูลต่างๆ
และทำให้ผู้ใช้งานอื่นๆ มีความสนใจในเฟซบุ๊กแฟนเพจ

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CHAPTER I

INTRODUCTION

1.1 Background and Problem Statements

Social network services have become a popular in recent years, users can interact between friends by sharing interests and information, making friends, posting and commenting messages, playing games, participating in social events and applications. The samples of social network services are Facebook, Twitter, Orkut, Flickr, MySpace, and Friendster. Since August, 2011 till the present, the top three global online community platforms are respectively Facebook (65.24%), Youtube (19.60%) and Twitter (1.32%). The result shown Facebook is tremendously popular, they have users more than 50% of all social network [1] (see Figure 1.1). Facebook, there are many interesting activities and applications that are popular and different from other social networks such as doing quiz, games, sports, education, business and creating events.

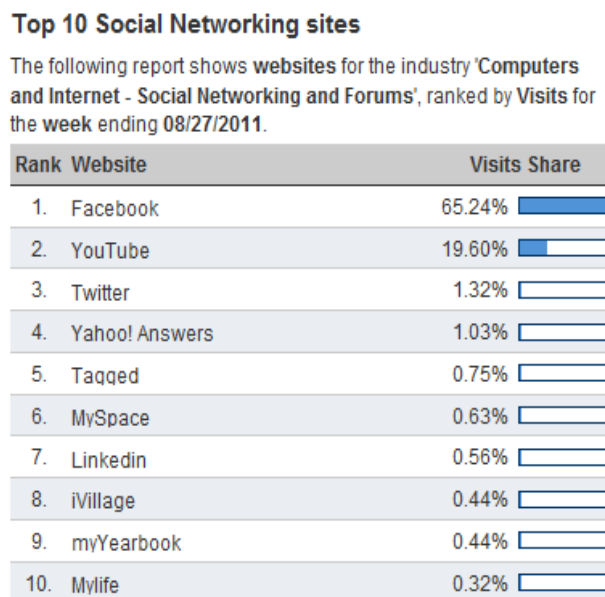


Figure 1.1 Top 10 social networking website in the world [1]

Facebook, an online social network, was founded by Mark Zuckerberg in February 2004 with his college roommates Dustin Moskowitz and Chris Hughes, fellow computer science students at Harvard University. From Harvard University expanded to other colleges and finally to anyone. There are over 750 million active users and 50% of active users logs on to Facebook in any given days. People spend over 750 billion minutes per month on Facebook and an average user has 130 friends [2]. Friends are people who similar interests, such as religions, hobbies, political, educations and works. Users can create and join a group based on common interests, They can invite other users from friends, friends of friends, family, acquaintances which represent the become new social relations and exchange of information between users, as expanding new neighbors in the network topology.

At present, Facebook develops and grows rapidly with increase continually users. The highest number of users with countries on Facebook.com are United States with approximately 154 million users, followed by Turkey with 30 million users and the United Kingdom with 29 million users, respectively[3]. The highest countries in Asia on Facebook.com are the Indonesia with approximately 40 million users, followed by India with 35 million users and Philippines with 26 million users, respectively. Thailand is ranked the fourth of Asia countries with 12 million users[4] (see Figure 1.2).

According to survey of information on Facebook users in Thailand, by statistics from August 25 – September 7, 2011 showing the amount increases rapidly of users (see Figure 1.3). The female users are more than the male users, with 52% of female and 48% of male by three dominant age groups are 18-24, 25-34 and 13-15 years (September 2011) [5].

#	Country	Users	Growth		Pen.
1.	Indonesia	40 139 480	+4 657 080	+13.13% ↑	16.52%
2.	India	34 609 480	+12 552 200	+56.91% ↑	2.95%
3.	Philippines	26 249 780	+3 400 440	+14.88% ↑	26.28%
4.	Thailand	12 176 640	+3 754 860	+44.59% ↑	18.34%
5.	Malaysia	11 633 740	+1 407 000	+13.76% ↑	44.47%
6.	Taiwan	10 875 760	+790 400	+7.84% ↑	47.23%
7.	Pakistan	5 265 880	+1 379 060	+35.48% ↑	2.97%
8.	Japan	4 595 460	+2 041 800	+79.96% ↑	3.62%
9.	Saudi Arabia	4 154 860	+668 140	+19.16% ↑	16.15%
10.	South Korea	4 010 060	-920	-0.02% ↓	8.25%

Figure 1.2 List of countries in Asia on Facebook in 2011[4]

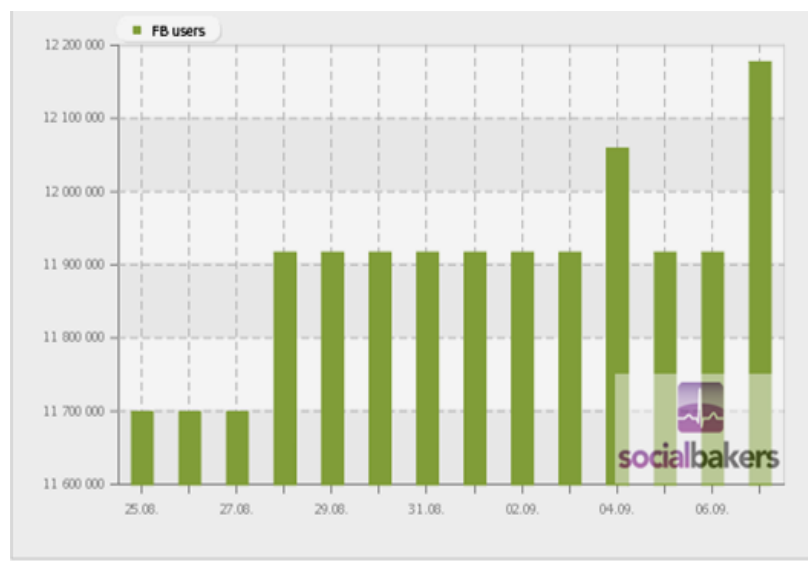


Figure 1.3 Users & Demography for the Thailand in 2011 [5]

The reason why it has increasing numbers of Facebook users because Facebook has some great and easy applications, functions, various selection of languages and more diversified applications than other social networking

services. Privacy setting can be set for limiting of friend or group. Diversified languages are the reasons that not found in other social networking services.

Now Facebook becomes to be the social media's influence on people practices. It has a lot of tools and applications to meet the users' requirements. Then it can be the channel to promote the information to public with fastest speed, lowest cost and also be the communication channel for updating and spreading news rapidly e.g. for business , it can be the channel for making incomes and promoting products and promotions for building up the customer volume and to meet the customers' requirements. For educations, it can be the rapidly communicating channel among students, it can help students sharing and exchanging their ideas. For politic, a lot of political parties used online networks as Facebook, Twitter, MySpace to promote their campaign, images and updating news or connecting to their targets group routinely. It can be used for company images and keep relation between customers and organizations or business companies.

Now Facebook Fan Page is extensively used in business for spreading news, advertising products and launch new products it can send all information to a target group or new members to meet their requirements. When customer used their products or services then they can present their comments and it will be significant information for customer's decision-makings.

Facebook Fan Page have application tabs that will entice visitors while promote engagement. Customers will receive news from Facebook smoothly from Discussion Board which is the tool for receiving feedbacks, reviews or write additional programs as game, music, video clip. Then users will involve and share information to friends and then groups of friends can share more and more information, then brand awareness of that product is occurred and user also can use it for several ways.

Several businesses are successful in advertising on Facebook such as Starbucks. Starbucks has fan in Facebook pages for 25,109,550 fans (14 September 2011). Starbucks always upload their contents with excited and interesting information also with pictures, videos, interviews and comments from customers. Furthermore, it also has the interesting advertisements. The communications are between Starbucks and customers or between customers. They are talking about taste, different

appreciations from customers around the world. They have suggestions about new services, new products, new taste which every people can taste and get the discount through Facebook which displays in wall post (see Figure 1.4). All activities launching by Starbucks through Facebook is the channel that people can share and tell, then the volume of fan is increasing until now



Figure 1.4 Facebook Fan Page of Starbucks [6]

The case study in Thailand utilizing Facebook Fan Page on marketing and can get a huge advantages is GTH (Filmmaker). GTH presents profile and page. On page always upload then newest movie such as “TOP SECRET วิวรุ่มพันล้าน”. It also introduces interesting point of this film which displays in wall post (see Figure 1.5). Then these contents will spread to member who are fan through News Feed and launch activities which customers can involved all the times. Then relations always happen. Videos, interviews of actor and posters of films for coming film and top hit films and all of events always inform in activities then page is interesting and fan is increasing. Now fan of GTH is 597,922 fans (14 September 2011).



Figure 1.5 Facebook Fan Page of GTH [7]

Since development of social networking services then number of online user is increasing. Hence the studying of information from social network and research is increasing also. People can post a link for requirement of interview then their friends can connect to complete that interview. It also has the research about behavior in utilizing Facebook on the topic of brand awareness or self-esteeming. Also the research about brand engagement on Facebook. Brand awareness is the relation about customers and each brand of product too. The newest report from FanGanger which is the research organization for researching brand engagement on Facebook, shown that a lot of interesting applications which promote activities and relation between customers and brand by using system of “Data Mining” on Facebook. It was checking daily for every page about activities of fan. It showed the comments, posted the content and then checked about the most interesting points from all fan and then tested the percentage of participations in activities. It showed the maximum scores of the brand engagement score[8]. Facebook in non-profit organization shown the attempts to entice the donator from social network by analyzing 275 organizations profiles. Those profiles try to develop the relation strategies for tracking more interests from donators[9].

Now people can use information from Facebook for in-depth analysis because in Facebook Fan Page has the tool named “Facebook Page Insights” which show information of users as number of like which increase daily and percentage of acceptance from Fans page. Then, we can know that how our page is getting hit and also get about the information of demographic as gender, range of age, city, country, language and then we can scope to our target group in our business. For the behaviors participating in activities as video views, audio plays and photo views can let we know about customer behaviors and then we can know the appreciation points of users. Which can export data insights from Facebook Page Insights is a spreadsheet file and comma-separated values (csv). The data from the Facebook Page Insights is the overall statistics of users participating in activities on Facebook Fan Page, not access an individual users data in Facebook Page Insights. This research proposes method to access the behaviors data of Facebook users by using the interaction within Page posts which can be useful in research. But in the Facebook have limited access to data of users that set up security and privacy settings for friends, friends of friends or public thus can't access friend data and other data of all users.

From significant information above, we know about advantages from Facebook for publicize and inform data or information to customer also with the trend to use Facebook Fan Page on marketing and other side. Nowadays, this knowledge is extensively known. The researchers brought the data from an example on a Facebook Fan Page in Thailand for analyzing Facebook users behavior by using the data of interaction with Page posts.

In order to find out influence users leader in the network who are leader or active users can attract more people and can help to promote information to the other people and use this media for the most advantage and right to the target group. Therefore to understand of the influence users of the network, which can send information directly to influence users to help spread news or activities of the organization to influence users directly and make other people or friends of fans to more interest and participate with Facebook Fan Page of organization.

1.2 Objectives of Study

The objectives of this are as follows :

1. To suggest an approach to find out the relationship between the users interaction on Page post with the overall users to participation with Facebook Fan Page.
2. To analyze the differences in the behavior of leaders and followers who have interaction on Page post with the Facebook Fan Page.

1.3 Scopes of Study

The scope of this study are as follows:

The criteria of this research consisted of the data collection from Facebook Fan Page of Kledthai which are Facebook Fan Page in Thailand on disclosed users profile. To collect data behavior and demographic characteristic data of Facebook Fan Page users from NodeXL during (1/12/2011 - 5/12/2012) consisted of 1,846 users and 501 Page posts.

This research doing data collection by NodeXL to calculate the centrality measures consist of degree centrality and betweenness centrality. Thereafter, to find the relation between the score of centrality measures with the overall users from Facebook Page Insights of Page by using Multiple Regression Analysis.

1.4 Expected Results

The expected results obtained in this study:

1. To evaluate the behavior of users on Facebook Fan Page and can know the active users who can be influence in the network . This will be the most helpful for communicate and promote the news.
2. To be the guideline for users who interest on Facebook and any marketer for applying the results in this study for utilized in the development plan to provide benefits to the organization.

CHAPTER II

LITERATURE REVIEW

This chapter presents a review of literature in relevant theories, definitions, concepts and researches in order to define approach of this research study.

2.1 Centrality Measures

Graph theory can be used to analyze the connection and importance of peoples in the network. Each person in the network can be represented in the graph as a vertex, while the connection between two people can be connected by the edge of the graph. In this study, we will be used centrality measures to analysis the relative importance of vertex within the graph which in NodeXL displays each vertex-specific metric in a set of Graph Metrics columns in vertices worksheet.

For simplicity and in accordance with centrality measures convention, described as a graph $G = (V,E)$ with V is a set of vertices (also called nodes, points or actors) and E is edges (also called ties or lines) that connect them. In this work, we will represent a graph in terms of adjacency matrix A , in which $a_{ij} = 1$ if (i, j) is in E , in which a_{ij} is the edge weight between vertex i and j . An adjacency matrix is a means of representing which vertices of a graph are adjacent to which other vertices.

The value that can be representing in this research are degree centrality and betweenness centrality. The descriptions including the follow.

2.1.1 Degree Centrality

The degree of a vertex is the number of unique edges that are connect to it or the measure of the total number of edges connected to a particular vertex. This value is useful for measure the relationship between two person. For directed graph networks, there are two measures of degree. In-degree is the number of connections

that point inward at a vertex. Out-degree is the number of connections that originate at a vertex and point outward to other vertices[10]. In this research is undirected which no measure of In-degree and Out-degree. The degree centrality measure in this study to measure the connections of the user to interaction with the Page posts.

The simplest and best measures of centrality is degree centrality. The degree centrality is a count of the number of edges incident upon a given node, with $C_{D(i)}$ equal to the number of other vertices directly linked to vertex i [11].

$$C_{D(i)} = \sum_j^n a_{ij} \quad (2.1)$$

where n = the total number of vertices in the network, a is the adjacency matrix, a_{ij} is defined as 1 if vertex i is connected to vertex j , and 0 otherwise.

2.1.2 Betweenness Centrality

The betweenness centrality is reflecting the extent to which a vertex is an intermediary on the various geodesics (i.e., shortest path) that link other vertices in the network[11], and is defined as measure of the number of times a vertex occurs on a geodesic. Betweenness relies on the identification of the shortest paths, and measures the number of them that passes through a vertex. For example, between centrality is a measure of how often a given vertex lies on the shortest path between two other vertices. Then the betweenness centrality is defined as follows[11]:

$C_{B(i)}$ is based on b_{ijm} the proportion of the geodesics linking j and m on which i falls.

$$b_{ijm} = \frac{g_{ijm}}{g_{jm}} \quad (2.2)$$

where g_{ijm} = the number of geodesics containing i that connect j to m , and g_{jm} = the number of geodesics connecting j to m .

$$C_{B(i)} = \sum_j^n \sum_{<m}^n b_{ijm}, \quad (2.3)$$

($i \neq j, i \neq m$) where n is the number of points in the graph.

2.2 NodeXL

NodeXL (Network Overview for Discovery and Exploration in Excel) is an open source template for Microsoft Excel 2007 and 2010 and used spreadsheet into a network analysis and visualization features[10].

Data can be entered and imported from another social network program such as UCINET[12], GraphML[13] network and Excel workbook. NodeXL includes import tools from email and from social sites such as Twitter, Youtube, Facebook, WWW and flickr social network. Data can applying network analysis and graph visualization. Multiple network visualization layouts[10].

NodeXL represents the relationship data in the form of edge lists such as relationship or connection between two vertices which are nodes or entities. Each vertex, nodes, agents or entities which is a representation of a node in the network. Each edge, also known as link, tie, relationship, and connection two vertices together is a representation of a relationship that exists between two vertices. Undirected or directed edges are the two major types of connections. Directed edges have a clear origin or destination and represents on a graph as a line with an arrow pointing from the source vertex to the recipient vertex. For example, a Twitter user follows another user, or a web page links to another web page. An Undirected edge simply exists between two people, which means the relationships between Vertex 1 and Vertex 2 is symmetric such as two people are members of the same organization, two Facebook users are friends. Undirected edges are represented on a graph as a line connecting two vertices with no arrows and no origin or destination is clear in these mutual relationships[14].

NodeXL can be calculates the centrality measures which about individual vertices such as degree centrality, closeness centrality, betweenness centrality and eigenvector centrality. The example measures of centrality that are used in network analysis consist of degree centrality, closeness centrality, betweenness centrality and eigenvector centrality by using data of Facebook Fan Page users (see Figure 2.1). Figure 2.1 shows the vertices sheet of graph metrics for each vertex, retrieving from Kledthai Facebook Fan Page based on co-likes, co-comments on relationship of user to user, user to post in the 2 Page posts.

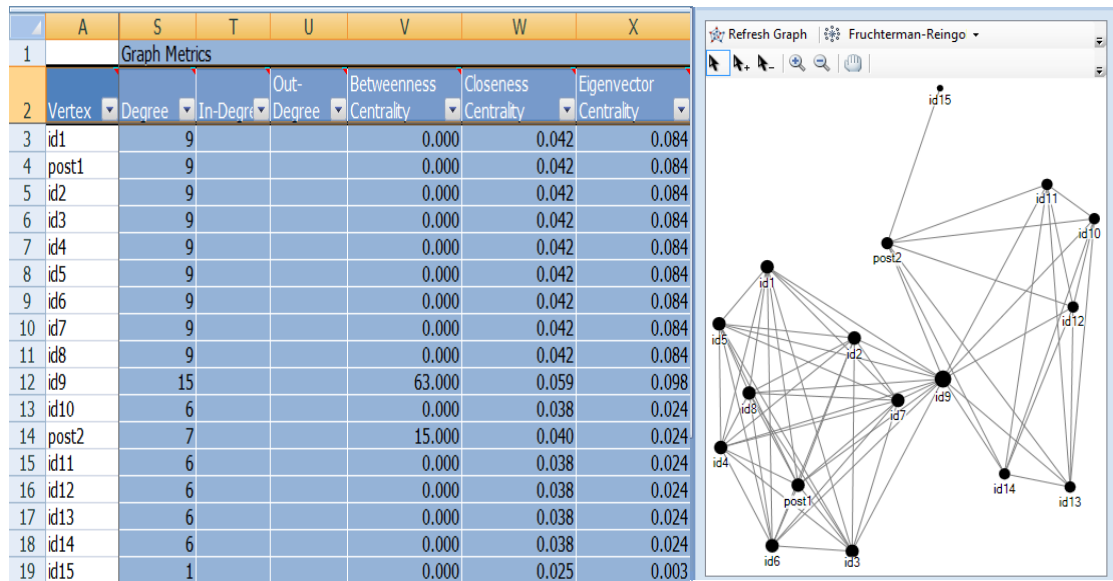


Figure 2.1 An example of graph metrics of centrality measures for each vertex, retrieving from Kledthai Facebook Fan Page based on co-likes is users who like in Page post, co-comments is users who comments in Page post of Facebook Fan Page on relationship of user to user and user to post in the 2 posts of 9/12/2012

This information is obtained by NodeXL to be calculated by using graph metrics. From Figure 2.1 represents the value of centrality measures from data of Kledthai Facebook Fan Page which is a connection between user to user (u-u) and user to post (u-p) in the 2 Page posts of 9/12/1012. To calculate graph metrics, NodeXL displays each vertex - specific metric in a set of Graph Metrics columns in the Vertices worksheet such as centrality measures consisting of degree centrality, betweenness centrality, closeness centrality, eigenvector centrality. In this case, the graph is undirected which it not calculated the In-Degree and Out-Degree. From centrality measures of vertex metrics can be mapped onto visual attributes by can recreate by using the AutofillColumns feature in the NodeXL Visual Properties menu ribbon [14]. The network of users with connection between user to user and user to post can be whole graph visualization of the data sample comprising 17 nodes and 67 edges. The graph was laid out using the Harel-Koren Fast Multiscale layout algorithm.

Graph Metric	Value
Graph Type	Undirected
Vertices	17
Unique Edges	67
Edges With Duplicates	0
Total Edges	67
Self-Loops	0
Reciprocated Vertex Pair Ratio	Not Applicable
Reciprocated Edge Ratio	Not Applicable
Connected Components	1
Single-Vertex Connected Components	0
Maximum Vertices in a Connected Component	17
Maximum Edges in a Connected Component	67
Maximum Geodesic Distance (Diameter)	3
Average Geodesic Distance	1.480969
Graph Density	0.492647059
Modularity	Not Applicable
NodeXL Version	1.0.1.224

Figure 2.2 The NodeXL Overall Metrics showing aggregate graph metrics for Kledthai Facebook Fan Page based on co-likes, co-comments on relationship of user to user, user to post in 2 Page posts

The summarizes information of the key properties of the entire network. Figure 2.2 represents different value of overall graph metrics, retrieving from Kledthai Facebook Fan Page based on co-likes, co-comments on relationship of user-user, user-post in 2 Page posts. These metrics include the following:

In this graph is an undirected graph and the connection between the two vertices with no directions. The number of vertices is equal to 17, consisting of 15 users and the 2 posts that involving based on co-likes, co-comments on relationship of user to user and user to post. The number of unique edges found in the edges worksheet is equal to 67. The number of total edges is 67 shows signifies connection two vertices together is a representation that exists between user to user, user to post. The maximum vertices in a connected component is number of vertices in the connected component with the most vertices. This is equal to 17 which signifies the

number of vertices in this network. In terms of the number maximum edges in a connected component is 67 shows the number of edges in the connected component with the most edges, because they are all part of the only connected component. The number of maximum geodesic distance (diameter) is 3 which the geodesic distance is the length of the shortest path between two people. Thus the maximum geodesic distance or diameter of a network, is the largest geodesic of all, or the distance between the two vertices that are farthest from each other[14]. The graph density signifies, the number between 0 and 1 indicating how interconnected the vertices in the network. In this network graph density is 0.49 of all possible ties which the graph density is calculated by dividing the number of total edges by the maximum number of possible edges[14].

2.3 The Facebook applications for network analysis

An example visualization tools for Facebook that can be used to create Facebook visualization with convenient for your facebook, corporations and businesses.

2.3.1 TouchGraph

TouchGraphFacebook [15], is a Java based application for presenting the connections between your Facebook friends. The application can show photos which are the profile photos of friends and show connections using a graph. Signing in to Facebook account is required to allow TouchGraph to display the visualization of the network of your friends. Figure 2.3 shows the picture of TouchGraph application once the user logged in and displays the visualization of relationship of your friends.

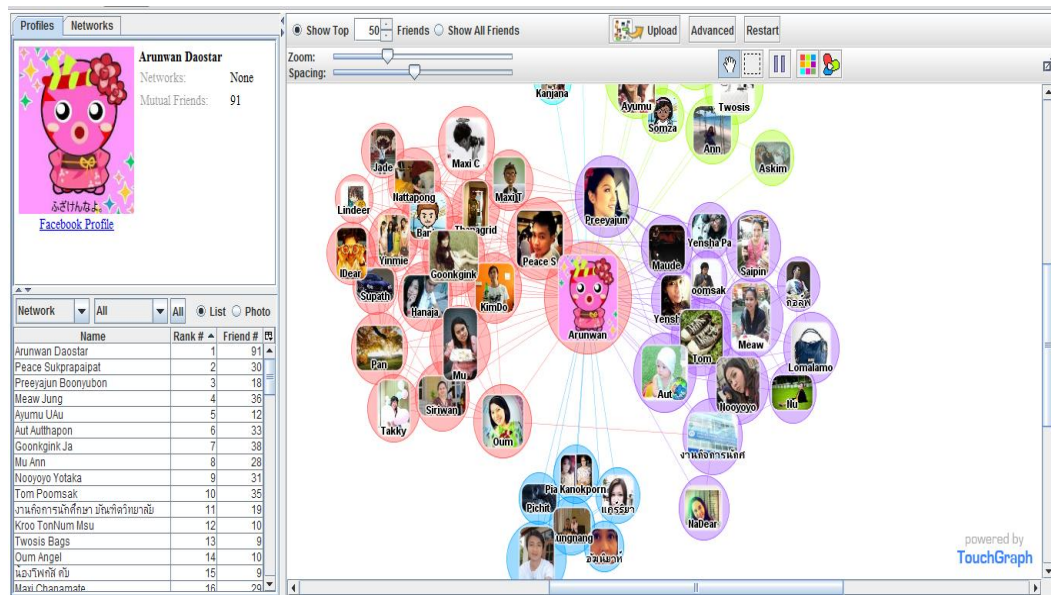


Figure 2.3 An example of use of TouchGraph application [15]

TouchGraph displays for all friends and the number of friends as required. Your friend's names in the photos are clickable; click friend's name to display friend's name, Networks, Mutual friends are Facebook friends and the person whose timeline are viewing (see Figure 2.4). Figure 2.4 shows list of friends and mutual friends. TouchGraph can be to show the network of friend that users can to create or join a group or community. These group represent common relationship of interest on the network such as family, religions, education or hobbies. Touchgraph displays data as a list and photo to display data for ease of use.

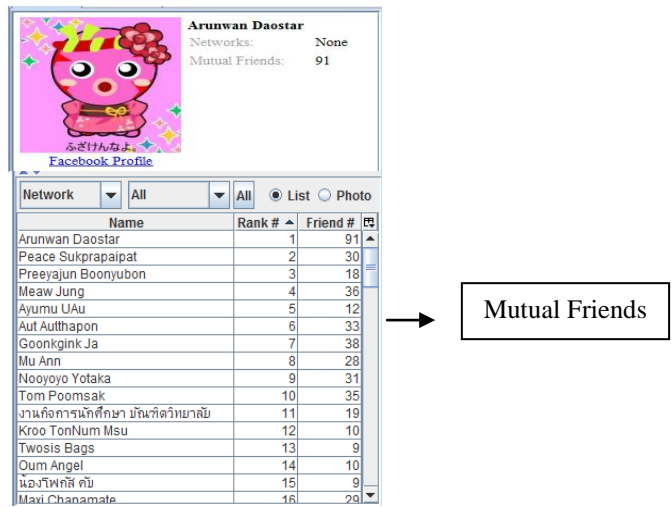


Figure 2.4 List of friends and mutual friends [15]

The tool allows users to see how their friends are connected, and who has the most photos together (see Figure 2.5). Figure 2.5 shows your friend profile and click on friends in the graph to quickly flip through their pictures. Users can also explore their own personal networks by graphing photos from anyone's album, or view the connections between members of a group.



Figure 2.5 The TouchGraph Facebook Browser shows your friend Profile and Click on friends in the graph to quickly flip through their pictures [16]

2.3.2 Facebook Visualiser

Facebook Visualiser [17] is a tool to graphically explore your social network filtering on criteria including gender and relationship status and can use it to see how all your contacts are connected to other people which display in Figure 2.6. Facebook Visualiser can be filtering your network by Relation Status Filter such as single, engaged, married and Gender Filter, Inner Connections and Node Distance (See Figure 2.7).

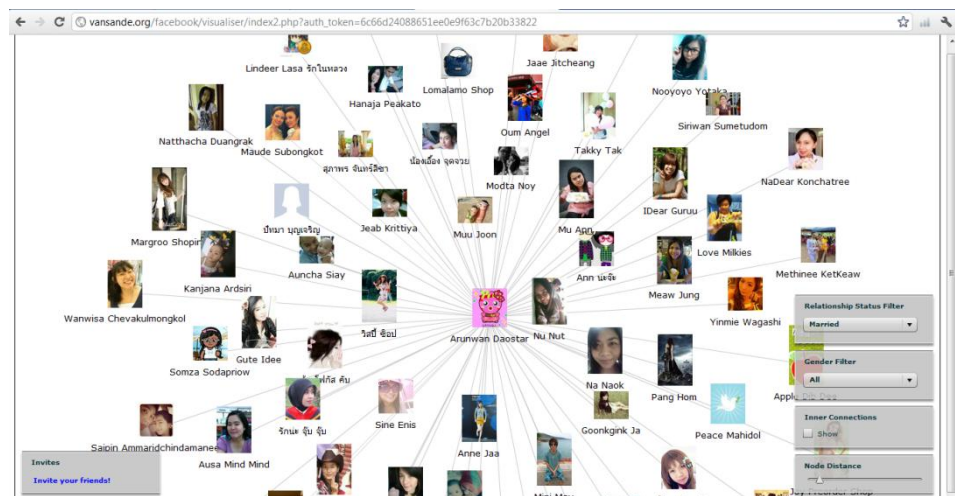


Figure 2.6 An example shows visualization of Facebook Visualiser [17]

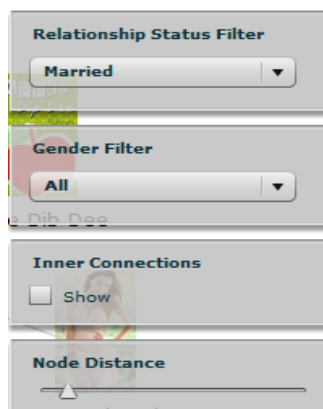


Figure 2.7 The picture shows Relationship Status Filter [17]

Figure 2.7 is an example of Relationship Status Filter by the details as follows :

- **Relation Status Filter:** Consisted of Single, Relationship, Open Relationship, Engaged, It' complicated and Unknown
- **Gender Filter:** Consisted of Male, Female and Unknown
- **Inner Connection:** Click show to display graph connections.
- **Node distance:** The distance away to make it easier to reduce overlap.

2.3.3 Social graph

Social graph[18] is represented visual of relationships between friends in the network, will require to log in to Facebook then can access to application. Social graph are separated into groups based on the relationships of friends. Social graph can be cluster by group of relationship between friend as display by the color difference. Then it can be displays the visualization of connection between friends by clusters social groups based on religion, family and colleague (see Figure 2.8).

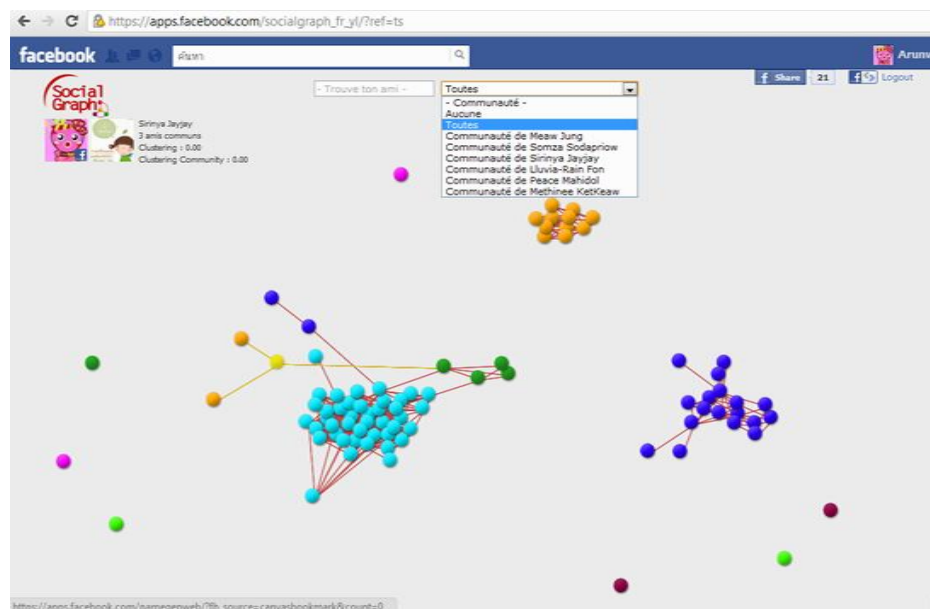


Figure 2.8 An example of visualization in network of Facebook social graph application [18]

2.3.4 NameGenWeb

NameGenWeb is application to help capture and visualize your Facebook network and can downloading social network data by can be choose in gender, locale, mutual friend count, relationship status and friend count as may be depending on the privacy setting of your friends. Which can export the data from NameGenWeb to use another program such as NodeXL, Ucinet, Gephi and offer 4 output formats: JSON, GraphML, Ucinet 'dl', and Guess GDF by these data can be used to advantage to find relationship between friends and the other side[19].

2.3.5 Facebook Page Insights

Facebook Page Insights represents behavior of users which have interacted with Page such as video views, photo views and post views by able to know participating in activities of users on Facebook Fan Page. The organization or business company able useful from these data to analyze behavior of users and develop efficiency communication for the right target group.

In the part of posting regularly with engaging content gets more people to talk about organization or business with their friends. As a result for reaching more people overall. The following graph (see Figure 2.9) shows how the posts that influence the number of people talking about organization or business, and how the number of people talking about you influences to overall reach.



Figure 2.9 An example of chart from data of the last 30 days [20]

Figure 2.9 can be described as follows, Number of posts is the size of the bubbles represents the number of posts in Page published each month, People Talking About This is the number of unique people who have created a story about Page in the past 7 days leading up to each date shown on the chart.

A story is created when people have interaction with Page such as

- Likes your Page
- Likes, comments or shares your Page post
- Answers a question you've asked
- Responds to your event
- Mentions your Page
- Tags your Page in a photo
- Checks into or recommends your Place

Total Reach is number of unique people who have seen any content associated with your Page (including any Ads or Sponsored Stories pointing to your Page) in the 7 days leading up to each date shown on the chart [20].

The information obtained can be utilized in the data analysis. In order to useful to organizations and businesses and increase customer interest and find a way to increase the number of Fans Page. The more details of the Facebook Page Insights in Appendix A.

From the described Facebook application for network analysis, which represents visual relationships of friends in Facebook Profile such as TouchGraph, Facebook Visualiser, Social graph with photo and graph connection by divided the group or network of friends. Facebook Visualiser application can display Relation Status Filter, Gender Filter, Inner Connections and Node Distance. However these application that limits the type of structures that can be displayed by the format of each application and can not export data from applications. NameGenWeb can be export the data relationships of friends in Facebook Profile for 4 output formats such as JSON, GraphML, Ucinet 'dl', and Guess GDF. These application shows the network of friends from Facebook Profile, which can not be analyzed data of users in the interaction with Facebook Fan Page.

In the part of Facebook Page Insights for analyzing Facebook Fan Page which represents demographics, consumption of content and creation of content

from this information can be utilized in this study. Which can export data insights is a spreadsheet file and comma-separated values (csv) from Facebook Page Insights. However, the data obtained is the total number of people participated in the activities of the Page from Facebook Page Insights which is not access the data of individual's personal data of users in Facebook Page Insights and unknown about users who have influential in the network. Thus, we can export data of behaviors of individual users on Facebook Fan Page by used NodeXL such as "likes" and "comments" on Page posts, demographic characteristic data and can be calculated by centrality measures. Researcher is interested in using NodeXL to analyze the relationship of users on Facebook Fan Page. The data in the worksheet as it easy to analyze the data and has information of individual users and show a graph of the relationships of user in a variety of formats.

2.4 Relevant Research

In the paper of Richard D.Watersa et al. [9] have studied "Engaging stakeholders through social networking": How nonprofit organizations are using Facebook" In this paper, studied how nonprofit organizations are taking advantage of the social networking popularity. Through a content analysis of 275 nonprofit organization profiles on Facebook, the sample of nonprofits in this study included 34 arts and humanities organizations, 50 educational organizations, 47 healthcare organizations, 39 human service organizations, 89 public/society benefit organizations, and 16 religious organizations. The profiles were evaluated for the presence of items representing organizational disclosure, information dissemination, and involvement. This study found that although nonprofits are open and transparent with their Facebook profiles, they are not using the sites to their full potential to inform others and get them involved with organizational activities.

In the evolution of user interaction in Facebook, Bimal Viswanath et al.[21] have studied the evolution of activity between users in the Facebook social network. They collected data on friendship links and the activity data based on wall posts of the Facebook New Orleans network and analysis display that there is a significant skew in the distribution of activity across links which a

minority of the user pairs generate a majority of the activity. They observed a general decay in the amount of interaction between pairs of users and suggested the activities of the network has rapid change and the strength of ties exhibits a general decreasing trend of activity as the social network link ages. They found that the individual links that constitute the activity network change rapidly overtime which the average network properties remained relatively stable.

In part of the social influence in online social network, Pan Hui and Sonja Buchegger[22] have studied “Groupthink and Peer Pressure: Social Influence in Online Social Network Groups” In this paper, presented a simple social influence model to describe and explain the group joining process of users on million sample nodes. They analysed the influence of friendship on group membership and vice versa using data sets of four popular online social networks. They calibrated the influence using similarity measurements, and characterize the differences of these four systems and investigate by using correlation between similarity with degree centrality and clustering. The results found cannot observe a strong correlation between similarity and clustering coefficients and found little correlation between the degree centrality and the similarity of nodes in data sets which the correlations they found do not indicate causation. Comparing the influence of neighbours in the social network on group joining behavior to the influence of random nodes in the network, found the neighbors have a much higher impact than random nodes, i.e., strangers.

In the paper of Fabrício Benevenuto et al. [23] have presented of analysis of user workload in online social network, which based on detailed click – stream data, collected over a 12-day period, summarizing HTTP sessions of 37,024 users who accessed four popular social networks: Orkut, MySpace, Hi5, and LinkedIn. The data were collected from a social network aggregator web- site in Brazil. They analyze the statistic of user activity and distributional properties of most of the important variables of OSN sessions. They used the click stream model to characterize user behavior in online social networks such as how frequently people connect to social networks and for how long, as well as the types and sequences of activities that users conduct on these sites. In analysis by using clickstream data in identifying patterns in social network workloads and social interaction that browsing

which cannot be inferred from crawling publicly available data, accounts for 92% of all user activities.

In the paper of Noppadon Khiripet et al. [24] have studied a network analytical approach to investigate DNA evidence and determine the existence of observable relationship among insurgent in the Deep South. The objective was to develop an understanding and test whether social network analysis can provide a new insight to the characteristics of the crimes. They used Social Network Analysis algorithms: small-world testing, centrality and community detection to identified the insurgents. The majority of the insurgents are unknown, their association with other known insurgent in a community will help strategic operations to pinpoint the suspects by acquiring more related evidence(such as testing DNA of the father, mother, or siblings of the suspect).These results are beneficial to forensic and intelligence personnel performing their duties.

In the paper of Arun S. Maiya and Tanya Y. Berger-Wolf [25] have studied the use of online sampling or crawling algorithms to determine the most influential or important individuals within the network by identified the set of individuals exhibiting the highest centrality in large social networks. They described a novel sampling technique based on concepts from expander graphs and evaluate this method in addition to other online sampling strategies on several real-world social networks. They found the sampling nodes to maximize the expansion of the sample and the set of most influential individuals can be approximated across multiple centrality measures.

In thepaper of Kanokkarn Chockkannajanawat, Assist.(Special) Dr. Ithikorn Khamdej [26] have studied “ Factors affecting decision making of using drugstore service in Phra Nakorn Sri Ayutthaya area” This paper analyzed frequency, percentage, mean, standard deviation, ANOVA, T - Test, F - Test and multiple regression analysis were used to analyze behavior of consumers bought drugs from drugstore. They studied the marketing mix factors influencing to select the Drugstore by used the coefficient of determination (R^2) to determine the factors influencing decision to select the Drugstore in Phra Nakorn Sri Ayutthaya area. The coefficient of determination (R^2) was used to determine the factors affecting decision making of

using drugstore service. From the result found the price factor was highest influencing to decision making of using drugstore service.

In this paper of Anyarat Thanapaisarnkij and Orapan Khongmalai [27] have studied “Successful Implementation of SAP Project: A case study of Government Agency” The objective of this research was to investigate factors influencing the successful SAP implementation between users and implementers who are key stakeholders of SAP projects. The multiple regression analysis is used for data analysis by stepwise method. The results showed the factors influencing the successful of the SAP project in part of stakeholders and users which have consistent with the overall of numbers three factors: 1. system consultants in SAP 2) project management and 3) users training.

From the research mentioned above. They have studied social network analysis of the behavior of users on social networks such as Facebook, Orkut, MySpace, Hi5, etc [9] [21] [22] [23] [24] [25]. In order to studied the activity of users and interaction between users on social network, which have used in different methods. In the paper of Noppadon Khiripet et al. have used Social Network Analysis algorithms: small-world testing, centrality and community detection to identified the insurgents in the Deep South[24]. In the part of Arun S. Maiya and Tanya Y. Berger-Wolf [25] have investigated the use of online sampling by can be identified the set of individuals the highest centrality in social networks. Thus, in the centrality measures can be indicated the importance of a person in the network. In the paper of Pan Hui and Sonja Buchegger [22] have studied “Groupthink and Peer Pressure: Social Influence in Online Social Network Groups” which calibrate the influence using similarity measurements, and characterise the differences of these four systems. They have investigate the correlation between similarity values and clustering and the correlation between the similarity and influence with the node degree. Therefore, can be applied to the benefit of other samples in Thailand. In the part of the multiple regression analysis applied in research in many fields such as [26] [27] which these paper applied to find out the factors or independent variables that can affect or influence dependent variables and studied the relationships between the variables used in the experiment. The multiple regression analysis is used for data analysis in this research by consider the standardized coefficients (Beta) to estimates the independent

variables are correlated with the dependent variable that can affect with the dependent variable which in this research does not consider the coefficient of determination (R^2).

In this research has centrality measures of users who have interactions on Page posts of Facebook Fan Page such as “likes” and “comments” on Page posts by using centrality measures consisted of degree centrality and betweenness centrality. To find out users who have high interactions with Page post is active users with the highest score of centrality in the network. Thereafter, the multiple regression analysis between the centrality scores of individual users that affects against the overall users of Page from Facebook Page Insights. This research has to used 2 methods to describe relation of users better than centrality measure alone. To analyze behavior of users who have the characteristics are leader and follower with interactions on Page posts that affect the other users who participated with the Page from statistical data of overall users. To increase the efficiency of data analysis better.

CHAPTER III

RESEARCH METHODOLOGY

This research is about behavior analysis of Facebook Fan Page users who have interactions on Page Post of Facebook Fan Page. The objective is to bring data of users behavior to analyze the benefits of the information from Facebook Fan Page. We try to find out influence users or active users will help in distributing news and information for other users and useful to planning on marketing.

3.1 Subjects

The sample size of this study is users who used Facebook Fan page and participated in on Facebook Fan Page of Kledthai¹ which are Facebook Fan page in Thailand. That is, users that have interactions on Page Posts of Facebook Fan Page such as likes and comments on Page Post. Kledthai Facebook Fan Page is a book publisher in Thailand and has fan page is 3,019 people (October 2012) and has number talking about this is 436 people (October 2012).

3.2 Procedure

The procedures used in the research are composed of data preparation and data collection.

3.2.1 Data preparation and Data collection

The user profile of each user during (1 Dec. 2011 - 5 Dec. 2012) are imported data from Facebook Fan Page network of Kledthai by use NodeXL. We collected data of Page posts and users have interacted with Page posts such as

¹ <http://www.facebook.com/kledthai>

“likes” is users who have a favorite on Page post, “comments” is the opinions or ideas of user that has on Page posts of each user. In this page, there are the number of Page posts as 501 messages and the number of users that have interaction with the Page post is 1,846 in during (1 Dec. 2011 - 5 Dec. 2012).

Each imported data will be stored as vertices. Vertices are nodes, agents or entities which in this research is users profile and Page post data of users that have interaction with likes and comments on the Page post. The data are as follows:

1. Vertex is profile, id of users that have participate in posts of Facebook Fan Page such as like, comment and Post id.
2. Sex is the state of being male or female.
3. Language is the language used of the user.
4. Comments are the opinions or ideas on Page posts.
5. Post Content is message by posted on the Page of Page administrator.

An example data of the Vertices.

Table 3.1 An example of data in the vertices retrieved from Kledthai Facebook Fan Page during 26 July – 1 August 2012

Order	Vertex	Sex	Language	Comments	Post Content
1.	id52	male	en_US	-	-
2.	id24	male	th_TH	หาซื้อได้จาก ร้านฉลาดๆ เท่านั้น	-
3.	id31	female	en_Us	-	-
4.	1205980680 36_1015096 6670108037	-	-	-	ผู้ที่ยิ่งใหญ่ที่สุด คือ ผู้ที่ทำตนให้ เล็กที่สุด ฯลฯ

Table 3.1 An example of data in the vertices retrieved from Kledthai Facebook Fan Page during 26 July – 1 August 2012 (cont.)

Order	Vertex	Sex	Language	Comments	Post Content
5.	1205980680 36_1015096 8239213037	-	-	-	ใกล้เข้าพรรษา แล้วเคล็ดไทย จะนำหนังสือ บางส่วนไป บริจาค ฯลฯ

Table 3.1 is retrieved from Kledthai Facebook Fan Page which the first - third rows are user data consisting of Vertex, Sex, Locale, Comments and the fourth, fifth rows are the Post id from Page post consist of Vertex is Post id, Post Content.

The data in terms of edges, are relationships, ties or connections in the network. Edges represent connection between two vertices together. The data are as follows

1. Vertex1 is a user or a Post id that has interactions with Page post.
2. Vertex2 is a user or a Post id that has interactions with Page post.
3. Relationships are the relationship between Vertex 1 and Vertex 2.
4. Posts are message by posted on the Page of Page administrator.

The Facebook Fan Page network importer can extract connections among users and Page posts linked in network. The relationships of edge consist of user to user, post to post, and user to post networks are available. In this research is used based on the relationship between user to user and user to post.

The relationships in the part of edges consist of two models :

- User to user network is relationships of between user and other users in each Page post of Facebook Fan Page. Data can be divided into two types.

- User to user based on co-likes is users who like in the same Page post of Facebook Fan Page.

- User to user based on co-comments is users who comment in the same Page post of Facebook Fan Page.

- User to post network is relationships of between user and Page post in each Page post of Facebook Fan Page. Data can be divided into two types.

- User to post based on likes is users who like on each the Page post of Facebook Fan Page.

- User to post based on comments is users who comment on each the Page post of Facebook Fan Page.

An example data of the Edges.

Table 3.2 An example of data in the edges retrieved from Kledthai Facebook Fan during 26 July – 1 August 2012

Order	Vertex1	Vertex2	Relationships	Posts	Comments
1.	id52	id72	co-liker	ผู้ที่ยิ่งใหญ่ที่สุด คือ ผู้ที่ทำตน ให้เล็กที่สุด ฯลฯ	-
2.	id1 (Kledthai)	id24	co-commenter	ซัมบาลา หนทางอัน ศักดิ์สิทธิ์ของ นักรบ ฯลฯ	-
3.	id24	1205980680 36_1015096 8027028037	user - post based on comments	-	หาซื้อได้ จากร้าน ฉลาดๆ เท่านั้น
4.	id31	1205980680 36_1015096 6670108037	user - post based on likes	-	-

Table 3.2 shows the data retrieved from Kledthai Facebook Fan Page which the first row is a relationship between user to user who like the same Page post based on co-liker. The second row shows relationship between user to user who comment the same Page Post based on co-comment on the same Page post. The third row shows relationship between user to post based on comments on Page post. The fourth row shows relationship between user to post based on like on Page post.

In terms of the data from Facebook Page Insights, data which is a page summary that can give the overall users of Facebook Fan Page, not an individual users data of a particular Facebook Fan Page. We are selected a range of time during (1 Dec. 2011 - 5 Dec. 2012) and a selected data type is “Page level data” for aggregated data about Page by to get the data as a spreadsheet file. Thereafter, we use the statistic data of Facebook Page Insights composed of daily page engaged users, daily total reach, daily organic reach which are the data of “Page level data” from Facebook Page Insights (See description of data in Table 3.3).

Table 3.3 The description of data from Facebook Page Insights

Columns	Descriptive
1. Daily page engaged users	The number of user who engaged with your Page. Engagement includes any click or story created. (Unique Users)
2. Daily total reach	The number of user who have seen any content associated with your Page. (Unique Users)
3. Daily organic reach	The number of user who visited your Page, or saw your Page or one of its Posts in News Feed or ticker. These can be people who have liked your Page and people who haven't. (Unique Users)

The study to calculate the centrality measures by using graph metrics of NodeXL to analysis behaviors of users who have interaction on Page post in the network. To indicate users that have high interactions with Page posts are active users with the highest score of centrality measures in the network and to determine the influential users or important individuals who have participated with Page posts. Therefore, the values consist of degree centrality, betweenness centrality as described in Chapter 2 to measure a nodes importance or prominence in the network.

3.3 Data Analysis

3.3.1 Centrality Analysis

The data are imported from Facebook Fan Page of Kledthai during (1/12/2011 - 5/12/2012) using graph metrics of NodeXL to analyse behaviors of users who have interaction on Page posts in the network. These data are calculated using the centrality measures consist of degree centrality and betweenness centrality by relationships between user to user and user to post by ranking the score of centrality measures of users who have participated with Page posts. Thereafter using the score of centrality measures for analyze the influential users within the network by users who have high interactions with Page post are active users with the highest score of centrality in the network and to determine the influential users or important individuals who have participated with Page posts.

3.3.2 Multiple Regression Analysis

The multiple regression analysis is used to measure the individual users from the centrality measures against the overall users from Facebook Page Insights of the Page which are daily page engaged users, daily total reach and daily organic reach. To find out the influence users which are leader and follower that affects the overall users of the Page.

Data analysis in terms of multiple regression analysis is a statistical process for analyze relationship of several variables composed of one dependent variable and at least 2 independent variables by k independent variable (X_1, X_2, \dots, X_k),

$k \geq 2$ are related to the dependent variable by linear relationships. Y is the dependent variable and X is the independent variable. The multiple regression equation which shows the relationship between Y and X_1, X_2, \dots, X_k as follows [28][29]

The multiple regression equation of the population is

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + e, \quad (3.1)$$

$\beta_0 =$ the Y – intercept when $X_1 = X_2 = \dots = X_k = 0$,

$e =$ random error and $\beta_1, \beta_2, \dots, \beta_k$ are partial regression coefficient. β_i is the change in the predicted value of the dependent variable Y . When the independent variable X_i change one unit by the other independent variable X have constant such as X_1 is the change one unit affect to values of Y change a one-unit increase by X_2, X_3, \dots, X_k are constant.

From the multiple regression equation which displays the relationship between dependent variable and independent variable k from equation (5) by using variable size n in the estimate $\beta_0, \beta_1, \beta_2, \dots, \beta_k$ by a, b_1, b_2, \dots, b_k respectively. The e value or random variable is the least squares method from the estimate β_i by b_i and the estimate β_0 by a to the estimated value of Y as follows:

The multiple regression equation of the sample is

$$\hat{Y} = a + b_1 X_1 + b_2 X_2 + \dots + b_k X_k, \quad (3.2)$$

$\hat{Y} =$ the estimate value or the predict value of variables of Y ,

$a =$ the Y – intercept when $X_1 = X_2 = \dots = X_k = 0$,

and $b_i =$ the estimate value of partial regression coefficient of each independent variable.

The multiple regression analysis have objective to study the factors or variables that affect or influence the dependent variables and for analyze the relationship between variables to estimate or predict the value of the dependent variable when determining the independent variables [28] [29].

In this research using the Enter multiple regression analysis to study the relationship of all variables. The “Enter” method enters all independent variables into the equation in one step. The selection of independent variables which are correlated with the dependent variable by considering the significance of statistical tests. The selection of independent variables that are correlated with the dependent variable by

considering the statistic value of the results which is standardized coefficients (Beta) and choose the significance level of statistical tests. In this research analyzed the data obtained from centrality measures of individual users to analysis relation against the overall of users who have participate with Facebook Fan Page from Facebook Page Insights. To analysis users who have interacted and participated with Page posts from the score of centrality measures that affect or influence to other users from the number of user from daily page engaged users, daily total reach and daily organic reach which are the data from Facebook Page Insights.

The variables used in the multiple regression analysis (display the overview of variables in Figure 3.1) consisted of:

- **Independent variables** are the degree centrality scores from two models which are user to user and user to post of each user who have interactions with Page posts in 53 weeks during 1 Dec. 2011 - 5 Dec. 2012 by selecting from the degree centrality scores are the top 100 users and the top 20 users from two models. In addition to analyzing the differences between user groups used in the experiment by reducing the number of users and selecting the top 10 users and the top 30 users from the relationship of user to post degree centrality scores as follows:

- The user to user degree centrality scores and the user to post degree centrality scores of each top 100 users by ranking from the top 100 scores of users.
- The user to post degree centrality scores of each top 10 users by ranking from the top 10 scores of users.
- The user to user degree centrality scores and the user to post degree centrality scores of each top 20 users by ranking from the top 20 scores of users.
- The user to post degree centrality scores of each top 30 users by ranking from the top 30 scores of users.

In the part of the multiple regression analysis of users from betweenness centrality scores by using independent variables are user to post betweenness centrality scores of each user who have interactions with Page posts by linking between users and Page posts based on likes and comments in 53 weeks during 1 Dec.

2011 - 5 Dec. 2012. Which selecting from the betweenness centrality scores of top 20 users by will consider only 20 active users as follows:

- The user to post betweenness centrality scores of each top 20 users by ranking from the top 20 scores of users.

- **Dependent variable** is the number of user from

- Daily page engaged users is the number of user who engaged with your Page.

- Daily total reach is the number of user who have seen any content associated with your Page.

- Daily organic reach is the number of user who visited your Page, or saw your Page or one of its Posts in News Feed or ticker. Which used these data in 53 weeks during 1 Dec. 2011 - 5 Dec. 2012 by shows the overview of independent variables and dependent variable of multiple regression analysis in Figure 3.1.

Independent variables

- The user to user degree centrality scores and the user to post degree centrality scores of the top 100 users
- The user to post degree centrality scores of the top 10 users
- The user to user degree centrality scores and the user to post degree centrality scores of the top 20 users
- The user to post degree centrality scores of the top 30 users
- The user to post betweenness centrality scores of top 20 users



Dependent variables

- The number of users from
- Daily page engaged users
 - Daily total reach
 - Daily organic reach

Figure 3.1 Shows independent variables and dependent variables of multiple regression analysis

CHAPTER IV

EXPERIMENT AND RESULTS

The behavioral analysis of the users has an interaction with Page posts by using centrality in order to find people with influence in the network. In this research, degree centrality and betweenness centrality were used. Then the data obtained from measuring centrality was used to analyze relationships by using multiple regression analysis with the aggregate statistical values of users participating with Page obtained from Facebook Page Insights on the Facebook Fan Page.

The experimental results are presented in two sections as follows:

4.1 Centrality results

4.2 Multiple linear regression results

4.1 Centrality Results

4.1.1 Network size

The analysis of the network size of the top 100 users from the degree centrality score of relationships for users interacting with the Page posts on the Kledthai Facebook Fan Page. The degree centrality scores for all of the users accessing the network during the 53-week period from 1 Dec. 2011 to 5 Dec. 2012 was divided into the following six time periods: Phases 1 to 5 covered periods of nine weeks each and Phase 6 covered a period of eight weeks as shown in Figure 4.1. The x-axis displays the 53-week period of time by dividing Phase 1- 6 and the y-axis displays the degree centrality scores for the top 100 users. Each graph line refers to the degree centrality scores for each of the top ten users over the 53-week period. According to the findings, the network size gradually grew from a small network in Phases 1-3 to a steadily growing network from Phase 4 to Phase 6 with maximum growth during Phase 6. These findings can be explained as follows:

According to Figure 4.1, which shows the overall network size of the top 100 users from the degree centrality of the users who participated in Page posts over the 53-week period with the relationships among the users who interacted with the Page posts of Kledthai Facebook Fan Page divided into six time periods, the periods during Phases 1-3 showed the network to be small because few users participated and there are few Page posts during those periods. Furthermore, there are no Page posts in some weeks while other posts attracted few users to participate with Page posts which made the network small during those periods. In Phase 2, the user id1, who is the Page administrator overseeing the Page with higher degree centrality than other users due to high degrees of interaction with Page posts during 9-15 February 2012 and regular activity during all six phases, was found to have the highest total degree centrality score when the total degree centrality of the user id1 in 53 weeks was considered to hold the top ranking in the user to user degree centrality and the user to post degree centrality in Figure 4.1 because the user id1 is highly active or has a high degree of interaction with Page posts and a high degree of interaction with users participating with Page posts.

As for Phase 4, the network has small during the early part of the phase and gradually grew larger. Changes in the network size in which more users became interested in accessing and participating with Page posts were likely due to more posts on the Page which increased the number of Page posts.

During Phase 5, there are more active users accessing the site to interact with Page posts. In this phase, the user id8 has a higher degree centrality than other users. During the period from 30 Aug – 5 Sep 12, the user id8 accessed the site to interact with more Page posts than other users. In other words, the user clicked “like” and commented on a number of Page posts and continually participated with Page posts in Phases 5 and 6 with the total user to post degree centrality over the 53-week period in fourth place from Table 4.1. There was more access from the user id8 to the site and interaction with Page posts during Phase 5 than other phases. The user did not, however, access the site to interact with Page posts during Phases 1 - 3.

During Phase 6, the network is becoming larger and users are continuing to participate. The number of users accessing the site to interact with Page posts was higher than during other phases. According to Figure 4.1, the user id3 has a degree

centrality scores that is noticeably higher than other users during this period. The user id3 interacts with many Page posts with a high degree centrality of frequency of participation with Page posts. Thus, the total degree centrality score is noticeably higher than other users. The total degree centrality from the 53-week period ranked second out from user to post degree centrality as shown in Table 4.1 where the user id3 appears to be the user with highest interaction with Page posts following the user id1. During the weeks of Phase 6 in which the user id3 participated with more Page posts than other phases, while the user did not access the site to participate with Page posts during Phases 1-3.

According to the consideration in Figure 4.1, it can be summarized that the overall users accessed the site to participate in Page posts during Phases 1-3, but had fewer interactions with Page posts than during Phases 4-6 when the number of users interested in and accessing the site to interact with Page posts increased, particularly in Phase 6 when the users participated with Page posts most frequently, thereby showing a high interactions in which more users are interested in and participated with the Page posts during Phases 4-6.

In users' participation with Pages, one factor causing users to interact with Pages more frequently was increased activity by the Page administrator and overall participation by users participating with the Page. Rises and falls in the number of users were caused by factors associated with multiple persons participating with one another and not only the user id1. Therefore, individual consideration on prioritizing the importance of multiple users is significant.

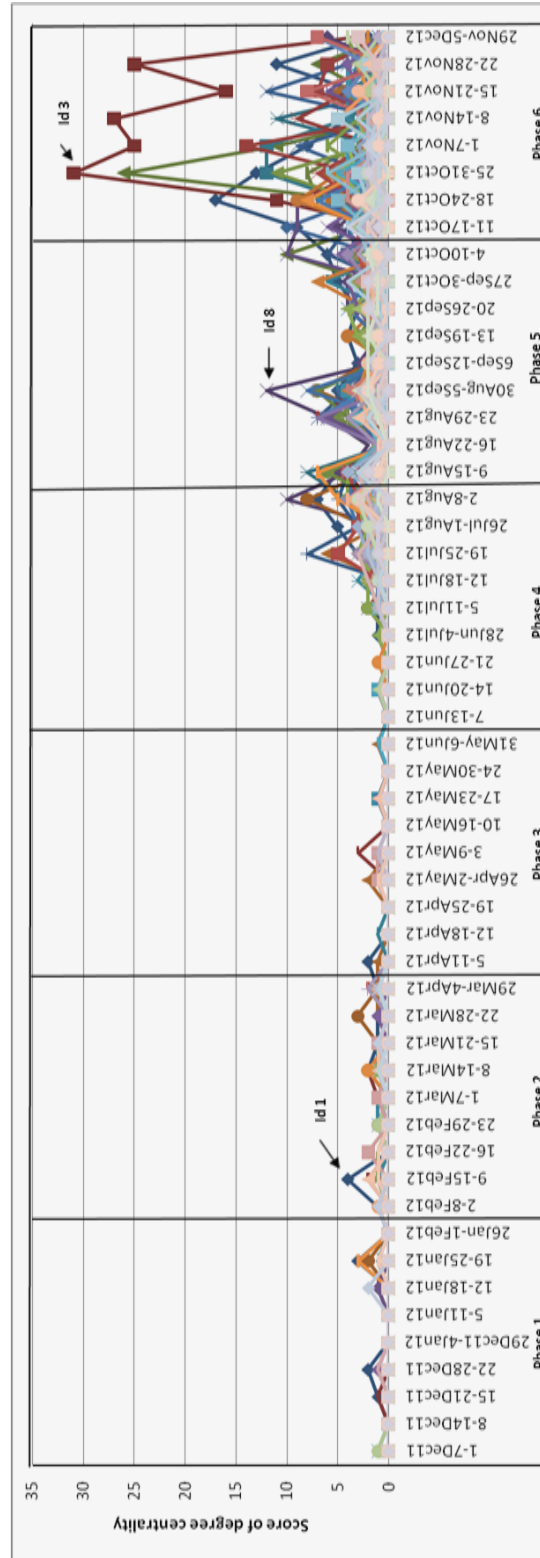


Figure 4.1 Shows an aggregate perspective of the network sizes for the top ten users from the degree centrality score of the users accessing the site to participate in the Page posts which is a relationship between users interacting with Page posts at the Kledthai Facebook Fan Page from 1 December 2011 to 5 December 2012 for a total of 53 weeks divided into six phases

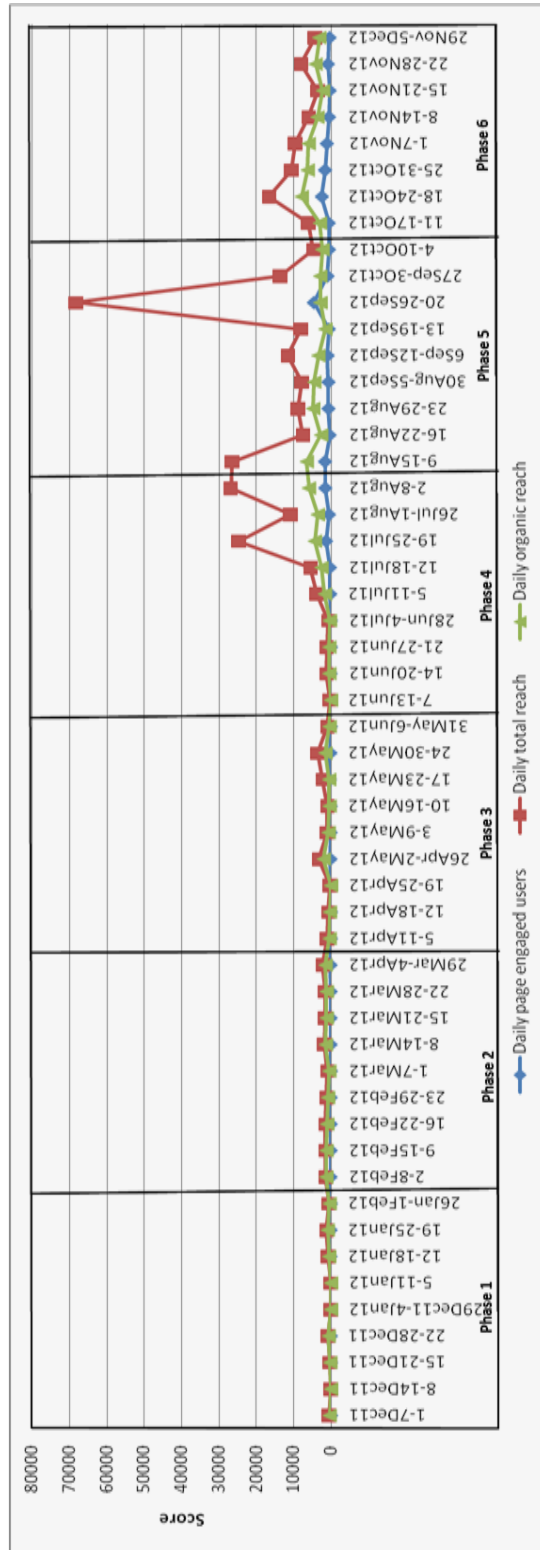


Figure 4.2 Shows the number of users from the daily Page engaged users, daily total reach and daily organic reach of the Kledthai Facebook Fan Page from 1 December 2011 to 5 December 2012 for a total of 53 weeks divided into six phases.

According to Figure 4.2, the number of users accessing the site to interact with the Page from all three values obtained from Facebook Page Insights, namely, daily page engaged users means the number of people who engaged with Page, the daily total reach, which means the number of people who have seen any content associated with the Page and daily organic reach, which further means the number of people who visited the Page, or the Page or one of its posts in the News Feed or ticker. The data collected from 1 December 2011 to 5 December 2012 covered a 53-week period divided into six phases as follows: Phases 1 to 5 covering nine weeks and Phase 6 covering eight weeks. The details in the graph can be explained as follows:

During Phases 1-3, the number of users interacting with the Page from the daily page engaged users, daily total reach and daily organic reach was lower than during Phases 4-6. During Phase 4, the number of users was higher at Week 7 (19-25 July 2012). According to all three of the values in Phase 5, at Week 7 of the phase (20 – 26 September 2012) the number of users viewing any content associated with the Page was taken from the highest daily total reach and the number standing out more than the number of users from other values. The number of users from the three values increases and becomes active in participation with the Page until Phase 6. The daily total reach has more users than the value for daily page engaged users and the daily organic reach.

When considered together with Figure 4.1, the network size at Phases 1-3 is small, but rises in Phases 4-6. The type of the network size is the same as in Figure 4.2, which can be explained in that Phases 1-3 had fewer users accessing the site to participate with the Page posts than in Phases 4-6. More users accessed the site to interact with the Page posts during Phases 4-6, these were of the same type as the increasing number of users in Phases 4-6 of the number of users from the daily page engaged users, the daily total reach and the daily organic reach.

4.1.2 Centrality results

The outcome of the centrality measurement in which the total degree centrality and betweenness centrality of the users who accessed the site to interact with the Page posts from 1 December to 5 December 2012 for a 53-week period shows the degree centrality scores and the betweenness centrality scores to be the thirtieth

highest scores from the two models, the user to user and user to post relationships are shown in Tables 4.1 and Table 4.2.

Table 4.1 Shows the total degree centrality scores of the top thirty rankings of the user to user (u-u) and user to post (u-p) relationships for the 53-week period according to Formula (2.1)

Rank	ID	Degree of u-p	Rank	ID	Degree of u-u
1	id1	141	1	id1	1467
2	id3	140	2	id2	1082
3	id13	63	3	id3	1019
4	id8	55	4	id4	988
5	id6	51	5	id5	953
6	id24	51	6	id6	923
7	id5	50	7	id7	919
8	id23	46	8	id8	882
9	id2	44	9	id9	879
10	id4	43	10	id10	849
11	id50	40	11	id11	804
12	id20	39	12	id12	773
13	id29	37	13	id13	768
14	id11	37	14	id14	764
15	id9	36	15	id15	762
16	id10	34	16	id16	755
17	id19	34	17	id17	727
18	id16	34	18	id18	719
19	id61	33	19	id19	690
20	id94	32	20	id20	690
21	id44	31	21	id21	683
22	id43	31	22	id22	663
23	id35	30	23	id23	654
24	id55	30	24	id24	653
25	id34	30	25	id25	646
26	id22	29	26	id26	641
27	id93	28	27	id27	633
28	id18	28	28	id28	623
29	id15	28	29	id29	621
30	id12	27	30	id30	617

Table 4.2 Shows the total betweenness centrality scores of the top thirty rankings of the user to user (u-u) and user to post (u-p) relationships for the 53-week period according to Formula (2.2-2.3)

Rank	ID	Betweenness of u-p	Rank	ID	Betweenness of u-u
1	id3	49918.957	1	id3	26668.223
2	id1	36425.601	2	id1	16929.725
3	id13	16443.338	3	id8	11770.632
4	id8	15490.757	4	id13	11145.269
5	id5	11701.343	5	id5	9125.743
6	id6	9182.210	6	id6	7831.524
7	id14	7022.961	7	id26	6225.115
8	id4	6635.742	8	id14	6116.844
9	id43	6593.795	9	id4	5680.719
10	id9	6504.509	10	id9	5376.621
11	id26	6415.385	11	id10	5352.564
12	id24	6378.534	12	id2	5306.722
13	id2	5982.667	13	id24	5254.671
14	id85	5466.489	14	id43	4568.792
15	id10	5311.234	15	id18	4406.934
16	id18	4903.508	16	id85	4210.344
17	id94	4868.457	17	id11	3932.555
18	id11	4472.480	18	id28	3789.305
19	id34	4294.873	19	id15	3710.230
20	id50	4267.386	20	id19	3709.712
21	id16	4212.645	21	id55	3645.880
22	id61	4211.733	22	id94	3642.807
23	id55	4137.886	23	id16	3592.602
24	id15	4117.267	24	id72	3590.253
25	id19	4098.852	25	id12	3390.188
26	id29	4081.997	26	id34	3377.782
27	id72	4032.950	27	id101	3368.495
28	id28	4016.278	28	id44	3353.917
29	id12	3805.338	29	id29	3296.454
30	id71	3630.617	30	id61	3241.337

From Table 4.1, we found that most users are the same users from degree centrality measures of two models but have different ranks of scores. The degree centrality scores of top 20 users for two models have few different of users and top 30 users have users that different of users more than top 20 users. The betweenness centrality measures from Table 4.2 found that most users are the same users from two models and have the rank of the scores are not much different and considering of top 30 users were found to be the same users and rank of scores that not much different from top 20 users. The users in the top ten of degree centrality scores and betweenness centrality scores of two models which most users are in the top 20 of degree centrality scores and betweenness centrality scores of two models by will focus on the top 20 users in multiple regression analysis and additional considered in terms of the top 10, 30 and 100 users to determine the different of users from the analysis.

Tables 4.3 and Table 4.4 show the comparison ranked of degree centrality scores and the betweenness centrality scores to be the tenth highest scores from the two models, the user to user and user to post relationships.

Table 4.3 Shows the total degree centrality scores, including the top ten rankings of the user to user (u-u) and user to post (u-p) relationships for the 53-week period. According to Formula (2.1): The symbol “-” means users whose scores did not make the top ten for the degree centrality measurement for each model

ID	Degree of u-u	Degree of u-p	Rank of u-u	Rank of u-p
id1	1467	141	1	1
id2	1082	44	2	9
id3	1019	140	3	2
id4	988	43	4	10
id5	953	50	5	7
id6	923	51	6	5
id7	919	-	7	-
id8	882	55	8	4
id9	879	-	9	-
id10	849	-	10	-
id13	-	63	-	3
id23	-	46	-	8
id24	-	51	-	6

Table 4.3 shows the values obtained from measuring the degree centrality for all fifty-three weeks with the scores in the top ten. The degree centrality means the number of interactions between the users in each Page post. Therefore, the top ten users in terms of user to user degree centrality have more interactions based on co-likers or co-commenters within the same Page posts (See Figure in Appendix B.1). The user to post degree centrality means the number of interactions between the users participating with Page posts based on likes or comments. The users have a higher total degree centrality score and the total user to post degree centrality ranking among the top ten indicates that the users are accessing the site to participate in many Page posts and have high activity in interacting with Page posts (See Figure in Appendix B.2). Most of these users in the top ten in Table 4.3 are ranked among the users with a high degree centrality scores over many weeks.

When the ranking is compared between the two degree centrality models with user to user and user to post relationships, the user id1 ranked first for both because the user id1 is a Page administrator who should be a user with high levels of activity and interactions with Page posts likely to attract the interests of other users accessing the site and participating in the Page more. For the user id3 and id6, the ranking of the degree centrality scores for the user to user degree centrality and user to post degree centrality does not differ much and is composed of users accessing the site to participate in numerous Page posts and interact with many people at the same Page post, which shows that these users have a high levels of interest in accessing the site, interacting and participating in Page posts.

Concerning the ranking of users with high total user to user degree centrality scores, but lower total user to post degree centrality scores means interaction with fewer Page posts than other users, such as the user id2 where the total user to user degree centrality ranked second, but the ranking for the total user to post degree centrality ranked ninth. When the behaviors of interactions with Page posts are considered, the user id2 is found to have participated with Page posts and interacted with other users in Phases 5 and 6, which are the active periods of Page posts when Page posts are numerous and overall user activity is high. However, the user id2 shows no activity at all in Phases 1-3. Furthermore, when the behaviors are compared, the user id2 is found to have interaction by participating with fewer Page posts than other

users, but participates in Page posts that have users interacting in large numbers. Thus, the total user to user degree centrality was ranked second.

In another model of comparison of the degree centrality ranking, there are low total user to user degree centrality scores, but high total user to post degree centrality scores. For example, the user id8 has a total user to user degree centrality ranked at eight, but the ranking for the total user to post degree centrality is fourth. Both rankings are different, thus indicating that the user id8 accessed the site to participate in numerous Page posts. Each Page post had few people participating with Page posts, thereby giving a low total user to user degree centrality because there are fewer users interacting with Page posts than the users with better ranking in accessing the site to participate in Page posts only at certain weeks. However, the rank for the total user to post degree centrality is higher because there are interactions with many Page posts. When the user id8 is considered in terms of interaction behaviors with Page posts, we find the user id8 to begin participation with Page posts and interaction with other users near the end of Phase 4 with more participating in Phases 5 and 6 but no participation at all in Phases 1 – 3.

According to the top ten degree centrality scores for the total user to user degree centrality and the total user to post degree centrality and the rankings of the users according to the degree centrality scores created awareness of users participating among users interacting with Page posts and interacting with other users in the top ten users with high activity and participation with Page posts. Most of the users with the highest participation in Phases 5 and 6 while few users participated with Page posts in Phases 1-3 (as shown in Appendix A.1 and A.2).

Table 4.4 Shows the total betweenness centrality scores including the top ten rankings of the user to user (u-u) and user to post (u-p) relationships for the 53-week period according to Formula (2.2-2.3): The symbol “-” means users whose scores did not make the top ten for the betweenness centrality measurement for each model

ID	Betweenness of u-u	Betweenness of u-p	Rank of u-u	Rank of u-p
id1	16929.725	36425.601	2	2
id3	26668.223	49918.957	1	1
id4	5680.719	6635.742	9	8
id5	9125.743	11701.343	5	5
id6	7831.524	9182.210	6	6
id8	11770.632	15490.757	3	4
id9	5376.621	6504.509	10	10
id13	11145.269	16443.338	4	3
id14	6116.844	7022.961	8	7
id26	6225.115	-	7	-
id43	-	6593.795	-	9

Table 4.4 shows how the ranking for the total betweenness centrality for two models were not much different from the top ten scores. The high total user to user betweenness centrality scores and the ranking for the total user to user betweenness centrality are among the top ten, which means the users accessing the site to participate with other users in many Page posts where many users accessed the site to participate made user to user relationships for different Page posts. Thus, users from different Page posts are connected (see Figure in Appendix B.3). As for the high total user to post betweenness centrality and the ranking of the total user to post betweenness centrality are among the top ten, which means the users who accessed the site to interact in many Page posts with links between user and Page posts (see Figure in Appendix B.4).

The outcome obtained from Table 4.4 found the users with the highest total betweenness centrality scores to be the user id3 which ranked first among both the user to user betweenness centrality and the user to post betweenness centrality, thereby showing that the user id3 accessed the site to interact with many Page posts and that the user id3 is the medium occurring on the shortest path (Geodesic path) with

connections between Page posts and causing interactions among the users accessing the site to participate with those Page posts with a betweenness centrality also linking high Page posts. When the user id1 is considered, the betweenness centrality scores are found to rank second out of the top ten according to the two models, but have degree centrality scores in the first rank according to the two models in Table 4.3. The user id1 is the user with the highest degree centrality score according to both models, but did not use the shortest path in linking with other users or linking to each Page post with which the user id1 interacted. The user id3 has the highest betweenness centrality score over the user id1 according to the two models.

In comparing Tables 4.3 and Table 4.4, the user id2, id7, id10, id23 and id24 were found in Table 4.3 but were not ranked among the top ten in Table 4.4 due to fewer interactions with Page posts and some of the users have total user to user degree centrality scores not ranked among the top ten. For example, the user id2, id7, id10, id23 and id24 are not ranked among the top ten in the Table 4.4 because they interacted with fewer Page posts than the other users appearing in this table. The user id2, id23, id24, they ranked in the top ten for user to user degree centrality, but they are in the top ten for user to post degree centrality but not in very high positions. Therefore, the low number of users accessing the site to interact with Page posts made betweenness centrality, which was also a connection between fewer Page posts. Hence, the user id2, id7, id10, id23 and id24 have total betweenness centrality scores not ranked among the top ten highest scores.

Concerning Table 4.4, the users were found to differ from Table 4.3, namely, the user id14, id26 and id43, are new in the Table 4.4. In other words, the users have total betweenness centrality scores ranked among the top ten, but not ranked accordingly in Table 4.3 due to fewer interactions with Page posts. Thus, the total degree centrality scores were not very high or not ranked among the top ten for the highest total degree centrality scores for the two models.

To sum up from centrality measures of top ten scores from two models:

- According to the degree centrality measures and the ranking of scores from the two models, the users are found to have high total user to user degree centrality scores, but lower total user to post degree centrality scores with different ranks of degree centrality according to the two models because the users interact with

fewer Page posts than other users, but participation in Page posts with high degrees of user interaction, causing the total user to user degree centrality scores to be higher in rank than the total user to post degree centrality scores.

- In other words, according to the degree centrality ranking according to the two models, the users were found to have low total user to user degree centrality, but high total user to post degree centrality scores. Due to the users' interactions with numerous Page posts, the users have high total user to post degree centrality scores and each Page post has few users participating with Page posts, thereby giving low total user to user degree centrality scores due to interactions with fewer users in the Page posts than the users at higher ranking due to the users' participation in Page posts.

- According to the betweenness centrality scores and the ranking of scores from the two models, the users were found to have similar ranking and some users have few difference from the two models.

- Furthermore, according to the betweenness centrality scores obtained, when the users interactions with many Page posts form the total high user to post degree centrality scores, the user will have a chance of having high total betweenness centrality scores among the top ten according to the two models because connections between users will be created from the total user to user betweenness centrality scores and with connections between users and Page posts from the total user to post betweenness centrality scores, thereby creating opportunities to perceive the news and information of related users in each Page post and users' friends. The fact that total betweenness centrality scores had different scores and ranks was due to participation in different numbers of Page posts with dependence on the shortest path in connecting with other users and each Page post causing the total betweenness centrality scores to be different.

The degree centrality and betweenness centrality measurements and the ranking of users reveal that larger numbers of users accessed the site to interact and participate with Page posts on the Page with high numbers of users participating. However, it cannot be concluded that these users have high influence over the network because there is a dearth of information on the access the Page of users participating with the Page and distributing the news about the Page at the time. The data was

analyzed by using multiple regression analysis by measuring centrality and the aggregate statistical information on the users accessing the site to interact with Facebook Page Insights.

4.2 Multiple regression analysis results

The analysis of the behavior data on the users according to the measurement of centrality by using multiple regression analysis between the values obtained from measuring degree centrality and betweenness centrality, which will be used as data for the top 100 users with user to user and user to post which will be considered together with daily Page engaged users, daily total reach and daily organic reach which is taking the value obtained from the Facebook Page Insights to help in analyzing the data on access to the site by users to participate with the Page and the dissemination of news to also accompany the consideration by analyzing with the data on the previously obtained centrality measurement.

4.2.1 Multiple regression analysis results of the top 100 users of user to post degree centrality.

In the multiple regression analysis between the values obtained from the 53-week measurement of degree centrality in which the data from the top 100 users with the total user to post degree centrality scores considered with the daily Page engaged users, the daily total reach and the daily organic reach by selecting the independent and entering into the equation for Enter multiple regression analysis using a reliability level of 95%. The standardized coefficients (Beta) are shown for the users with scores in the top five users as shown in Table 4.5.

Table 4.5 The degree centrality of the user to post of top 100 users during the 53-week period with daily page engaged users, daily total reach and daily organic reach by using the method of Enter multiple regression analysis

Daily Page engaged user					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of degree (u-p)
1	id56	1.110	0.002	12	98
2	id42	0.778	0.002	20	48
3	id72	0.474	0.106	17	58
4	id147	0.386	0.010	12	100
5	id92	0.374	0.024	16	64
Daily total reach					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of degree (u-p)
1	id56	1.484	0.002	12	98
2	id72	0.727	0.089	17	58
3	id42	0.571	0.049	20	48
4	id60	0.463	0.026	13	81
5	id115	0.433	0.001	15	70
Daily organic reach					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of degree (u-p)
1	id72	1.024	0.288	17	58
2	id60	0.539	0.219	13	81
3	id56	0.516	0.528	12	98
4	id42	0.477	0.439	20	48
5	id31	0.385	0.243	24	37

Table 4.5 shows the results of the multiple regression analysis of the total degree centrality for the users occurring within 53 weeks, i.e. the number accessing the site to interact with Page posts during the 53-week period, the user to post degree centrality of all 100 users, which was found to be capable of affecting the users who engaged with Page (daily page engaged users). The user ids comprised the users with the top one hundred degree centrality scores. This table shows the Beta of the users who had the top five scores. When the Beta are considered, the user id56 is found to have the highest value of Beta equal to 1.110 with statistical significance at 0.05 (Sig. < 0.05), which is more than other variables. Furthermore, the degree centrality is 12 and ranked at degree 98 out of 100 people, which is not high. The user id56

engaged by accessing the site and interacting with Page posts for a total of 12 times and the most correlated with users who engaged with Page (daily page engaged users) because the highest Beta was followed by the user id42, id47 and id92. The Beta equal 0.778, 0.386 and 0.374, respectively. The relationship in the same direction with statistical significance is 0.05 (Sig. < 0.05) which participating with Page posts of these users and the user id56, thus resulting more interact of other users with Page. The user id72 and id92 have Sig. higher than 0.05 the lack of statistical significance for the daily page engaged users.

Concerning the multiple regression analysis of the total degree centrality of the users who viewed contents associated with Page (daily total reach). The user id56 continues to have the highest Beta at 1.484 with statistical significance at 0.05 (Sig. < 0.05), which is higher than other variables, thereby indicating that the user id56 is a user with behaviors from total degree centrality most capable of influencing users who viewed contents associated with Page (daily total reach), followed by the user id42, id60 and id115 with Beta of 0.571, 0.463 and 0.433, respectively, with statistical significance at 0.05 (Sig. < 0.05) which participating with Page posts of these users and the user id56, thus resulting more interact of other users with Page. With regard to the user id72, the user has a Sig. higher than 0.05, thereby it indicates the lack of statistical significance correlated of users who viewed contents associated with Page (daily total reach).

However, when the multiple regression analysis of total degree centrality with the daily organic reach was considered in terms of users with the top five Beta, the Sig. values are found to be more than 0.05, thus indicates the lack of statistical significance towards the number of users who visited Page or viewed posts in News Feed or ticker (daily organic reach).

The analysis results from Table 4.5 can be summarized as follows: According to the multiple regression analysis, when the users are considered with the top five Beta value from analysis with all three values consisting of daily page engaged users, daily total reach and daily organic reach, the top five users are mostly frequently found to be the same person in different orders due to different Beta values. When considered in terms of the total degree centrality of the user id56 who participated in Page posts twelve times at the rank of degree at 98 out of 100 people,

the user id56 is found to have not participated in Page posts during Phases 1 – 3, but only participated in Phase 4 - 6, furthermore, the user id56 would interact with Page posts at times with multiple users participating in Page according to Facebook Page Insights statistical data. Hence, this user has the most Beta from analysis with daily Page engaged users and daily total reach. Therefore, the user id56 has the characteristics of a user who followed trends in not having high overall degree centrality scores due to few interactions with Page posts while having the highest Beta.

Thus, the user id56 has the highest Beta, which is higher than the user id1 who has the highest total degree centrality value of 141. Thus, the user id1 has the highest frequency of interaction with Page posts and regular interaction with Page posts in every phase as shown in Figure 4.1 while having no high Beta and a significance value of more than 0.05, which the lack of statistic significance for users from daily page engaged users, daily total reach and daily organic reach, thereby indicating high overall degree centrality values to not be a factor main attracting and leading other users to interact with Pages, which depends on the data of multiple users interacting with Page. From Table 4.5, it is the users interactions with Page posts is not high level and a medium level from degree centrality scores by these users to create a network that will help to spread the news. Furthermore, whether or not the time of posting is a time when users are active and message of Page posts causes different user interactions. The analysis outcomes from this table show the users to have characteristics of the Page followers more than leading users during the aforementioned period.

After the multiple regression analysis of all one hundred users, who are users the degree centrality scores among the top hundred scores, most of the users with the top five Beta are found to be users who irregularly interacted with Page posts and not very active. Most of the users followed trends causing the users to have total degree centrality scores which are not high but have Beta values among the top five values. It indicates that users with low interactions who are the Page follower that have less opportunity to see the Page posts when these users interactions with Page posts can be distribution the news in one channel and affecting the overall users of Facebook Page Insights to be increased. Therefore, an experiment was conducted by reducing the number of users to remove all the Page follower and selecting the ten users and twenty users with top ten and top twenty high degree centrality scores for all fifty-three weeks.

Highly active and regularly interacting with Page posts, these users were considered with daily page engaged users, daily total reach and daily organic reach values by selecting independent variables into the regression equation with the Enter multiple regression analysis method using a reliability level of 95% with outcomes of ten users shown in Tables 4.6 – 4.8 and outcome of twenty users in Tables 4.9 – 4.11.

4.2.2 Multiple regression analysis results of the top 10 users of user to post degree centrality.

In the multiple regression analysis between the values obtained from the 53-week measurement of degree centrality in which the data from the top 10 users with the total user to post degree centrality scores considered with the daily page engaged users, the daily total reach and the daily organic reach by selecting the independent and entering into the equation for Enter multiple regression analysis using a reliability level of 95% with results shown in Table 4.6 – 4.8.

Table 4.6 The degree centrality of the user to post of top 10 users during the 53-week period with daily page engaged users by using the method of Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily page engaged users - Degree centrality of user to post of top 10 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-p)
1	id8	0.624	0.062	55	4
2	id1	0.508	0.014	1	141
3	id13	0.421	0.142	63	3
4	id6	0.324	0.033	51	5

Table 4.7 The degree centrality of the user to post of top 10 users during the 53-week period with daily total reach by using the method of Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily total reach - Degree centrality of user to post of top 10 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-p)
1	id8	0.743	0.037	55	5
2	id13	0.446	0.143	63	3
3	id5	0.429	0.009	50	7
4	id6	0.355	0.028	51	51
5	id1	0.277	0.195	1	141

Table 4.8 The degree centrality of the user to post of top 10 users during the 53-week period with daily organic reach by using the method of Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily organic reach - Degree centrality of user to post of top 10 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-p)
1	id1	0.368	0.002	141	1
2	id3	0.217	0.113	140	2
3	id5	0.177	0.041	50	7
4	id4	0.164	0.050	43	10
5	id6	0.162	0.059	51	5
6	id24	0.116	0.452	51	6
7	id8	0.081	0.661	55	4
8	id23	0.064	0.554	46	8

Table 4.6 – 4.8 show the outcomes of the multiple regression analysis for the total user to post degree centrality scores of the users during the 53-week period, which are the numbers of interactions with Page posts of the 10 users capable of influencing the users who engaged with Page (daily page engaged users), the users

who viewed contents associated with Page (daily total reach) and users who visited Page or viewed posts in News Feed or ticker (daily organic reach). This table is arranged in the order of Beta values from users with the highest Beta to the lowest Beta. When Beta is considered, the user id1 have the highest Beta capable of influencing the users who engaged with Page (daily page engaged users) and the users who visited Page or viewed posts in News Feed or ticker (daily organic reach) and considered the correlation coefficient between the user to post degree centrality scores with daily page engaged users, daily total reach and daily organic reach which the high correlation is 0.83 in daily organic reach, the moderate correlation is 0.58 in daily page engaged users and the low correlation is 0.36 in daily total reach. The distribution of the news and information to reach the many users be caused by the interactions and to participate of the many users which contributing factors that capable of influencing the users engaged with Page (daily page engaged users) is the user id6. In part of contributing factors with the user id1 that capable of influencing the users who visited Page or viewed posts in News Feed or ticker (daily organic reach) is the user id4 and id5. Therefore the user id1 alone cannot make other users engage more with Page which must interaction together with other users such as the user id4, id5 and id6 who are important to increase the Page boost. In terms of the users capable of influencing the users who viewed contents associated with Page (daily total reach) are the user id8, id5 and id6.

From the multiple regression analysis of the top 10 users by considered of users that have positive Beta values and statistical significance at 0.05 (Sig. < 0.05) is found to have a few user who can influence the overall users from 3 values. Therefore are considered in the selections of variables to confident on the selection variables is increase the number of users more than the top 10 users by selections the top 20 users shown in Table 4.9 – 4.11 and top 30 users shown in Table 4.12 – 4.14. In order to analyze the frequency of user groups to interact with Page posts which different with the top 10 users that can participated together causes distributions news to attract interest and to increase engaging with Page.

4.2.3 Multiple regression analysis results of the top 20 users of user to post degree centrality.

Table 4.9 The degree centrality of user to post of the top 20 users during 53-week period with daily page engaged users by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily page engaged users - Degree centrality of user to post of top 20 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-p)
1	id29	1.595	0.000	37	13
2	id10	1.517	0.000	34	16
3	id50	0.680	0.002	40	11
4	id5	0.440	0.000	50	7
5	id4	0.382	0.000	43	10
6	id6	0.378	0.001	51	5
7	id8	0.264	0.076	55	4
8	id2	0.250	0.105	44	9
9	id3	0.247	0.278	140	2
10	id20	0.058	0.544	39	12
11	id23	0.057	0.441	46	8
12	id1	0.048	0.704	141	1

Table 4.9 shows the outcomes of the multiple regression analysis for the total user to post degree centrality scores of the users during the 53-week period, which are the numbers of interactions with Page posts of the twenty users capable of influencing the users who engaged with Page (daily page engaged users). This table is arranged in the order of Beta values from users with the highest Beta to the lowest Beta. According to the findings total of six users were able to influence users who engaged with Page (daily page engaged users) with statistical significance at 0.05 (Sig. < 0.05). When Beta is considered, the user id29 is found to have the highest Beta of 1.595 with statistical significance at 0.05 (Sig. < 0.05), which is higher than other variables, thereby indicating that the user id29 interacts with Page posts from the total

degree centrality scores for all fifty-three weeks and is most closely correlated with users who engaged with Page from daily page engaged user. In addition, the user id29 has a total degree centrality of 37 in the thirteenth rank of twenty users which is a medium level out of twenty users.

The users with lower Beta are the user id10, id50, id5, id4 and id6 with Beta values of 1.517, 0.68, 0.44, 0.382 and 0.378 , respectively, with correlates in the same direction with statistical significance at 0.05 (Sig. < 0.05) which participating with Page posts of these users, thus resulting more interact of other users with Page. When the degree centrality scores are considered, the total degree centrality scores of the user id10, id50 and id4 are at a medium level out of twenty users at 16, 11 and 10, respectively, while the user id5 and id6 have rank of degree scores at the seventh and fifth places, respectively, with higher total degree scores among twenty users and the top ten users from Table 4.1, which is a user to post degree centrality by highly active in interacting with Page posts.

Table 4.10 The degree centrality of user to post of the top 20 users with daily total reach during 53-week period by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily Total Reach - Degree Centrality of user to post of top 20 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-p)
1	id29	1.794	0.000	37	13
2	id10	1.606	0.000	34	16
3	id50	0.748	0.000	40	11
4	id5	0.566	0.000	50	7
5	id4	0.509	0.000	43	10
6	id6	0.502	0.000	51	5
7	id3	0.487	0.033	140	2
8	id8	0.334	0.024	55	4
9	id2	0.113	0.444	44	9
10	id20	0.082	0.381	39	12
11	id23	0.027	0.710	46	8

Table 4.10 shows the results of the multiple regression analysis of total user to post degree centrality scores for the users over the fifty-three-week period, which were numbers of interactions with Page posts for twenty users capable of influencing the users who viewed any content associated with Page (daily total reach). This table was arranged in the order of Beta values from users with the highest Beta values to the lowest Beta values. A total of eight users are found to be able to influence users who viewed any content associated with Page (daily total reach) with statistical significance at 0.05 (Sig. < 0.05). According to the analysis, the user id29, id10, id50, id5 and id4 have high Beta values similar to the Table 4.9 in which the user id29 is found to have the highest Beta value of 1.794 with statistical significance at 0.05 (Sig. < 0.05), which is higher than other users. Hence, the indication is that the user id29 interacted with Page posts from total degree centrality scores in correlates with users who viewed any content associated with Page (daily total reach). In addition, the user id29 has a total degree centrality of 37 at the thirteenth rank of twenty users, which is a medium level out of twenty users.

The users with lower Beta values are the user id10, id50, id5, id4, id6, id3 and id8 with Beta values of 1.606, 0.748, 0.566, 0.509, 0.502, 0.487 and 0.334, respectively, and correlates in the same direction with statistical significance at 0.05 (Sig. < 0.05) which participating with Page posts of these users, thus resulting more interact of other users with Page. When the degree centrality scores of these users are considered, the total degree centrality values of the user id10, id50 and id4 are at a medium level out of twenty users at 16, 11 and 10, respectively, while the user id5, id6, id3 and id8 are higher total degree centrality values among twenty users and the top ten users from Table 4.3 on user to post degree centrality.

Table 4.11 The degree centrality of user to post of the top 20 users with daily organic reach during 53-week period by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily Organic Reach - Degree Centrality of user to post of top 20 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-p)
1	id3	0.673	0.030	140	2
2	id50	0.527	0.052	40	11
3	id4	0.394	0.000	43	10
4	id10	0.385	0.004	34	16
5	id16	0.307	0.036	34	18
6	id20	0.260	0.046	39	12
7	id29	0.224	0.403	37	13
8	id24	0.221	0.126	51	6
9	id8	0.105	0.586	55	4
10	id1	0.100	0.549	141	1
11	id2	0.022	0.913	44	9
12	id5	0.007	0.950	50	7

Table 4.11 shows the results of the multiple regression analysis for the total user to post degree centrality of the users over the fifty-three-week period, namely the numbers of interactions with Page posts for the twenty users which can influence the users who visited Page or viewed posts in News Feed or ticker (daily organic reach). This table is arranged in the order of Beta values from users with the highest Beta to the lowest Beta. A total of five users are found to be able to influence users who visited Page or viewed posts in News Feed or ticker (daily organic reach) with statistical significance at 0.05 ($P < 0.05$). According to the analysis, the user id3, id4, id10, id16 and id20 have highest Beta with statistical significance at 0.05 ($P < 0.05$) which these users have participating with Page posts together, thus resulting more interact of other users with Page. The user id3 has the highest Beta value of 0.673 with statistical significance at 0.05 ($P < 0.05$), which is higher than other users, thereby indicating that the user id3 interacted with Page posts from total degree centrality scores and correlates with users who visited Page or viewed posts in

News Feed or ticker (daily organic reach). In addition, the user id3 has a total degree centrality of 140 in the second rank of degree out of twenty users, which is a good level.

The users with lower Beta values are the user id4, id10, id16 and id20 with standardized coefficients (Beta) values of 0.527, 0.394, 0.385 and 0.307, respectively, with correlates in the same direction with statistical significance at 0.05 ($P < 0.05$). When the degree centrality scores of these users are considered, the total degree centrality values for the user id50, id4, id10 and id16 are at a medium level out of twenty users at 11, 10, 16, 18 and 12, respectively, from the rank of degree. These users are moderately active users capable of influencing other users who visited Page or viewed posts in News Feed or ticker (daily organic reach).

According to Tables 4.9 – 4.11, it can be concluded that, when the number of users is reduced to twenty highly active users with total user to post degree centrality scores for the entire fifty-three-week period in the top twenty scores. According to the analysis results of Tables 4.9 and 4.10, the users with the top six Beta values are the user id29, id10, id50, id5, id4 and id6, the same people with no difference in the rank of Beta. When the total degree centrality scores are considered, the users with the top six Beta values are mostly found to have moderate total degree centrality scores out of twenty users. The user id5 and id6 are in the seventh and fifth places, respectively, from the rank of degree and id4 is in the tenth from rank of degree for users with total user to post degree centrality from Table 4.3 among the top ten scores. The other users with total degree centrality scores among the top ten from Table 4.10 are the user id3 and id8. These users are leading users due to continual interaction with Page posts and because the users are actively interacting with Page posts from high total degree centrality scores and high Beta values. In addition, these users can influence other users from Facebook Page Insights. The aforementioned finding can be explained in that interactions with Page posts by users with influencing potential and high activity in liking and commenting on various Page posts influenced the interest of user from daily page engaged users and daily total reach users along with attracting the aforementioned users to become more involved with Page. Furthermore, high Beta values indicate the users with leadership characteristics to have high levels of correlate with daily page engaged users and daily total reach users. Regarding Table 4.11, the users with the highest Beta values is the user id3 and the users similar to Table 4.9 and Table 4.10

is the user id4, id10. The user id3 has the highest Beta value with most correlated with users who visited Page or viewed posts in News Feed or ticker (daily organic reach) with the second highest total degree centrality score as users who interacted with multiple Page posts and users with higher interaction with Page posts in Phase 6 than other phases as shown in Figure 4.1. Frequent interactions with page posts during Phase 6 by the user id3 can influence users who visited Page or viewed posts in News Feed or ticker (daily organic reach) with a high level of correlate with the aforementioned users with the highest Beta values, thus indicating that the user id3 can be concluded a leader correlated with other users and created users who visited Page or viewed posts in News Feed or ticker (daily organic reach).

The user id1, or the Page administrator for Kledthai, is a highly active user who posts many statements without high Beta values and a significance value of more than 0.05, which lost significance to users from daily page engaged users, daily total reach and daily organic reach from the fact that users participating and interacting with Page created more correlates together to create a network that will help to spread the news to other users, thereby indicating that the user id1 posts attract interest and influence users to participate with Page posts at different high or low amounts in each Page post. The user id1 was not always the main factor and there was dependence on other users who interacted with Page posts and other factors of users who interacted with Page. The number of Page administrator posting may be important but the number of users participating and a few influential users and users with active medium level from degree centrality scores can be a more important fact on to increase the Page overall participation and view.

4.2.4 Multiple regression analysis results of the top 30 users of user to post degree centrality.

Table 4.12 The degree centrality of user to post of the top 30 users during 53-week period with daily page engaged users by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily page engaged users - Degree centrality of user to post of top 30 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-p)
1	id44	2.271	0.000	31	21
2	id50	0.891	0.017	40	11
3	id8	0.569	0.000	55	4
4	id29	0.518	0.269	37	13
5	id10	0.501	0.003	34	16
6	id3	0.495	0.337	140	2
7	id5	0.416	0.002	50	7
8	id43	0.374	0.166	31	22
9	id12	0.339	0.049	27	30
10	id93	0.287	0.052	28	27
11	id16	0.167	0.379	34	18
12	id20	0.127	0.057	39	12
13	id35	0.118	0.021	30	23
14	id4	0.096	0.380	43	10
15	id24	0.049	0.455	51	6
16	id23	0.041	0.356	46	8
17	id55	0.015	0.930	30	24

Table 4.13 The degree centrality of user to post of the top 30 users during 53-week period with daily total reach by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily total reach - Degree centrality of user to post of top 30 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-p)
1	id44	2.106	0.000	31	21
2	id50	0.615	0.080	40	11
3	id8	0.604	0.000	55	4
4	id5	0.560	0.000	50	7
5	id10	0.544	0.001	34	16
6	id4	0.224	0.043	43	10
7	id93	0.206	0.145	28	27
8	id55	0.193	0.265	30	24
9	id3	0.185	0.710	140	2
10	id20	0.167	0.013	39	12
11	id29	0.164	0.716	37	13
12	id35	0.146	0.004	30	23
13	id43	0.114	0.660	31	22
14	id12	0.100	0.537	27	30
15	id94	0.076	0.904	32	20
16	id16	0.065	0.723	34	18
17	id34	0.039	0.849	30	25
18	id23	0.015	0.720	46	8

Table 4.14 The degree centrality of user to post of the top 30 users during 53-week period with daily organic reach by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily organic reach - Degree centrality of user to post of top 30 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-p)
1	id34	0.841	0.056	30	25
2	id16	0.639	0.102	34	18
3	id55	0.540	0.135	30	24
4	id15	0.530	0.051	28	29
5	id94	0.485	0.708	32	20
6	id93	0.431	0.140	28	27
7	id4	0.414	0.067	43	10
8	id19	0.399	0.039	34	17
9	id50	0.389	0.579	40	11
10	id20	0.359	0.010	39	12
11	id10	0.261	0.402	34	16
12	id18	0.239	0.230	28	28
13	id3	0.238	0.817	140	2
14	id35	0.229	0.025	30	23
15	id44	0.128	0.860	31	21
16	id11	0.080	0.924	37	14
17	id8	0.037	0.868	55	4
18	id1	0.016	0.931	141	1
19	id24	0.008	0.954	51	6

According to Table 4.12 - 4.14 show the results of the multiple regression analysis for the total user to post degree centrality scores of the users during the 53-week period , which are the numbers of interactions with Page posts of the 30 users to determine the different users who have the positive Beta with statistical significance at 0.05 (Sig. < 0.05) of the top 20 users and the top 30 users who capable of influencing the users who engaged with Page (daily page engaged users), the users who viewed contents associated with Page (daily total reach) and users who visited Page or viewed posts in News Feed or ticker (daily organic reach). This table is

arranged in the order of Beta values from users with the highest Beta to the lowest Beta. When Beta considered is found to have many users who capable of influencing the users who engaged with Page (daily page engaged users) which have positive Beta with statistical significance at 0.05 (Sig. < 0.05) of the top 30 users from Table 4.12 the same as the results of Table 4.9 from top 20 users considered with daily page engaged users such as the user id50, id10 and id5. The users who capable of influencing the users who viewed contents associated with Page (daily total reach) which are users the same as the results of Table 4.10 from top 20 users considered with daily total reach such as the user id8, id5, id10 and id4.

The users interactions with Page posts who have the user to post degree scores lower the top 20 scores which capable of influencing the users who engaged with Page (daily page engaged users) are the user id44, id8, id12 and id35, in the users who capable of influencing the users who viewed contents associated with Page (daily total reach) are the user id44, id20 and id35. Therefore, these user have together participate can be a factor for other users to more participate with Page. The user id19, id20 and id35 who visited Page or viewed posts in News Feed or ticker (daily organic reach). Because most users will be the same users with the top 20 users and when increase the number of users, the results are the users interactions lower the top 20 users with high Beta to be factors that affect the overall user, therefore we will only focus on the active users of the top 20 users from user to post degree centrality, user to user degree centrality and the user to post betweenness centrality.

Concerning the Multiple regression analysis among the values obtained from the degree centrality measurement for the fifty-three-week period which used the top one hundred data with the highest total user to user degree centrality scores of considered with the values of the daily page engaged users, daily total reach and daily organic reach by selecting independent variables for entering into the Enter Multiple regression analysis using a reliability level of 95%, the regression coefficients will be shown in the form of the users' Beta values with the top five Beta values. The outcomes are displayed as follows:

4.2.5 Multiple regression analysis results of the top 100 users of user to user degree centrality.

Table 4.15 The degree centrality of the user to user of the top 100 users for the 53-week period with daily page engaged users, daily total reach and daily organic reach by using the method of Enter multiple regression analysis

Daily Page engaged user					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of degree (u-u)
1	id92	2.072	0.031	357	92
2	id72	1.568	0.008	418	72
3	id44	1.165	0.088	510	44
4	id1	1.141	0.059	1467	1
5	id57	0.956	0.016	478	57
Daily total reach					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of degree (u-u)
1	id92	2.951	0.023	357	92
2	id72	2.176	0.006	418	72
3	id57	1.560	0.004	478	57
4	id94	1.463	0.005	350	94
5	id54	1.383	0.241	489	54
Daily organic reach					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of degree (u-u)
1	id92	7.234	0.025	357	92
2	id72	5.025	0.010	418	72
3	id1	4.938	0.018	1467	1
4	id44	3.944	0.084	510	44
5	id57	3.638	0.007	478	57

According to the analysis results from Table 4.15, the multiple regression analysis, the Enter method, of the total user to user degree centrality scores for the users over the fifty-three-week period who are capable of influencing users from daily page engaged users, daily total reach and daily organic reach, the user id92 and id72 have the first and second Beta rankings, respectively, with statistical significance at 0.05 (Sig. < 0.05). When both users interact with Page posts, both users are able to have high levels of correlate with users and to influence users participating or interacting with Page from daily page engaged users, daily total reach, daily organic

reach with high Beta values with statistical significance at 0.05 (Sig. < 0.05).

Table 4.15 showing the results from the multiple regression analysis of the total use to user degree centrality scores for the users over the fifty-three-week period who are capable of influencing users who engaged with Page (daily page engaged users) when the Beta are considered, the user id92 is found to have the highest score at 2.072 with statistical significance at 0.05 (Sig. < 0.05), which is higher than other users, thereby indicating the user id92 to be interacting with Page posts correlated among the users interacting with each page post from the total degree centrality score of 357. In other words, the rank of degree (u-u) is 92 out of one hundred users, which can be viewed as a rank that is not high in terms of user to user degree centrality but is capable of being the most correlated with users who engaged with Page (daily page engaged users), followed by the user id72 and id57 with Beta of 1.568 and 0.956, respectively, which are correlated in the same direction with statistical significance at 0.05 (Sig. < 0.05) which these users have participating with Page posts together including the user id92, thus resulting more interact of other users with Page. The user id44 and id1 have significance values of more than 0.05, which has no statistical significance towards users who engaged with Page (daily page engaged users).

Concerning the multiple regression analysis for the total user to user degree centrality scores for users over the fifty-three-week period capable of influencing users who viewed any content associated with Page (daily total reach), when the Beta is considered, the user id92 is found to have the highest score at 2.951 with statistical significance at 0.05 (Sig. < 0.05), which is higher than other users, thereby indicating that the user id92 interacted with Page posts by having the most correlated with users who viewed any content associated with Page (daily total reach), followed by the user id72, id57 and id94, which have correlate in the same direction with statistical significance at 0.05 (Sig. < 0.05) which these users have participating with Page posts together including the user id92, thus resulting more interact of other users with Page. The user id54 has a significant value of 0.241, which is higher than 0.05. Thus, no statistical significance is indicated for the users who viewed any content associated with Page (daily total reach). Concerning the user id1 of this table, the user id1 is found to have the sixth highest Beta value and a significance value of more than 0.05,

which has no statistical significance toward users who viewed any content associated with Page (daily total reach).

Concerning the multiple regression analysis of the total user to user degree centrality scores of users over the fifty-three-week period and capable of influencing users who visited Page or viewed posts in News Feed or ticker (daily organic reach). When the Beta is considered, the user id92 is found to have the highest score at 7.234 with statistical significance at 0.05 (Sig. < 0.05), which is higher than other users, thereby indicating that the user id92 interacted with Page posts and correlations users who visited Page or viewed posts in News Feed or ticker (daily organic reach), followed by the user id72, id1 and id57 with Beta values of 5.025, 4.938 and 3.638, respectively, which correlates in the same direction and correlates with users who visited Page or viewed posts in News Feed or ticker (daily organic reach) which these users have participating with Page posts together including the user id92, thus resulting more interact of other users with Page. The user id44 has a significance value of 0.084, which is higher than 0.05. Hence, no statistical significance is indicated for users who visited Page or viewed posts in News Feed or ticker (daily organic reach).

When the analysis results for the user id92, which is the user with the highest Beta value, are considered in terms of the number of users from the values of daily page engaged users, daily total reach and daily organic reach, the behaviors correlations among users interacting and participating with Page posts, the user id92 is found to have a total degree centrality value of 357, thereby ranking 92 out of one hundred users. When the period of time is divided into six phases, the user id92 was found to have not interacted with Page posts in Phases 1 – 3, but to have interacted in Phases 4 and 5. The interaction by the user id92 at this time is a time when many other users interact with Page according to the statistical data of Facebook Page Insights. The user id92 has characteristics as a user following along with trends or the Page followers because the user id92 has a lower total degree centrality score.

The user id1 was found to be correlated with users who visited Page or viewed posts in News Feed or ticker (daily organic reach) with statistical significance at 0.05 (Sig. < 0.05). The aforementioned correlate shows the user id1 to be users capable of leading other users to interact with pages because the user id1 has a high total degree centrality score of 1,467, which is the highest out of one hundred users

because the user id1 has a high frequency and continuity of interaction in Page posts, interacting with other users who interact with each Page post. Furthermore, the user id1 has the third highest Beta. However, the user id1, who is the Page Administrator, is not found to be related to users who engaged with Page (daily page engaged users) and users who viewed any content associated with Page (daily total reach) and is also found to have a significance value of more than 0.05 with no statistical significance, thereby indicating high overall degree centrality scores to not be a factor attracting and leading other users to interact with Page because not every statement posted by the user id1 influences the interests of every user. Different people have different preferences and preferences also depend on whether the time of the posting is the time when users are active, thereby making the interactions and access from the viewed contents correlated with pages of users different.

From this table shows most of the users have a lower degree centrality scores and some users have moderate degree centrality scores but have the top five Beta values similar to the Table 4.5. When these users have participating with Page posts together, thus resulting more interact of other users with Page and can be create a network that will help to spread the news.

After the Multiple regression analysis of all hundred users, most of the users with the top five Beta values are found to be users irregularly interacting with Page posts and are not very active users. Most of the users follow trends because the users have total degree centrality scores that are not very high but have the top five Beta values similar to the results of user to post degree centrality. When the data is analyzed by reducing the number of users and analyzing the data from the total user to user degree centrality scores of users the top twenty highest scores who are highly active users regularly interacting with page posts are selected in order to determine the users who are leaders capable of influencing daily page engaged users, daily total reach and daily organic reach values by selecting independent variables for entry into the Enter multiple regression analysis and using the reliability level of 95%. The outcomes can are shown in Tables 4.16 – 4.18.

4.2.6 Multiple regression analysis results of the top 20 users of user to user degree centrality

Table 4.16 The degree centrality of user to user of the top 20 users during 53-week period with daily page engaged users by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily page engaged users - Degree centrality of user to user of top 20 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-u)
1	id18	0.751	0.006	719	18
2	id12	0.526	0.013	773	12
3	id8	0.349	0.002	882	8
4	id5	0.328	0.000	953	5
5	id7	0.324	0.004	919	7
6	id3	0.299	0.002	1019	3
7	id6	0.232	0.025	923	6
8	id10	0.199	0.082	849	10
9	id17	0.133	0.417	727	17
10	id1	0.126	0.563	1467	1
11	id13	0.106	0.401	768	13
12	id19	0.098	0.294	690	19
13	id2	0.051	0.703	1082	2
14	id15	0.036	0.751	762	15

Table 4.16 showing the results of the multiple regression analysis of the total user to user degree centrality scores of users over the fifty-three-week period with among the twenty users interacting with one another in each Page post organizes users with the highest Beta values to the lowest user value. A total of seven users are found to be capable of influencing users who engaged with Page (daily page engaged users) with statistical significance at 0.05 (Sig. < 0.05). When the Beta values are considered, the user id18 is found to have the highest Beta value at 0.751 with statistical significance at 0.05 (Sig. < 0.05), which is higher than other users, thereby indicating that the user id18 interacted with Page posts by having correlates among users

interacting with each Page post. The user id18 interacted with Page posts in Phases 5 and 6. The behavior of the user id18 in interacting with Page at this time resulted in correlates with users most frequently who engaged with Page (daily page engaged users). The user id18 has a total degree centrality score of 719 making it eighteenth out of twenty users, which is not high level among twenty users but makes the user id18 an active user when compared with one hundred users.

The users with the lower Beta values are the user id12, id8, id5, id7, id3 and id6 with Beta values of 0.526, 0.349, 0.328, 0.324, 0.299 and 0.232, respectively with statistically significant to correlate at 0.05 (Sig. < 0.05). When these users have participating with Page posts together including the user id18, thus resulting more interact of other users with Page. When degree centrality values are considered, the user id12 are found to have moderate total degree centrality ranked twelfth out of twenty users at the twelfth rank while the user id8, id5, id7, id3 and id6 are ranked at the eighth, fifth, seventh, third and sixth ranks, respectively. These users are persons with high levels of interaction with other users from each Page post and high levels of correlate with users who engaged with Page (daily page engaged users).

Table 4.17 The degree centrality of user to user of the top 20 users during 53-week period with daily total reach by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily total reach - Degree centrality of user to user of top 20 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-u)
1	id18	0.992	0.002	719	18
2	id8	0.454	0.001	882	8
3	id7	0.431	0.001	919	7
4	id5	0.423	0.000	953	5
5	id3	0.256	0.018	1019	3
6	id6	0.193	0.095	923	6
7	id17	0.191	0.305	727	17
8	id12	0.169	0.462	773	12
9	id19	0.157	0.14-	690	19
10	id13	0.060	0.677	768	13
11	id15	0.018	0.888	762	15
12	id10	0.007	0.957	849	10

Table 4.17 contains the results of the multiple regression analysis of the total user to user degree centrality values for the top twenty users with an ability to influence users who viewed any content associated with Page (daily total reach) over the fifty-three-week period. The table distinguishes the users with the highest Beta values from the lowest user value. A total of five users is found to be capable of influencing users who viewed any content associated with Page (daily total reach) with statistical significance at 0.05 (Sig. < 0.05). The user id18 has the highest Beta value at 0.992 with statistical significance at 0.05 (Sig. < 0.05), thereby indicating that the user id18 interacts with Page posts with correlates among users interacting with each Page post and creating correlates with users who viewed any content associated with Page (daily total reach). In addition, the user id18 has a total degree centrality value of 719 and ranks eighteenth out of twenty users. Although the user id18 is not among the top ten, the user id18 is capable of influencing other users.

The users with lower Beta values are composed of the user id8, id7, id5 and id3 at 0.454, 0.431, 0.423 and 0.256, respectively, with a high level of significance (Sig. < 0.05). When degree centrality scores are considered, the total degree centrality scores for the user id8, id7, id5 and id3 are found to be among the top ten users shown in Table 4.1, thereby showing the top ten total user to user degree centrality scores for these users to be ranked 8th, 7th, 5th and 3rd, respectively. These users interact with Page posts together including the user id18 and are correlated with other users interacting with each Page post of user to user based on co-likes, namely, users who like each page post on the Facebook Fan Page and user to user based on co-comments, namely, users who comment on each Page posts on the Facebook Fan Page which makes the total degree centrality high. Therefore, the high Beta values and high degree centrality scores of these users have leader characteristics capable of influencing users from the daily total reach to interact with Page.

Table 4.18 The degree centrality of user to user of the top 20 users during 53-week period with daily organic reach by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily organic reach - Degree centrality of user to user of top 20 users.					
Rank of Beta	ID	Beta	Sig.	Degree	Rank of Degree (u-u)
1	id12	1.124	0.059	773	12
2	id11	0.674	0.152	804	11
3	id7	0.624	0.049	919	7
4	id8	0.574	0.067	882	8
5	id13	0.421	0.251	768	13
6	id3	0.417	0.118	1019	3
7	id5	0.414	0.066	953	5
8	id15	0.222	0.495	762	15
9	id10	0.179	0.580	849	10

Table 4.18 shows the results of the multiple regression analysis of total user to user degree centrality values for the top twenty users of the top twenty users with ability to influence users who visited Page or viewed posts in News Feed or ticker (daily organic reach) over the fifty-three-week period. This table distinguishes users from the users with the highest Beta values to the lowest user values. A total of one users are found to be able to influence the number of who visited Page or viewed posts in News Feed or ticker (daily organic reach) with statistical significance at 0.05 (Sig. < 0.05). When the significant values are considered of other users, the values are found to have significance values higher than 0.05, thereby causing no statistical significance in the number of users visiting pages or viewing posts in news feeds or tickers (daily organic reach). The user id7 has the third highest Beta value at 0.624 with statistical significance at 0.05 (Sig. < 0.05). The user id7 interacts with users interacting with one another in each Page post based on co-likes in Phases 4 and 5 and ability to influence correlates with the numbers of users who visited Page or viewed posts in News Feed or ticker (daily organic reach). When the total degree centrality is considered, the user id7 is found to have a total degree centrality value of 919, ranked seventh out of twenty users and included in the top ten in Table 4.3 which shows the top ten total user to user degree centrality scores. The user id7 has a high Beta value and a high total degree centrality value, thus showing coherence between the user interaction with Page and other users. Thus, this can indicate the true leader characteristic of this user.

According to the multiple regression analysis in Tables 4.16 – 4.18 by using the top twenty total user to user degree centrality scores of users who are active users frequently interacting with Page for the entire fifty-three-week period to consider with all three values obtained from Facebook Page Insights, According to the analysis users from Table 4.16 – 4.17 are found to be the same users consisting of the user id3, id5, id7, id8 and id18 from Beta values with statistical significance at 0.05 (Sig. < 0.05). The user id18 has the highest Beta value from considerations with two of the aforementioned values while the user id12 and id6 differed. When these users including the user id12 and id6 have participating with Page posts together by having interactions among users with Page post, thus resulting to users who engaged with the page (daily Page engaged users) and users who viewed any content associated with Page (daily total reach). In terms of users

from consideration with daily organic reach from Table 4.18, only the user id7 has statistical significance at 0.05 (Sig. < 0.05) and is the same user from the Table 4.16 and Table 4.17.

When the total user to user degree centrality scores are considered, the user id18 has the highest Beta values by having a total user to user degree centrality value of 719 and ranked eighteenth out of twenty users, which is not a high ranking. However, the user id18 is an active user when compared to all one hundred users. The user id8, id7, id5, id6 and id3 are among the top ten users according to Table 4.3 showing the top ten total user to user degree centrality scores from high total degree centrality scores. These have a noticeably high level of interaction with Page posts at the time and correlates among users interacting with the Page posts as well as high Beta values. Therefore, users with high Beta values and high total degree centrality can be summarized to exhibit true leadership and correlate with other users, thereby causing interactions between users capable of leading other users to interact with the Page. The user id1 is the page administrator for Kledthai and a highly active user who posts numerous messages without high Beta values or significance of loss 0.05. The user id1 was not always the main factor and there was dependence on multiple users who interacted with Page posts and other factors of users who interacted with Page, not caused by a single user only. The number of users participating and users with active medium level and high level from degree centrality scores and high Beta values can be a more important fact on to increase the Page overall participation and view the Page that will help to spread the news to other users.

4.2.7 Multiple regression analysis results of the top 20 users of user to post betweenness centrality

In analyzing the data of user behaviors from measuring betweenness centrality by using multiple regression analysis between betweenness centrality scores considered with the number of the page engaged users, daily total reach and daily organic reach from the fifty-three-week period and selecting the top twenty users with user to post betweenness centrality scores which are highly active users interacting with multiple Page posts by linking between users and Page posts based on likes and comments. The user to post betweenness centrality is found to correlate involving Page posts more than user to user betweenness centrality due to the users deficient

awareness of networks of relationship among users interacting with the Page posts of user to user betweenness centrality. Therefore, the multiple regression analysis among the values obtained from user to post betweenness centrality is considered with daily page engaged users as shown in Table 4.19.

Table 4.19 The betweenness centrality user to post of the top 20 users during 53-week period with daily page engaged users by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily page engaged users - Betweenness centrality of user to post of top 20 users.					
Rank of Beta	ID	Beta	Sig.	Betweenness	Rank of Betweenness (u-p)
1	id14	1.144	0.000	7022.961	7
2	id9	0.371	0.000	6504.509	10
3	id1	0.364	0.152	36425.601	2
4	id13	0.325	0.325	16443.338	3
5	id5	0.271	0.004	11701.343	5
6	id11	0.243	0.150	4472.48	18
7	id94	0.220	0.101	4868.457	17
8	id8	0.219	0.473	15490.757	4
9	id4	0.216	0.004	6635.742	8
10	id24	0.182	0.034	6378.534	12
11	id10	0.124	0.383	5311.234	15
12	id43	0.047	0.729	6593.795	9
13	id26	0.027	0.865	6415.385	11

Table 4.19 shows the results of the multiple regression analysis of the total user to post betweenness centrality scores of the users over the fifty-three-week period among twenty users capable of influencing users who engaged with Page (daily page engaged users). This table categorizes the users with the highest Beta to the lowest user value and the highlighted users are the users with statistical significance at 0.05 (Sig. < 0.05). A total of five users in bold are found to be able to influence the number

of users who engaged with Page (daily page engaged user) with statistical significance at 0.05 (Sig. < 0.05). When the Beta values are considered, the user id14 are found to have the highest Beta value at 1.144 with statistical significance at 0.05 (Sig. < 0.05), which is higher than other users, thereby indicating that the user id14 interacted with multiple Page posts with frequent interaction behaviors in Phase 5 and frequent interaction with Page posts in Phase 6. According to Table 4.4, the user id14 has a total user to post betweenness centrality score among the top ten and ranks seventh with a total score of 7022.961. The user id14 is a highly active user during the above time with the most correlate with users who engaged with the Page (daily page engaged users).

Other users with lower Beta values consist of the user id9, id5, id4 and id24 at 0.371, 0.271, 0.216 and 0.182, respectively, with statistical significance at 0.05 (Sig. < 0.05). These users are correlated with users who engaged with Page (daily page engaged users). When the user to post betweenness centrality scores are considered, the user id9, id5 and id4 have high total user to post betweenness centrality scores among the top ten in Table 4.4 which means these users have interaction with Page in many Page posts with links between user and Page posts. Furthermore, the user id24 has moderate the user to post betweenness centrality score in the twenty users. Therefore, high total user to post betweenness centrality scores and moderate total user to post betweenness centrality scores and with positive Beta values of these users including the user id14 have leader characteristics capable of influencing users from the daily page engaged users to interact with Page.

Table 4.20 The betweenness centrality user to post of the top 20 users during 53-week period with daily total reach users by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily total reach - Betweenness centrality of user to post of top 20 users.					
Rank of Beta	ID	Beta	Sig.	Betweenness	Rank of Betweenness (u-p)
1	id14	1.629	0.000	7022.961	7
2	id8	0.531	0.161	15490.757	4
3	id9	0.372	0.000	6504.509	10
4	id26	0.365	0.069	6415.385	11
5	id50	0.308	0.281	4267.386	20
6	id4	0.270	0.003	6635.742	8
7	id24	0.237	0.025	6378.534	12
8	id10	0.237	0.178	5311.234	15
9	id5	0.233	0.038	11701.343	5
10	id43	0.214	0.204	6593.795	9
11	id3	0.206	0.400	49918.957	1

According to Table 4.20 showing the results of the multiple regression analysis of total user to post betweenness centrality scores for the twenty users capable of influencing users who viewed any content associated with Page (daily total reach) over the fifty-three-week period. This table categorizes users from those with the highest Beta to the lowest user value, and the highlighted users are users with statistical significance at 0.05 (Sig. < 0.05). A total of five users in bold are found to be able to influence the number of users who viewed any content associated with Page (daily total reach) with statistical significance at 0.05 (Sig. < 0.05). When the Beta values are considered, the user id14 is found to have the highest Beta value at 1.629 with statistical significance at 0.05 (Sig. < 0.05), which is higher than other users and is the same as in the Table 4.19. The user id14 is highly active in Phase 5 and Phase 6

with the most correlate with users from the highest Beta values and is capable of influencing users who viewed any content associated with Page (daily total reach).

Other users with lower Beta values consist of the user id9, id4, id24 and id5 at 0.372, 0.270, 0.237 and 0.233, respectively, with statistical significance at 0.05 (Sig. < 0.05). These users who are the same users in Tables 4.19 but have different ranks of Beta values. These users are correlated with users who viewed any content associated with Page (daily total reach). When the user to post betweenness centrality scores are considered, the user id9, id5 and id4 have high total user to post betweenness centrality scores among the top ten in Table 4.4. Furthermore, the user id24 has moderate user to post betweenness centrality score in the twenty users. Therefore, high total user to post betweenness centrality scores and moderate total user to post betweenness centrality scores and with positive Beta values of these users including the user id14 have leader characteristics capable of influencing users from the daily total reach to interact with Page.

Table 4.21 The betweenness centrality user to post of the top 20 users during 53-week period with daily organic reach by using Enter multiple regression analysis: The users in bold font are referred to as the group with Sig. < 0.05 and the users are displayed with the positive Beta

Daily organic reach - Betweenness centrality of user to post of top 20 users.					
Rank of Beta	ID	Beta	Sig.	Betweenness	Rank of Betweenness (u-p)
1	id13	1.770	0.085	16443.338	3
2	id11	0.835	0.107	4472.48	18
3	id94	0.724	0.078	4868.457	17
4	id4	0.715	0.002	6635.742	8
5	id1	0.661	0.390	36425.601	2
6	id18	0.467	0.281	4903.508	16
7	id8	0.451	0.627	15490.757	4
8	id26	0.344	0.482	6415.385	11
9	id24	0.333	0.195	6378.534	12
10	id5	0.152	0.576	11701.343	5
11	id9	0.150	0.493	6504.509	10
12	id34	0.127	0.878	4294.873	19
13	id10	0.013	0.976	5311.234	15

Table 4.21 shows the results of the multiple regression analysis for all twenty users to post betweenness centrality scores of users over the fifty-three-week period and capable of influencing users who visited Page or viewed posts in News Feed or ticker (daily organic reach). This table categorizes users with the highest Beta to the lowest user value and the highlighted users have statistical significance at 0.05 (Sig. < 0.05). When the Beta values are considered, the user id4 is found to have Beta value at 0.715 with statistical significance at 0.05 (Sig. < 0.05) and ability to influence the number of users who visited Page or viewed posts in News Feed or ticker (daily organic reach). The user id4 interacts with multiple page posts throughout the fifty-three-week period with frequent interaction behaviors in the later weeks of Phase 4 and frequent interactions with page posts in Phases 5 and 6. The user id4 has total user

to post betweenness centrality scores among the top ten in Table 4.4 with a betweenness ranking of eight. The user id4 has a high degree of correlate among Page posts out of twenty users. The user id4 is a highly active user during the aforementioned time with the most correlate with users who visited Page or viewed posts in News Feed or ticker (daily organic reach). Other users are found to have significance values of more than 0.05 without statistical significance toward users who visited Page or viewed posts in News Feed or ticker (daily organic reach).

According to the multiple regression analysis of Tables 4.19 – 4.21, which analyzed the data for the total user to post betweenness centrality scores of the users over the entire fifty-three-week period in consideration with the number users of the daily page engaged users and daily organic reach, The user id14 is found to have the highest Beta value with statistical significance at 0.05 (Sig. < 0.05) in Tables 4.19 and Table 4.20. The user id14 is a user with a high total user to post betweenness centrality score and the seventh rank of betweenness out of twenty users. The user id14 is a highly active user interacting with multiple Page posts, thereby causing a high degree of correlate between the user id14 and Page posts as well as the highest Beta value. The user id14 is able to have interactions with users and influence other users to be involved with Page by influencing users who participated and interacted with Pages (daily page engaged users) and users who viewed any content associated with Page (daily total reach). The user id4, id5, id9 and id24, who are the same users in Tables 11 and 12 with statistical significance at 0.05 (Sig. < 0.05) and found to have a Beta ranking with differences in users. These users are able to influence the users who participated and interacted with Pages (daily page engaged users) and users who viewed any content associated with Page (daily total reach) as well.

In Table 4.21, the user id4 has the fourth Beta rank and with a rank of betweenness centrality in the eighth rank, which is correlated with users and influences other users to participate with Page by significantly influencing users who visited Page or viewed posts in News Feed or ticker (daily organic reach) because the users are highly active in interacting with multiple Page posts, thereby causing a high level of correlate between the user id4 and Page posts with high Beta values.

Therefore, high total user to post betweenness centrality scores and moderate total user to post betweenness centrality scores of these users from

interactions between users and Page posts based on likes and comments on various Page posts and causing links between user and Page posts by most users participated with Page posts based on likes. Furthermore, high Beta values and positive Beta values of users cooperated interactions between users and Page posts can influence the users from daily page engaged users, daily total reach and daily organic reach along with attracting the users to become more involved with Page and distributing the news about the Page to other users. Resulting in the expansion of the network even more.

From to the multiple regression analysis between centrality scores of top 20 users with the three values from Facebook Page Insights. When the Beta values are considered, positive Beta with statistical significance at 0.05 (Sig. < 0.05) of the number of users from daily page engaged users and daily total reach, the most of users are the same while a few are different. With the “daily organic reach”, are found users who have positive Beta with statistical significance at 0.05 (Sig. < 0.05) are fewer of users but most users are the same user in considered with daily page engaged users and daily total reach, only a few are different. With the relatively high centrality scores, ranked in the top 10 and have positive Beta with statistical significance at 0.05 (Sig. < 0.05), are the user id5, id4, id6, id3, id8, id7 etc. These users to be capable of affecting the overall users who participated in Page. In the multiple regression analysis between of frequency from participation of users with all three values obtained from Facebook Page Insights which will provide different benefits in each table by based on a consideration with these values are the number of users who engaged with Page (daily page engaged users), the number of users who viewed contents associated with Page (daily total reach) and the number of users who visited Page or viewed posts in News Feed or ticker (daily organic reach).

After the multiple regression analysis which the questionnaires were collected to get a behavior of users to participate with the Page by posting messages inviting users to answer questionnaires on Kledthai Facebook Fan Page, which are shown detail in Chapter 5.

CHAPTER V

DISCUSSION AND CONCLUSION

This research was conducted on the subject of Facebook user behavior analysis using centrality measures with Facebook Page Insights. The objective of this research is to analyze the behavior of users who have interaction with the Page posts of the Kledthai Facebook Fan Page and the behavior of leaders who influence users and followers to enable the aforementioned to disseminate news and attract more users to the Facebook Fan Page.

5.1 Discussion

Centrality measures measure important people in the network and can be indicators of the influence of users interacting within the network.

This research employed degree centrality and betweenness centrality.

5.1.1 Degree Centrality

In this research, degree centrality measurement can be used in measuring the number of relationship links between users accessing the site to interact with Page posts by categorizing the relationship of degree centrality into two types, namely, user to post relationships, which are measurements of the number of links occurring as a result of users accessing the site to interact with Page posts based on likes and comments with Page posts able to be used in identifying active users and persons who are interested and frequently access the site to participate in Page posts. User to user relationships are measurements of the number of relationships between users who access the site to interact with each Page post based on co-likers or co-commenters.

5.1.2 Betweenness Centrality

In this research, measuring betweenness centrality involves categorizing the correlations of measuring betweenness centrality into two categories, namely,

user to post relationships involving key measurements of users who are linked to Page posts by linking between users who access the site to interact with the number of Page posts resulting in links between users and Page posts. The user to user relationship is a key measurement of users who access the site to participate with other users from the number of Page posts and resulting in links between users who access the site to interact with different Page posts with perceived information from Page posts together among users. However, the user to user relationship is unable to reveal the network relationship between users accessing the site to interact together with each Page post because the information of co-users is inaccessible and this is a limitation involving user privacy settings.

The behavioral analysis of Facebook Fan Page users by using centrality measurements was able to reveal that the significant users in the network during the period from 1 Dec. 2011-5 Dec. 2012 and the high number of users accessing the site to interact with Page posts. Each user practiced different behaviors in accessing the site to participate during each phase from Phase 1 to Phase 6. The aforementioned finding concurred with the study of Arun, S, Maiya and Tanya Y. Berger-Wolf [25] which found it possible to identify persons with a high level of influence or significant persons in the network from the sample group from the large online social network. Estimating the value obtained from measuring each centrality. The findings obtained from measuring centrality in this research revealed a preliminary identification of the persons with influence, but did not identify the relationship of users able to influence other users who accessed the site to participate with Page. Hence multiple regression analysis was used.

5.1.3 Multiple Regression Analysis

In this study, the data obtained from measuring centrality was analyzed for consideration together with the overall statistical data on users from Facebook Page Insights by using multiple regression analysis. The multiple regression analysis is used to consider the users with influence capable of affecting groups of other users from the aggregate statistics for the users who accessed the site to participate and interact with the Page in addition to accessing various information related to the Page of users and the distribution of the news and information of various Page during the phase and in

order to improve analysis efficiency. Using multiple regression analysis helps explain the relationships among users better than data analysis from measuring centrality alone. Therefore, doing so can identify the true leaders or persons with influence in the network and the user who have a high level of interaction with Page posts and are active users in accessing the site to participate with Page posts based on likes and comments. Users who are leaders are users with high centrality scores. In other words, they are users who have a high level of interactions in accessing the site to participate with Page posts and have high Beta values obtained by multiple regression analysis and a positive Beta with statistical significance at 0.05 (Sig. < 0.05). In the users who are trend followers, the findings show lower centrality scores. In other words, the users who had little participation with Page posts, but higher Beta values from this data analysis will identify the users who are leaders and trend followers in the network during the aforementioned phase which will help in distributing news and information for other users who will receive more news and information and greater overall interest in the Facebook Fan Page of organizations.

According to the multiple regression analysis of the value obtained from the centrality measures and considered in combination with all three values from Facebook Page Insights, the users with considerably high centrality scores among the top ten with positive Beta values and with statistical significance at 0.05 (Sig. < 0.05). The findings also indicated that many users, such as the user id5, id4, id6, id3, id8, id7 were able to affect and have interactions with other users participating with the Page. After the data analysis, the questionnaires about the study of behavior and the factors affecting "likes" and "comments" on the posts of Kledthai Facebook Fan (see in Appendix C) were used to show Page participation behavior such as channels of access Page posts and pictures with "likes", "comments" of users, frequency and channels of viewed news and information and visits Kledthai Facebook Fan Page and the number of Facebook friends, etc. by posting the questionnaires on the Kledthai Facebook Fan Page and inviting users to complete the questionnaires. The questionnaire data was collected from 12 November 2013 to 30 November 2013 from a total of thirty-five subjects who completed the questionnaires. The results of Questions 2-10 are shown in graphs (see in Appendix D).

The user data on Page post interactions were gathered during the aforementioned period of time from NodeXL. The total of 16 users who have interactions by liked and commented on the Page posts by show graph from results of Question 2-10 (see in Appendix E).

The results from the questionnaires of 16 users show the comparison frequency of the news and information viewed with posts from the News Feed on Question 7 and the frequency of interactions in visiting the Kledthai Facebook Fan Page in Question 9 (shown in Figure 5.1).

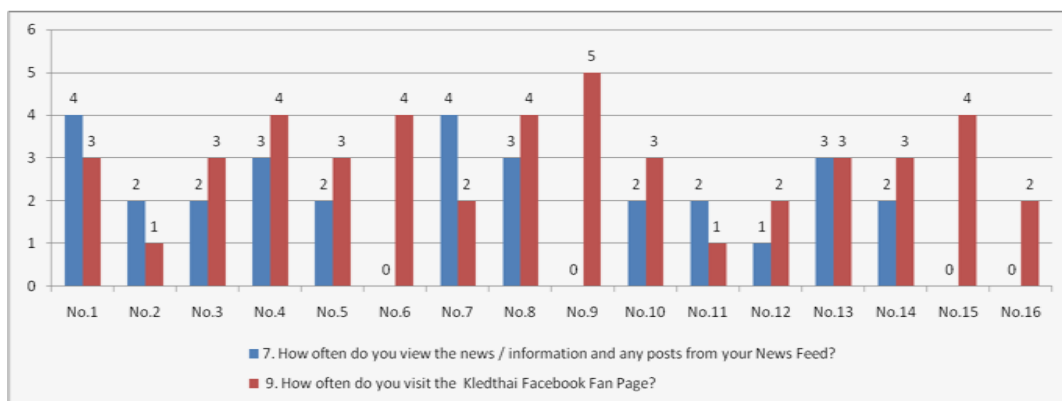


Figure 5.1 Shows the comparison between Question 7, “How often do you view the news / information and any posts from your News Feed?”, with Question 9, “How often do you visit the Kledthai Facebook Fan Page?”

Table 5.1 The details of the scoring for Figure 5.1 of the comparison on Question 7 and Question 9

7. How often do you view the news / information and any posts from your News Feed?		9. How often do you visit the Kledthai Facebook Fan Page?	
Once a week	is 1	Never	is 1
2-3 times a week	is 2	1 time a week	is 2
5- 6 times a week	is 3	2-4 times a week	is 3
more than six times a week	is 4	5-6 times a week	is 4
non - respondents	is 0	Everyday	is 5

Figure 5.1 shows the users who frequently viewed news and information with posts from the News Feed and are users who also frequently visit the Kledthai Facebook Fan Page such as Respondent No.1, No.4, No.8 and No.13 who more opportunities to view posts; the difference depends on past between user with Page interaction. Facebook filters content in the to be displayed in the user's News Feed differently.

The new News Feed algorithm allows brand post content to be displayed in a fan's News Feed based on the users' past interactions with the Page and a variety of other factors [25]:

- The number of times users engage with a particular friend or brand Page posting content.
- The number of likes, shares and comments a post has received.

On the part of the users low frequency in viewing news and information with posts from the News Feed also leads to the interaction of users in visiting Kledthai Facebook Fan Page few times such as Respondents No.2, No.11 and No.12.

The data provided by the users in the questionnaires revealed the user id6 and id20 to be the users who accessed the site and interacted with the Page posts between 1 December 2011 and 5 December 2012 and completed the questionnaires during the data collection period (see details in Table 5.2) who are the users in the multiple regression analysis table with positive Beta values with statistical significance at 0.05 (Sig. < 0.05) by showing the results by of Question 2-10 from all 12 questions used in this research. Other users were new users and did not interact with the Page posts between 1 December 2011 and 5 December 2012.

Table 5.2 Shows the results of the completed questionnaires about the study behavior and factors affecting "likes" and "comments" on posts of Kledthai Facebook Fan Page of the user id6 and id20

Question	Id6 Answer	Id20 Answer
Do you "Like" the Kledthai Facebook Fan Page?	- Like	- Like
How did you find out about the Kledthai Facebook Fan Page?	- Interested in participating with Page manually	- Interested in participating with Page manually

Table 5.2 Shows the results of the completed questionnaires about the study behavior and factors affecting "likes" and "comments" on posts of Kledthai Facebook Fan Page of the user id6 and id20 (cont.)

Question	Id6 Answer	Id20 Answer
Did you view news / information related to the Kledthai Facebook Fan Page through any of the following channels?	<ul style="list-style-type: none"> - Accessing the site to follow-up on the Page's news and information independently - In a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or the Facebook Fan Page information you can follow, etc.). 	<ul style="list-style-type: none"> - Accessing the site to follow-up on the Page's news and information independently - In a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or the Facebook Fan Page information you can follow, etc.).
Do you "like" and "comment" on Kledthai Facebook Fan Page posts and pictures via any of the following channels?	<ul style="list-style-type: none"> - In a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or Facebook Fan Page information you can follow, etc.) 	<ul style="list-style-type: none"> - In a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or Facebook Fan Page information you can follow, etc.)
Factors concerning the visited Kledthai Facebook Fan Page with private interests affecting "Like" and "comment" on the various Page posts? (more than 1 answer possible).	<ul style="list-style-type: none"> - Interested in the news / information and follow-up on various Page updates. - Interested in finding about products and services. 	-
How often do you view the news / information and any posts from your News Feed?	- more than six times a week	- 2-3 times a week
Did you view the news / information and posts from the News Feed in either of the cases?	- I viewed the information from the News Feed in both cases.	- I viewed the News Feed showing information updates from friends such as the user's friends' "likes" or "comments" on Kledthai Facebook Fan Page posts.
How often do you visit the Kledthai Facebook Fan Page?	- 2- 4 times a week	- Never
How many online Facebook "friends" do you currently have?	- 100 - 200 users	- 300 - 400 users

The user id6 held fifth place among the total user to post degree centrality scores and the sixth place among the total user to user degree centrality scores. The user id6 was shown to be highly active in participating with Page posts and highly interactive with other users. According to the multiple regression analysis, the user id6 ranked sixth among the total user to post betweenness centrality scores. The user id6 had a positive Beta values with statistical significance at 0.05 (Sig. < 0.05) as shown in Table 4.9, namely, the degree centrality of user to post for the top 20 users with daily page engaged users. Table 4.10 is the degree centrality of user to post for the top 20 users with daily total reach. And Table 4.16 is the degree centrality of the user to user for the top 20 users with daily page engaged users. According to the questionnaires, the behavior of accessing the Page to participate with the Page from Table 5.2:

- The user id6 has two ways of viewing news and information related to the Kledthai Facebook Fan Page: 1. Accessing the site to follow-up on the Page's news and information independently 2. Through a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or Facebook Fan Page information you can follow, etc.)

- Concerning "like" and "comment" behavior on Kledthai Facebook Fan Page's posts and pictures, the user id6 "liked" or "commented" through the News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or Facebook Fan Page information you can follow, etc.)

- The user id6 viewed news and information with posts from the News Feed more than six times per week, thereby indicating a user who frequently participates with Page. The user id6 ranks fifth on the total user to post degree centrality score, thereby enabling the user id6 to view posts from the News Feed several times weekly with news and information and posts from the News Feed showing information updates from friends such as the user's friends' "likes" or "comments" on Kledthai Facebook Fan Page's posts and in the News Feed displaying updated information on Page followed such as when admin posts information or updates on Kledthai Facebook Fan Page status.

- The user id6 visited Kledthai Facebook Fan Page 2-4 times weekly and has 100-200 friends on Facebook. The user id6's "likes" and "comments" on posts can

be disseminated to the user's friends' news and information while helping attract many other users to join in and participate with Page.

The user id20 completed the questionnaire with a total user to post degree centrality score was ranked at twelve and a total user to user degree centrality score was ranked at twenty. The user's total user to post betweenness centrality score was ranked at thirty-six. According to the multiple regression analysis, the user id20 was a user placed in Table 4.11, namely, degree centrality of user to post among the top 20 users with a daily organic reach and positive Beta value with statistical significance at 0.05 (Sig. < 0.05). The behavior of accessing the Page to participate with the Page from Table 5.2:

- The user id20 has two ways of viewing news and information related to the Kledthai Facebook Fan Page: 1. Accessing the site to follow-up on the Page's news and information independently 2. Through a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or Facebook Fan Page information you can follow, etc.)

- Concerning "like" and "comment" behavior on Kledthai Facebook Fan Page's posts and pictures, the user id20 "liked" or "commented" through the News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or Facebook Fan Page information you can follow, etc.)

- The user id20 viewed news and information related to the Kledthai Facebook Fan Page by accessing the site and monitoring the news and information independently or through the News Feed (the column in the middle of the Facebook Page showing recently updated information about Pages from friends or Pages' information).

- The user id20 "liked" and commented on Kledthai Facebook Fan Page's posts and pictures through the News Feed (the column in the middle of the Facebook Page showing recently updated information about Pages from friends or Facebook Fan Page information you can follow, etc.).

- The user id20 viewed news and information with posts on the News Feed 2-3 times per week, which is considered low frequency viewing, and viewed news and information with posts from the News Feed showing recently updated information

from friends such as Kledthai Facebook Fan Page's posts that friends "liked" or commented on.

- Low frequency viewing of news and information prevented the user id20 from visiting the Kledthai Facebook Fan Page. The questionnaire data collection period was scheduled at a different time than the collection of the research data. The user id20 interacted with the Page between 1 December 2011 and 5 December 2012, but the questionnaire data collection period was between 12 November 2012 and 30 November 2013. The user id20 also has 300 - 400 friends on Facebook.

According to the questionnaire data collection, the users' behavior in accessing the site to interact with the Page was identified. The very active users had more opportunities to view posts. For example, the user id6 viewed news and information with various posts from the News Feed more than six times per week, which shows the user to have frequent participation with the Page.

As a result of the new News Feed algorithm information[25], we know that each user's chance of viewing the information they receive from Pages is unequal. People who are less active also have fewer opportunities to view posts. For example, the user id20 viewed news and information and posts from the News Feed only 2-3 times per week according to Facebook's system that filters each entry of content displayed on a fan's News Feed differently. Facebook offers a way to send messages in the News Feed of a brand and should consider using paid distribution to ensure the information reaches Fan Page groups [25]. This research can be beneficial to brands or organizations with no requirement to pay for information dissemination on Facebook. The findings show that being active and having high degrees of interaction with Pages helps users receive more news and information and that those users are important in helping to disseminate news to other users and friend groups. In addition, brands or organizations can tag news and information directly for users to receive.

5.2 Conclusion

In this research, Facebook Fan Page users' behaviors are analyzed by using centrality measures with users who have interaction with the Page posts by using

the Kledthai Facebook Fan Page during the period from 1 December 2011 to 5 December 2012. The results of the data analysis in using degree centrality and betweenness centrality measurements are displayed in the top thirty scores and the comparison ranked of the top ten scores of both models are shown in Chapter 4. Furthermore, the data obtained from the centrality measurements were analyzed in combination with the aggregate statistical data from Facebook Page Insights by using multiple regression analysis to analyze the relationships among users with true influence over the network. The research findings can be summarized as follows:

1. According to the multiple regression analysis by using the data on the users with the top 100 degree centrality scores from the user to post relationships and the user to user relationships that were considered with the statistical aggregate data of the Page users. It can be concluded that most users had high Beta values and positive values with statistical significance at 0.05. Both the total user to post degree centrality scores and total user to user degree centrality scores from the 53-week period were not high. Furthermore, some users had moderate degree centrality scores, ranking 50-70, but high relation with other users according to the users who accessed the site to participate with the Pages of each relationship from the high Beta value. These more of these user are trend followers than leaders in the network. The interactions together of users who have low interactions and moderate interactions and have positive Beta values with statistical significance at 0.05 of these users able to influence the overall users of Page.

2. According to the multiple regression analysis by reducing the number of users and selecting the users with the top ten, top twenty, top thirty of degree centrality scores over the 53-week period, the relationship user to post and the top twenty scores of the relationship user to user of users, which was considered together with the aggregate statistics for the Page users, namely, the values of the daily page engaged users, daily total reach and daily organic reach, the users with the top ten, top twenty degree centrality scores are highly active users with participation by interacting with Page posts on a regular basis. This part of the analysis reduces the number of users with low total degree centrality scores from both of the relationships in order to identify the users who are leaders capable of attracting other users with more interest in the Page. Furthermore, these users are related to other users accessing the site to

participate with the Page according to the statistics for all three values of the users on the Page.

- Concerning the multiple regression analysis of the top ten users of user to post degree centrality by considered of users that have positive Beta values with statistical significance at 0.05 (Sig. < 0.05) was found to have a few user who can influence the overall users from 3 values which these users insufficient in the distribution news, so should be a collaboration of many users. To confident on the selection variables, therefore increase the number of users by selections the top 20 users and the top 30 users.

- Concerning the multiple regression analysis of the top twenty user to user degree centrality, user to post degree centrality, it can be concluded that the users with high Beta values with statistical significance at 0.05 and high total degree centrality scores ranking among the top twenty users and ranked at the moderate level, 11-20 rankings, for the total number of twenty users. These users have the characteristics of leaders because they are related to the users accessing the site to participate the Page to a high level with consideration based on the high Beta values and their frequent access to the site to interact with Page posts. Consideration was also based on the total degree centrality scores from both high degree relationships.

- Concerning the multiple regression analysis of the top thirty users of user to post degree centrality, it can be concluded that the most users will be the same users with the top twenty users and was found to have additional users from degree centrality scores lower the top twenty users with high Beta values with statistical significance at 0.05 to be factors that affect the overall user. When increasing the number of users, additional low interactive are introduced. Therefore we will focus on the active user of the top 20 users.

3. According to the multiple regression analysis by selecting the users with the top twenty betweenness centrality scores over the 53-week period, the user to post relationships mean the users accessing the site to interact with numerous Page posts resulted in links between users with many Page posts. The user to post relationship is more related to Page posts than user to user relationships because the network of relationships of the users who are friends accessing the site to interaction with each Page post together is unidentifiable. Hence, the data was analyzed by using data from

the betweenness centrality scores of the user to post relationships considered in combination with the daily page engaged users, daily total reach and daily organic reach capable of affecting the users who participate and interact with Page posts, which can be summarized as follows:

The number of users with high Beta values and statistical significance at 0.05 ($P < 0.05$) were found to have betweenness centrality scores among the top ten scores which means that links occurred among the users on numerous Page posts when these users accessed the site to interact with numerous Page posts. Consequently, there was related between the users who participated and interacted with Page posts together and this enabled the users to become leaders for other users to also access the site and participate with the Page.

According to the data analysis, creating a network that is large and able to disseminate the news and information on the Page to other users in large numbers requires access to the site with interactions and participation with the Page by groups with many users. According to the multiple regression analysis of the top 100 users for user to user degree centrality and user to post degree centrality with consideration of the daily page engaged users, daily total reach and daily organic reach, most of the users were found to be users who interacted with Page posts to a level that was not high and users who interacted with Page posts to a moderate level with high Beta values and positive values with statistical significance at 0.05 ($P < 0.05$). These users had characteristics of being trend followers. When these users accessed the site to participate with Page posts, they were able to affect other users according to the aggregate user statistics.

Concerning the multiple regression analysis focus on the top twenty users of user to user degree centrality, user to post degree centrality and user to post betweenness centrality scores considered in combination with the daily page engaged users, daily total reach and daily organic reach, most of the users were found to be users who interacted with Page posts to a high level, high Beta values and positive values with statistical significance at 0.05 ($P < 0.05$). These users have the characteristics of leaders. Because a group of users who have high interactions with Page posts thus able to attract the attention of other users more than users with low interactions with Page posts. And when these users access the site to participate in

Page posts, they are able to affect other users according to the aggregate statistics for the users. This group of users can result in network expansion and help disseminate news and information on the Page to access other users in greater numbers.

The outcomes of the multiple regression analysis indicates the users who able to affect the overall users who participated in Page with participation together of many users that not caused by a single user by considered the positive Beta values and using a reliability level of 95% with statistical significance at 0.05 ($P < 0.05$). In determining whether a leader or a follower to engage with the Page by considered from the ranked of centrality scores of interactions of users with Page posts and the result from the multiple regression analysis, depending on the objective determining leaders / follower of which type.

According to the multiple regression analysis of the value obtained from the centrality measures and considered in combination with all three values from Facebook Page Insights which will provide different benefits in each table by based on a consideration with these values. In case to consider with daily page engaged users is the number of unique user who engaged with Page by the types of engagement related actions on post and Page such as post likes, post comments, post shares, offer claims, question follows, link clicks, photo views, video plays, Page likes, check-ins, Page mentions, tab views, question answers, question follows, etc. In case to consider with daily total reach is the number of unique user who viewed contents associated with Page, including an Ads or Sponsored Stories pointing to Page and posts, posts by other people, Page like ads, mentions, check-ins, etc. In case to consider with daily organic reach is the number of unique user who visited Page or viewed posts and any content in News Feed and ticker, including user who saw it from a story shared by a friend when they liked, commented on or shared Page post, answered a question or responded to an event, etc. Therefore, the benefits of adoption are depending on the purpose of study about different participation of users with Page.

From the questionnaires have shown that Page participation behavior of users such as channels of access Page posts and pictures with “likes”, “comments” of users, frequency and channels of viewed news and information and visits Kledthai Facebook Fan Page, the number of Facebook friends, etc.

To create a large network and can be distribution the news or information to more user will be caused by the cooperation and interactions together of many users, not caused by a single user only. Users who are leaders with high interactions and high Beta values from the multiple regression analysis with data from the Facebook Page Insights will be able to attract users to participate more with Page. However, some users who have high interactions sometimes are unable to attract users to participate with Page. In the part of users with low interactions who are followers that have less opportunity to see the Page posts when these users have interactions with Page posts and have high Beta values can be distribution the news in one channel and affecting the overall users of Facebook Page Insights to be increased.

5.3 Recommendations

1. Additional studies should be conducted on the network relationships of the friends of users who interact with Page posts in order to examine the relationships occurring among users and the networks of each of the users' friends because the limitation involving user privacy settings resulting in inability to access the data of users who are not friends.

2. Additional studies should be conducted on the types of contents on the Page in order to categorize groups of Page post types capable of causing more users to access the site and participate with the Page and capable of identifying the interests of each user in the types of Page posts.

3. Because Facebook undergoes regular changes in usage algorithms, people who are interested in this field of research should also take Facebook's changing algorithms into consideration.

4. In the present study, the data from the Kledthai Facebook Fan Page was analyzed. If there is a need to compare the differences of other Facebook Fan Page sample groups, other Facebook Fan Page sample groups should be used in experimentation aimed at analyzing different network sizes, network changes and user behaviors for each organization.

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APPENDICES

APPENDIX A

The detail of Facebook Insights to described in the main. The four metrics at the top of Insights tab allow to understand the size and engagement of your audience. This information can useful to evaluate the success of the marketing of business or organization.

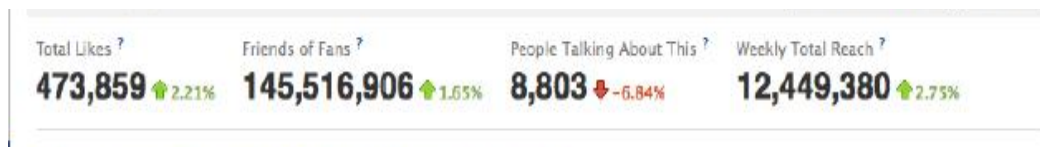


Figure A.1 The example the top of Facebook Insights [20].

The descriptions include Total Likes: The number of unique people who like your Page, Friends of Fans: The number of unique people who are friends with your fans, including your current fans then friends of fans represent a much larger set of consumers than fans alone and are much more likely than the average consumer to visit a Facebook Fan Page, website, People Talking About This: The number of unique people who have created a story about your Page in the last seven days, Total Reach: The number of unique people who have seen any content associated with your Page (including any Ads or Sponsored Stories pointing to your Page) in the last seven days[20].

The example of Demographics information for Taking About Your Page who the people talking about your Page are, and the types of stories they're telling friends about your business. In this section to help understand who your fans are and how you acquired them such as sex, age, country that our Fan Page and Languages (see Figure A.2).

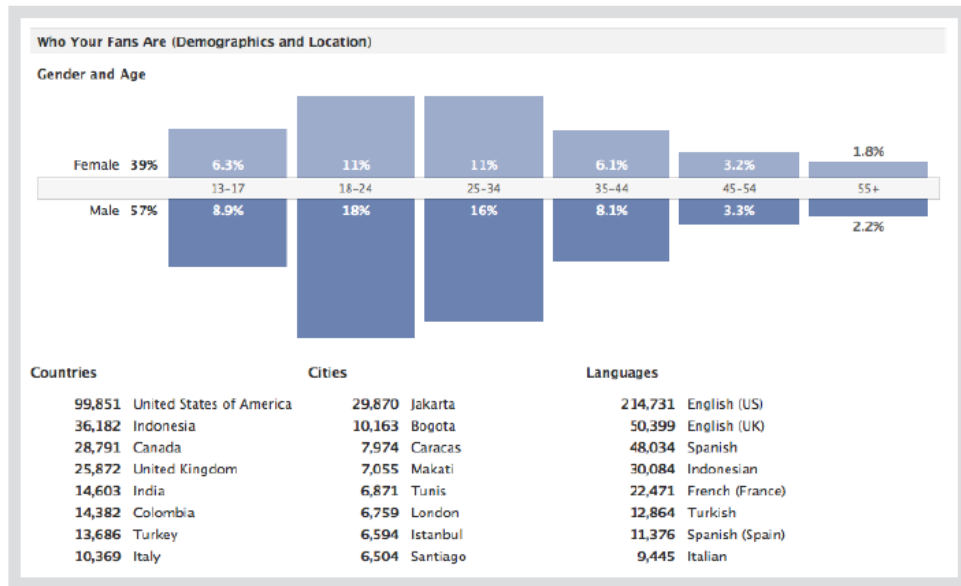


Figure A.2 This chart shows data of demographics of Taking About Your Page [20].

From Figure A.2 shows descriptions including the following such as [20]:

- Gender and Age: The percentage of people who liked your Page for each age and gender bracket as of the last day of selected date range. This is based on the data people enter in their profile.
- Countries: The number of people who liked Page as of the last day of your selected date range, broken down by country.
- Languages: The number of people who liked your Page as of the last day of your selected date range, broken down by language.

APPENDIX B

Graph of users from measuring the centrality with the scores in top 10 for 53 weeks.

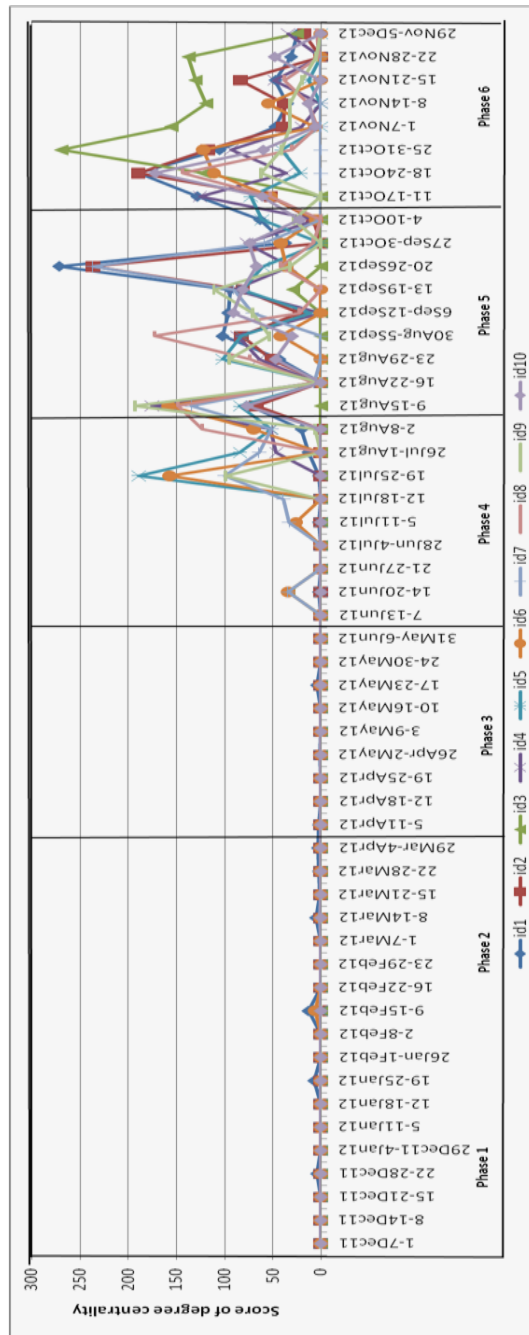


Figure B.1 Shows the total user to user degree centrality scores of top 10 users from 1 December 2011 to 5 December 2012 for 53 weeks divided into six phases.

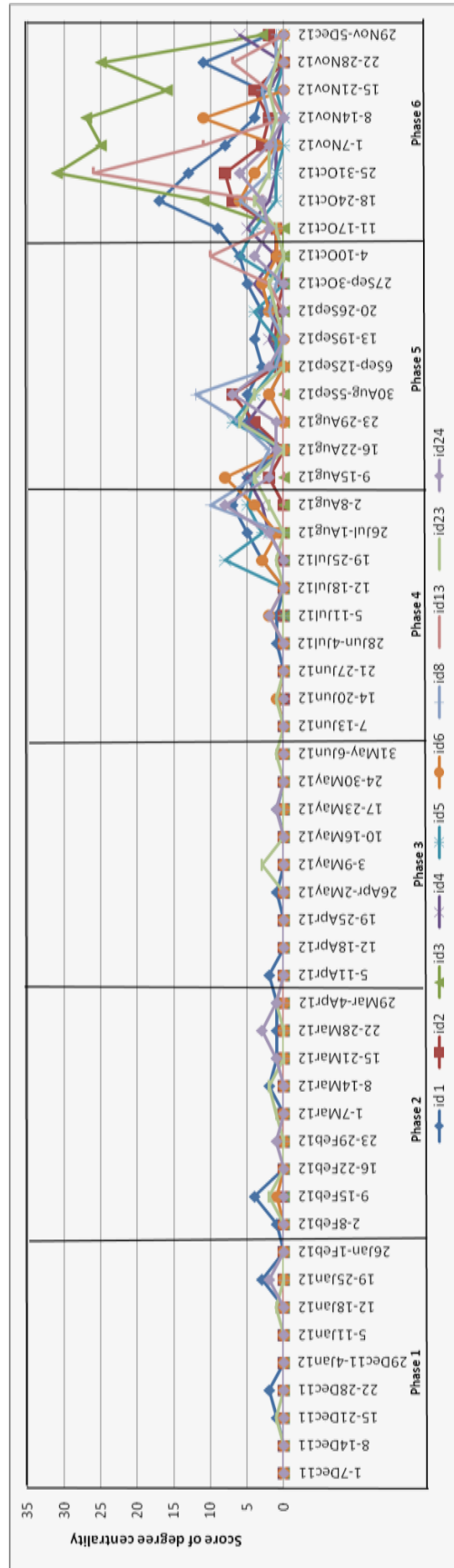


Figure B.2 Shows the total user to post degree centrality scores of top 10 users from 1 December 2011 to 5 December 2012 for 53 weeks divided into six phases.

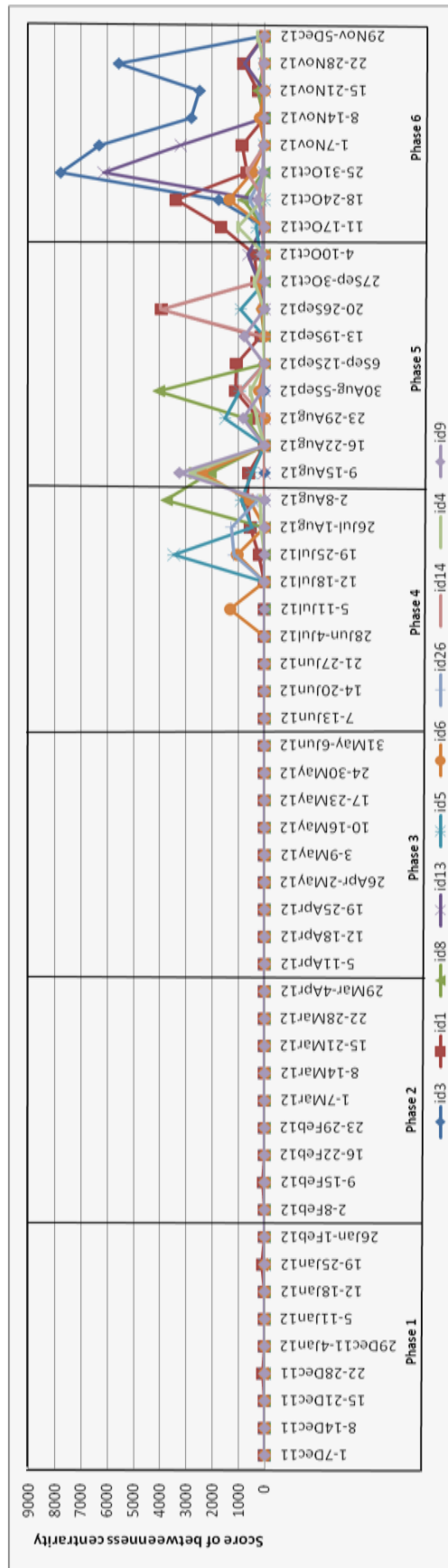


Figure B.3 Shows the total user to user betweenness centrality scores of top 10 users from 1 December 2011 to 5 December 2012 for 53 weeks divided into six phases.

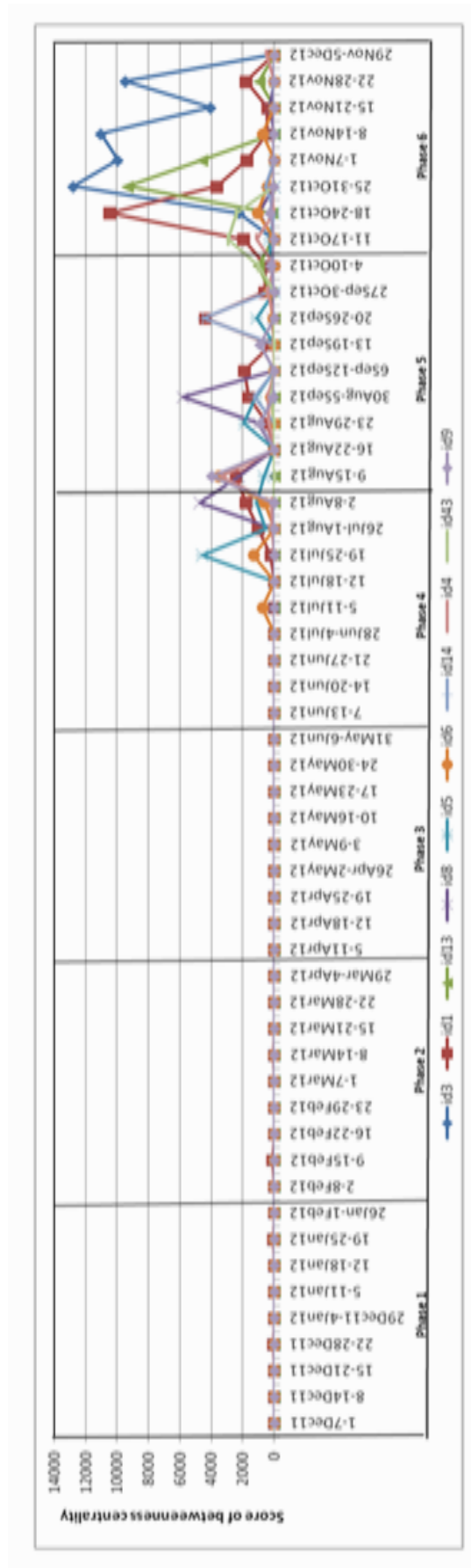


Figure B.4 Shows the total user to post betweenness centrality scores of top 10 users from 1 December 2011 to 5 December 2012 for 53 weeks divided into six phases.

APPENDIX C

QUESTIONNAIRE

แบบสอบถามเกี่ยวกับการศึกษาพฤติกรรมและปัจจัยที่มีผลต่อการกด like และแสดงความคิดเห็น (comment) ต่อโพสต์ของ Kledthai Facebook Fan Page โดยแบบสอบถามนี้จัดขึ้นทำเพื่อใช้ประกอบการทำวิจัยในระดับปริญญาโท สาขาเทคโนโลยีการจัดการระบบสารสนเทศ มหาวิทยาลัยมหิดล

โปรดกรอกข้อมูลของท่านลงในแบบสอบถามคำตอบของท่านจะถูกรวบรวมและนำไปวิเคราะห์ ซึ่งใช้การวิจัยเท่านั้น โดยข้อมูลที่ได้รับจะถูกเก็บไว้เป็นความลับ ทั้งนี้ผู้วิจัยขอขอบคุณทุกท่านในการให้ความร่วมมือในการตอบแบบสอบถามเป็นอย่างยิ่ง

1. ชื่อ Facebook profile หรือ Facebook Id ของท่านที่ใช้ในปัจจุบัน

.....

2. ท่านกด Like ใน Kledthai Facebook Fan Page หรือไม่

กด Like

ไม่ได้กด Like

3. ท่านรู้จัก Kledthai Facebook Fan Page ได้อย่างไร

คนรู้จักแนะนำ (เช่น เพื่อนหรือบุคคลอื่น ๆ)

มีความสนใจในการเข้ามามีส่วนร่วมกับ Page ด้วยตนเอง

รู้จักผ่านเว็บไซต์ www.kledthaishopping.com

อื่น ๆ

4. ท่านเห็นข้อมูล/ข่าวสารที่เกี่ยวข้องกับ Kledthai Facebook Fan Page จากช่องทางใด

ตอบได้มากกว่า 1 คำตอบ

เข้ามาติดตามข้อมูล/ข่าวสารของ Page ด้วยตนเอง

ใน News Feed (คอลัมภ์ตรงกลางของหน้า Facebook ที่แสดงการอัปเดตข้อมูลเกี่ยวกับ Page จากเพื่อนหรือข้อมูลของ Page ที่คุณได้ติดตามของ Facebook เป็นต้น)

ใน Ticker (คอลัมภ์ด้านขวาที่แสดงกิจกรรมล่าสุดที่เกิดขึ้นในกลุ่มเพื่อนของท่าน)

อื่น ๆ

5. ท่านกด like และ comment โพสต์และรูปภาพต่างๆ ของ Kledthai Facebook Fan Page ผ่านช่องทางใด

- เข้ามาติดตามข้อมูล/ข่าวสารของ Page ด้วยตนเอง (โปรดตอบคำถาม ข้อ 6. และข้ามไปตอบข้อ 9 เป็นต้นไป)
- ใน News Feed (คอลัมภ์ตรงกลางของหน้า Facebook ที่แสดงการอัปเดตข้อมูลเกี่ยวกับ Page จากเพื่อนหรือข้อมูลของ Page ที่คุณได้ติดตามของ Facebook เป็นต้น) (โปรดข้ามไปตอบข้อ 7 เป็นต้นไป)
- ใน Ticker (คอลัมภ์ด้านขวาที่แสดงกิจกรรมล่าสุดที่เกิดขึ้นในกลุ่มเพื่อนของท่าน) (โปรดข้ามไปตอบข้อ 9 เป็นต้นไป)

6. ปัจจัยในการเข้าไปชม Kledthai Facebook Fan Page ด้วยความสนใจส่วนตัว ที่มีผลทำให้ท่าน กด Like และ comment ในโพสต์ต่างๆ ของ Page (ตอบได้มากกว่า 1 ข้อ)

- มีความสนใจในข้อมูล/ข่าวสารและติดตามความเคลื่อนไหวต่าง ๆ ของ Page
- มีความสนใจในการเข้าร่วมกิจกรรมต่าง ๆ ของ Page
- มีความสนใจในการค้นหาเกี่ยวกับสินค้าและบริการต่าง ๆ
- ต้องการแสดงความคิดเห็นกับ Admin และแลกเปลี่ยนความคิดเห็นกับผู้ให้บริการท่านอื่น
- อื่นๆ

7. ท่านเห็นข้อมูล/ข่าวสาร และโพสต์ต่างๆ จาก News Feed ของท่านบ่อยเพียงใด

- 1 ครั้งต่อสัปดาห์
- 2 - 3 ครั้งต่อสัปดาห์
- 5 - 6 ครั้งต่อสัปดาห์
- มากกว่า 6 ครั้งต่อสัปดาห์

8. ท่านเห็นข้อมูล/ข่าวสาร และโพสต์ต่างๆ จาก News Feed ของท่านจากกรณีใด

- ใน News Feed ที่แสดงการอัปเดตข้อมูลของเพื่อน เช่น เพื่อนของท่านกด likes หรือ comments ในโพสต์ของ Kledthai Facebook Fan Page
- ใน News Feed ที่แสดงการอัปเดตข้อมูลของ Page ที่ท่านได้ติดตาม เช่น เมื่อ admin ได้โพสต์ข้อความ (Page post) หรืออัปเดตสถานะต่าง ๆ ของ Kledthai Facebook Fan Page
- เห็นข้อมูล จาก News Feed จากทั้ง 2 กรณี
- อื่นๆ

9. ท่านเข้าชม Kledthai Facebook Fan Page บ่อยเพียงใด

- ไม่เคย
- สัปดาห์ละ 1 ครั้ง
- สัปดาห์ละ 2 - 4 ครั้ง
- สัปดาห์ละ 5 - 6 ครั้ง
- ทุกวัน

10. จำนวนเพื่อนที่มีใน Facebook ของท่านมีจำนวนเท่าไร

- น้อยกว่า 100 คน
- 100 - 200 คน
- 300 - 400 คน
- มากกว่า 400 คน
- อื่น ๆ

11. E - mail ที่ท่านใช้ในปัจจุบันคือ (โปรดระบุเพื่อใช้ในการติดต่อกลับ)

.....

12. ข้อเสนอแนะ

.....

APPENDIX D

The questionnaire data was collected from 12 November 2013 to 30 November 2013 from a total of thirty-five subjects who completed the questionnaires. The results of Questions 2-10 are shown in Figure D.1 – D.9

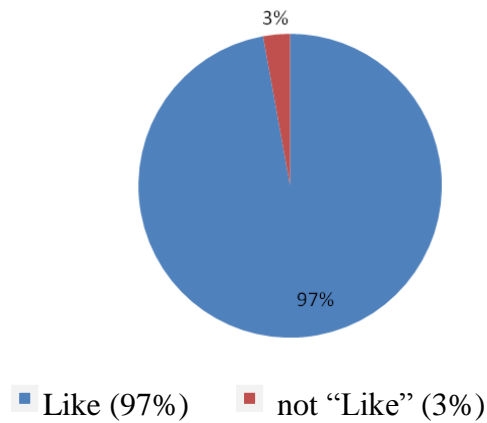


Figure D.1 Question 2. Do you "Like" the Kledthai Facebook Fan Page?

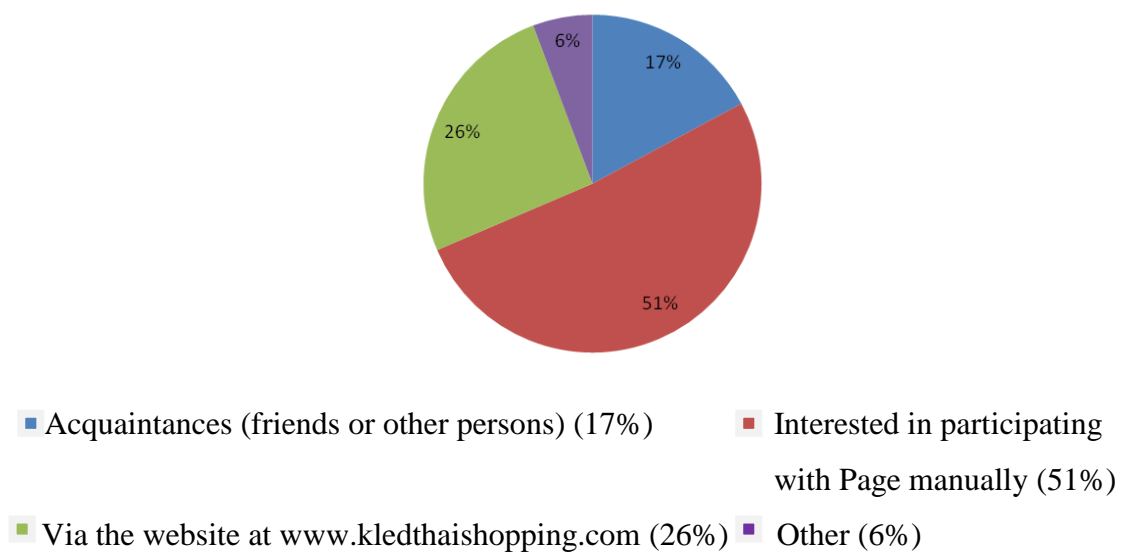
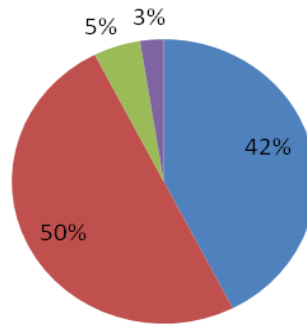
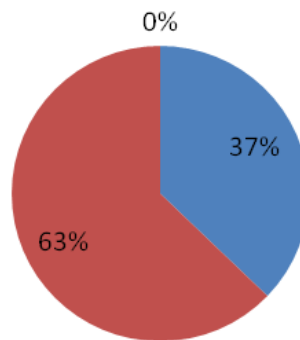


Figure D.2 Question 3. How did you find out about the Kledthai Facebook Fan Page?



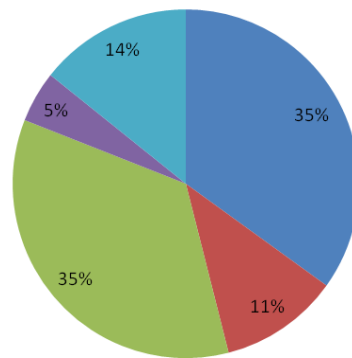
- Accessing the site to follow-up on the Page's news and information independently (42%)
- In a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or the Facebook Fan Page information you can follow, etc.) (50%)
- In Ticker (the column in the right that displays the latest activities happening in your group of friends) (5%)
- Other (0%)

Figure D.3 Question 4. Did you view news / information related to the Kledthai Facebook Fan Page through any of the following channels?



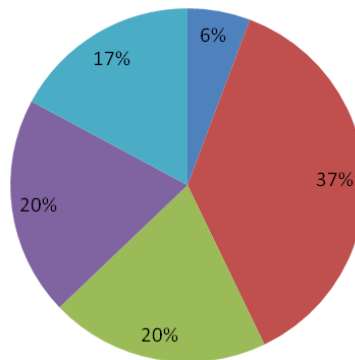
- Accessing the site to follow-up on the Page's news and information independently (Please answer No.6. and skip to No.9 onward.) (37%)
- In a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or Facebook Fan Page information you can follow, etc.) (Please skip to No.7 onward) (63%)
- In Ticker (the column in the right that displays the latest activities happening in your group of friends) (Please skip No.9 onward) (0%)

Figure D.4 Question 5. Do you "like" and "comment" on Kledthai Facebook Fan Page posts and pictures via any of the following channels?



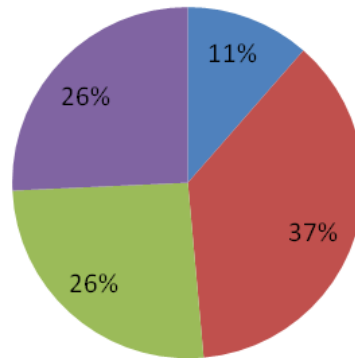
- Interested in the news / information and follow-up on various Page updates (35%)
- Interested in joining Page the activities (11%)
- Interested in finding about products and services (35%)
- Wanted to comment with Page admin and exchange ideas with other users (5%)
- Other (14%)

Figure D.5 Question 6. Factors concerning the visited Kledthai Facebook Fan Page with private interests affecting "Like" and "comment" on the various Page posts? (more than 1 answer possible)



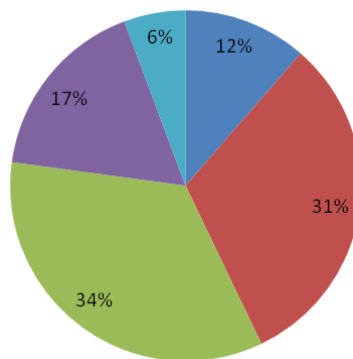
- Once a week (6%)
- 2-3 times a week (37%)
- 5- 6 times a week (20%)
- more than six times a week (20%)

Figure D.6 Question 7. How often do you view the news / information and any posts from your News Feed?



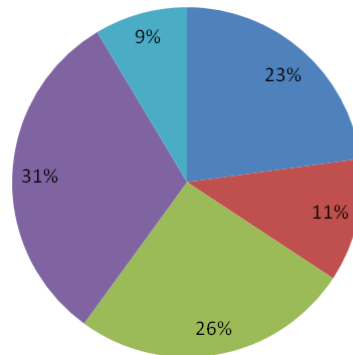
- I viewed the News Feed showing information updates from friends such as the user's friends' "likes" or "comments" on Kledthai Facebook Fan Page posts (37%)
- I viewed News Feed display on updated information for the Page followed such as when admin posts information or updates on Kledthai Facebook Fan Page status (11%)
- I viewed the information from the News Feed in both cases (26%) ■ Other (26%)

Figure D.7 Question 8. Did you view the news / information and posts from the News Feed in either of the cases?



- Never (12%) ■ Once a week (31%) ■ 2-4 times a week (34%)
- 5-6 times a week (17%) ■ Everyday (6%)

Figure D.8 Question 9. How often do you the Kledthai Facebook Fan Page?



- Less than 100 users (23%)
- 100 - 200 users (11%)
- 300 - 400 users (26%)
- more than 400 users (31%)
- Other (9%)

Figure D.9 Question 10. How many online Facebook "friends" do you currently have?

APPENDIX E

The questionnaire data was collected from 12 November 2013 to 30 November 2013 from a total of sixteen users who completed the questionnaires and have interactions by liked and commented on the Page posts during the aforementioned period of time. The results of Questions 2-10 are shown in Figure E.1 – E.9.

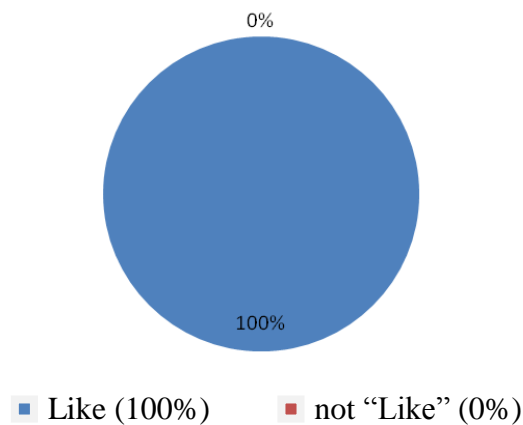


Figure E.1 Question 2. Do you "Like" the Kledthai Facebook Fan Page?

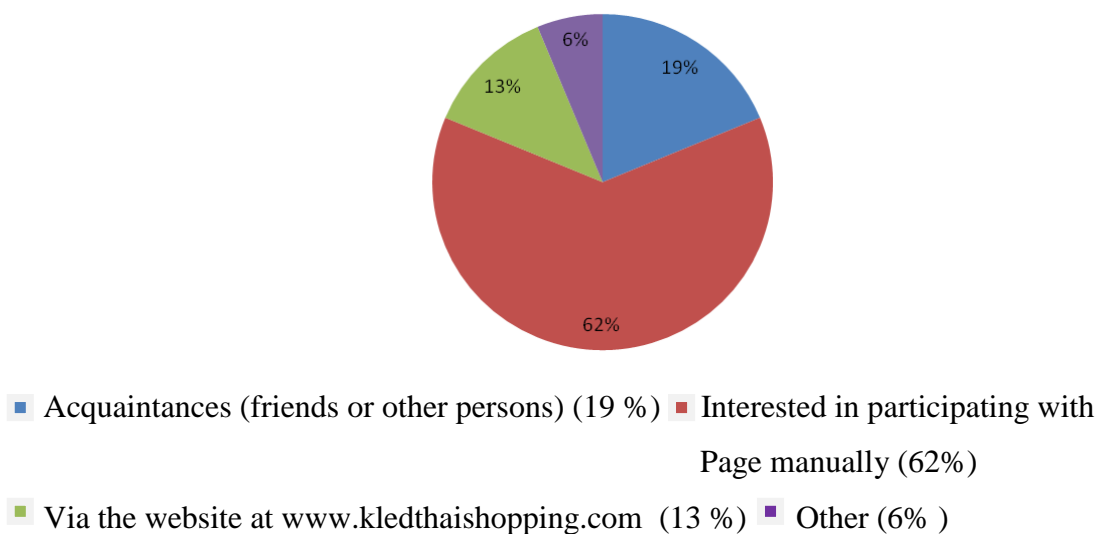
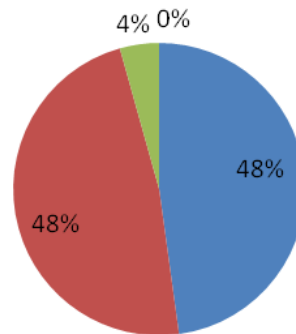
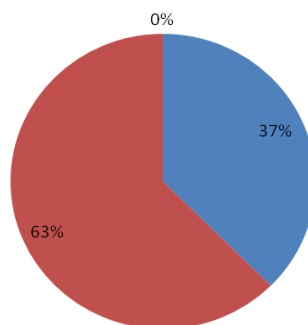


Figure E.2 Question 3. How did you find out about the Kledthai Facebook Fan Page?



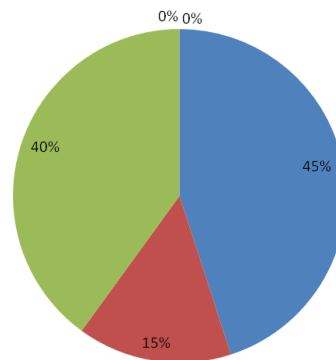
- Accessing the site to follow-up on the Page's news and information independently (48%)
- In a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or the Facebook Fan Page information you can follow, etc.) (48%)
- In Ticker (the column in the right that displays the latest activities happening in your group of friends) (4%)
- Other (0%)

Figure E.3 Question 4. Did you view news / information related to the Kledthai Facebook Fan Page through any of the following channels?



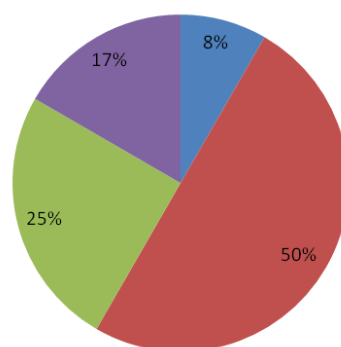
- Accessing the site to follow-up on the Page's news and information independently (Please answer No6. and skip to No.9 onward.) (37%)
- In a News Feed (the column in the middle of the Facebook that shows recently updated information about Page from friends or Facebook Fan Page information you can follow, etc.) (Please skip to No.7 onward) (63%)
- In Ticker (the column in the right that displays the latest activities happening in your group of friends) (Please skip No.9 onward) (0%)

Figure E.4 Question 5. Do you "like" and "comment" on Kledthai Facebook Fan Page posts and pictures via any of the following channels?



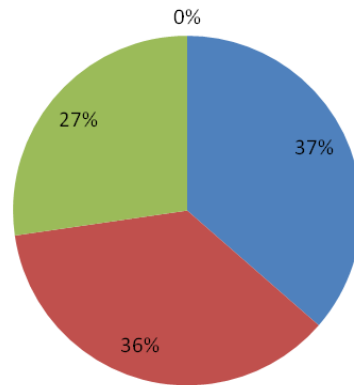
- Interested in the news / information and follow-up on various Page updates(44%)
- Interested in joining Page the activities (15%)
- Interested in finding about products and services (40%)
- Wanted to comment with Page admin and exchange ideas with other users (0%)
- Other (0%)

Figure E.5 Question 6. Factors concerning the visited Kledthai Facebook Fan Page with private interests affecting "Like" and "comment" on the various Page posts? (more than 1 answer possible)



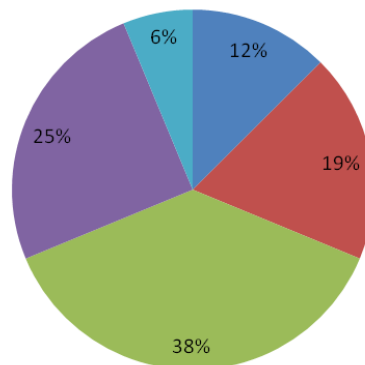
- Once a week (8%) ■ 2-3 times a week (50%) ■ 5- 6 times a week (25%)
- more than six times a week (17%)

Figure E.6 Question 7. How often do you view the news / information and any posts from your News Feed?



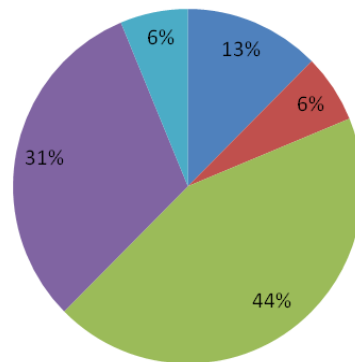
- I viewed the News Feed showing information updates from friends such as the user's friends' "likes" or "comments" on Kledthai Facebook Fan Page posts (36%)
- I viewed News Feed display on updated information for the Page followed such as when admin posts information or updates on Kledthai Facebook Fan Page status (37%)
- I viewed the information from the News Feed in both cases (27%) ■ Other (0%)

Figure E.7 Question 8. Did you view the news / information and posts from the News Feed in either of the cases?



- Never (12%) ■ Once a week (19%) ■ 2-4 times a week (38%)
- 5-6 times a week (25%) ■ Everyday (6%)

Figure E.8 Question 9. How often do you the Kledthai Facebook Fan Page?



- Less than 100 users (13%)
- 100 - 200 users (6%)
- 300 - 400 users (44%)
- more than 400 users (31%)
- Other (6%)

Figure E.9 Question 10. How many online Facebook "friends" do you currently have?

BIOGRAPHY

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