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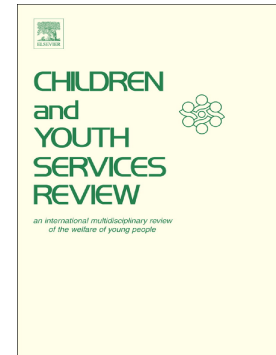
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**Analysing Social Networks for Social Work Practice: A Case Study of the Facebook Fan  
Page of an Online Youth Outreach Project**

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### Abstract

This study adopted social network analysis (SNA) to interpret a Facebook fan page used by a youth outreach project in Hong Kong. The study aimed to: i) explore what types of open data can be captured from social media, ii) explore in what ways SNA metrics can be used to generate meaningful indicators that help track relationship changes, and iii) examine to what extent SNA findings agree with social workers' perceptions. These results preliminarily suggest the feasibility and validity of SNA in social work practice research. This study adds to the emerging knowledge base of how practitioners and researchers might use SNA to assess social networks, supplement need assessments, track service users' behavioural changes, and evaluate services.

**Analysing Social Networks for Social Work Practice: A Case Study of the Facebook Fan  
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If one of the core missions of social work is to facilitate individuals to have more effective interactions with resources and social systems (M. Holosko, 2017; Moore, 1990), social media may likely offer new opportunities for the profession (Chan & Holosko, 2017). Nonetheless, this potential is yet to be verified.

Social media refers to a set of online tools that support social interaction between users, and cover a range of interactive Internet-based applications such as YouTube, Facebook, Instagram, LinkedIn (Hansen, Schneiderman, & Smith, 2011; Kaplan & Haenlein, 2010). The term social media is often used to contrast with more traditional media such as television and books that deliver content to mass populations but do not facilitate the creation or sharing of content by users (Hansen et al., 2011).

Research has been conducted on the use of social media in social work, outlining the increased use in direct practice (Best, Manktelow, & Taylor, 2014; Chan, 2016; Goldkind, 2015; Valimaki, Athanasopoulou, Lahti, & Adams, 2016). There are healthcare interventions using social media (Welch, Petkovic, Pardo, Rader, & Tugwell, 2016), but in social work, social media has been shown to be mainly used for service user engagements (Chan & Holosko, 2016b) or for sharing service information (Fitch, 2007). A 2016 scoping review reported that there are a limited number of studies that posit social media as a medium to implement social work interventions, need assessments or evaluations, and most of them reported using social media as an effective means to engage service users (Chan, 2016).

Among social work intervention studies adopting social media as a medium of intervention, most are qualitative studies exploring social workers' or service users' experiences

(Ballantyne, Lowe, & Beddoe, 2017; Chan & Holosko, 2016b; Leung et al., 2016; Oliver et al., 2015), or content analysis of communications on social media pages (Lee & Suzanne Horsley, 2017; Oliver et al., 2015). Compared with other more traditional types of technology-supported intervention studies (e.g., online training) social media based studies have much less experimental designs (Chan, 2016). Qualitative case studies have offered unique insights that has contributed to social work knowledge development, but the lack of empirical evidence has partly limited what these studies can say.

There are some common hurdles in using social media data to evaluate interventions. First, social media is a third-party platform, consequently researchers as they do not have control of the interface design, the algorithm, and the data (Chan & Holosko, 2016b). Algorithms are designed by people, and they only do what they are designed to do (Godinho et al., 2017), but social workers usually are not aware of that and they may not be in a position to negotiate this with social media companies. Second, workers need to consider ways in which this data can be ethically collected and used. In some countries, such as the USA, interventions conducted via social media platforms (e.g., Skype) may not be covered by insurance (Reamer, 2015), and this may affect practitioners' incentive to adopt social media in clinical interventions. Third, social work does not have appropriate conceptual tools and research instruments for measuring social networks and interactions. Intervention research in social work mainly adopts subjective measures relying on self-reporting scales/instruments (Fraser, 2004; M. J. Holosko, 2016), objective measures tracking behaviours, relationships or social networks are not as developed as these, and hence this has limited the choices of research methods.

Nevertheless, there are emerging studies which have partly overcome these hurdles. For example, researchers have captured social media data within the permitted parameters via the application programming interfaces (APIs) of social media platforms, and have used such data to identify users' demographic data (Lewis, Kaufman, Gonzalez, Wimmer, & Christakis,

2008), analyse group dynamics (Wölfer, Faber, & Hewstone, 2015), identify significant members in social movements (Chan, 2013), and analyse social trends (Del Vicario, Zollo, Caldarelli, Scala, & Quattrociocchi, 2017).

A core technique behind these emerging social media studies is social network analysis (SNA), which is derived from the concept of sociogram – a representation of social links. A sociogram consists of two primary building blocks: nodes and edges. Nodes (also called vertices, entities or items) can represent many things such as people, groups or even countries. Edges (also known as links, ties, connections or relationships) are the building blocks of networks. An edge connects two nodes together. Edges can represent many different types of relationships such as collaborations, kinship, friendship or citations. Based on these sociogram concepts, there are various metrics used to measure the weighting or connectedness of individuals in a network, such as the number of in-coming connections, outgoing connections, or the total number of people connected (Hansen et al., 2011). Further details about SNA metrics will be introduced in the Data Collection and Analysis section.

In fact, social scientists have long proposed metrics aiming to calculate network developments and individual weightings in social networks (Freeman, 1977), but these metrics have not been widely applied until recently in social work or social sciences (Hansen et al., 2011). The development of various types of social media platforms has resulted in a large amount of structured data becoming available to the public (Coulton, Goerge, Putnam-Hornstein, & de Haan, 2015). In conjunction with the research tools currently available to collect, analyse, and visualize social media data, new insights can be revealed (Hansen et al., 2011). If these new measurements can quantify and measure changes of social network over time, bivariate and/or multivariate analyses can be applied, particularly useful for intervention studies.

Against this background, we contend that SNA may possibly provide new opportunities for social work intervention research. This study aimed to depict the social network development of a Facebook fan page used by a youth work service in Hong Kong, with special reference to the following questions: i) What types of data can we ethically get from social media? ii) What analytical tools can we use to generate meaningful indicators that help track changes? iii) To what extent the results of SNA metrics agree with social workers' perceptions? Validation is both useful and essential, because it can tell us whether SNA findings are trustworthy, therefore researchers and practitioners can use it to triangulate findings from other data sources, and assess social media networks without relying on network members' self-reporting.

### **The Case: The Facebook Page of Infinity Teens**

This study analysed the Facebook fan page activities of the Infinity Teens project (<https://www.facebook.com/caritas.infinityteens/>) operated by Caritas Hong Kong, which is a local charitable organisation running various services in Hong Kong, such as social services, educational services and medical services.

The Infinity Teens project is one of three online youth service projects operated by local NGOs with support from the Social Welfare Department (SWD) operating since 2011. These projects had been initially evaluated in 2015 and had received further support from the Hong Kong Jockey Club Charities Trust in 2016 to run for a further three years (SWD, 2011).

These projects aim to serve young Internet users aged under 24 in Hong Kong, particularly those *hidden youth* who may be at risk of socio-economic exclusion. The term hidden youth means those young people who are socially-withdrawn, marginalized and prone to emotional disturbances, which was a phenomenon originally recognized in Japan (called Hikikomori) and then spread to Hong Kong (Wong, 2009). A closely related term often used in English

speaking regions is NEET (Not in Education, Employment, or Training). However, the meaning of hidden youth covers a wider scope, as some of the hidden youth do have some short term trainings or employments. Those with less education and fewer economic resources are at a higher risk of being marginalized from traditional employment and mainstream society.

The Infinity Teens project has adopted an approach that enables individuals to reach their potential, and facilitates effective interactions between individuals and local social systems. Under this service framework, all cases are initially engaged via the Internet. In addition to using a project website, a range of social media platforms (e.g., Facebook fan pages) are also used to identify and attract potential clients. Practitioners promote their full worker identity on their social media account profiles. These workers might have their own personal profiles, but that these working profiles reported in this study were distinct from their personal profiles. Rather than from a particular physical catchment area, all service users from all districts in Hong Kong are welcome. After engaging the clients online, practitioners assess the clients' needs and suggest a variety of online and/or offline support services, which can include social activities, training, job referrals and/or counselling.

As of December 31, 2016, the project had engaged 200 cases, all were directed from the Internet including the project website, apps, Facebook, Instagram and instant messaging apps. It should be noted that not all the fans on the fan page were cases. Cases were opened based on mutual agreements. The fan page users covered in this study were the online users "engaged" in their outreach activities. They did not necessary become "cases". The social workers on the project frequently use the project's Facebook fan page to promote their services, to share relevant information, and to interact with Internet users. They might not work the same amount of time and in the same way. They posted weekly, but there was no maximum limit. In addition to posting or sharing relevant information and news, the social



workers often use Facebook Live to discuss various issues and topics. On the project's Facebook fan page, Internet users can access online self-assessment resources and find a way to seek online counselling services. Internet users can also make an appointment with social workers online. As of June 10, 2017, there were 4,497 Facebook users who liked the Infinity Teens Facebook fan page and 4,392 users who followed the fan page.

## **Data Collection and Analysis**

### **Overall Study Design**

This study basically adopted an SNA approach, with special reference to the following analytical components. First, SNA software was used to capture data allowed by social media platform. Social media offer different privacy settings, for example, there are private groups, private communications, open group, public group, and public fan page, implying different levels of research subjects' consents. This study only aimed to capture publicly available information supported by the application programming interface (API) of Facebook. API is a set of protocols, and tools for building application software for communication between various software components. In this study, NodeXL was used to import users' information supported by the API of Facebook.

Second, this study adopted social networker metrics supported by the SNA software, particularly the measure of Betweenness Centrality, which measures the centrality of individual network members. The study aimed to explore to what extent this measure can systematically indicate the centrality of network members over time.

Third, a simple validation study was conducted with the objective to examine to what extent SNA findings reflect "reality". There is thus far no known commonly accepted method of validating social media metrics. Currently, there are research studies that examine to what extent social media information corresponds to real life situations, for example, whether

social media users' close friends on social media are also close friends in real life (Bond et al., 2012) or whether social media users' online expressions correspond to what they say offline (Hampton et al., 2014). Similarly, this study examined to what extent results from SNA metrics agree with social workers' perceptions in selected domains. These include: their assessment of fan page content popularity, their assessment of overall social network development, and their assessment of network members' significance. Of course, this is a version of "reality" perceived by the social workers. Nonetheless, this is the first such validation study in the social work literature.

## **Data Collection**

### **Collecting social media data**

The analysis measured the connectedness of fan page members in the Infinity Teens Facebook fan page (<https://www.facebook.com/caritas.infinityteens/>) in 2016. Data concerning fan page activities were collected over four time points in 2016 in March, June, September and December. Data collection and analysis were completed according to the parameters set by Facebook. The data import, analysis, clustering and graphical presentation were conducted using NodeXL (<http://nodexl.codeplex.com/>) (Hansen et al., 2011), which is an open-source extension of MS Excel that is increasingly used in social media studies (Chan, 2013; Doran, Doran, & Mazur, 2011; Hansen, 2011). The technical details of the software will not be illustrated here due to the nature and word limit of this article.

### **Collecting social workers' views**

There were five social workers on the Infinity Teens project who collaboratively managed the fan page. They were counted in the BC index, the solid squares in the revised socio-grams indicate workers' account. All of them were full time social workers who dedicated to this project. The study invited each of them to complete a short online questionnaire, which

covered some definite statements requiring them to indicate their levels of agreement using a 5 point Likert scale (From 1= Strongly disagree to 5 = Strongly agree). The average ratings of these statements were assumed to represent the views of the team.

## SNA Metrics

### Fan page content popularity

A simple test was used to identify whether posts about online activities or posts about face-to-face activities were more popular. All posts on the fan page within the study period were exported, the number of likes received by each post were counted, and the top 10% of posts receiving the most likes were identified. These were then manually categorised into two broad categories: posts about face-to-face activities (e.g., news about face-to-face gatherings, photos after activities) and posts about online activities (e.g., online voting, online counselling services). There could be different ways to categorize the posts (e.g., activity objectives, time), but this is one of the objective and commonly shared marker that can differentiate the nature of all posts. These two categories were adopted in order offer a convenient binary concept to differentiate different types of posts. The total number of “likes” of these two types of posts were identified and compared.

### Overall social network development

*Total number of nodes:* Nodes are service users, and the total number of nodes in the graph is the total number of service users engaged via the fan page.

*Total number of edges:* An edge connects two nodes together. The total number of edges in the graph is the sum of all edges between all nodes. In this study, an edge is counted between two users whenever there is a relationship between: a) post author and reactor/commenter/sharer, b) users who reacted to/commented on/shared the same post, c)

two consecutive commenters, d) comment author and reactor/commenter/sharer, e) post/comment author and user tagged.

*Connected Components:* A connected component is a set of nodes that are connected to each other but not to the rest of the graph. The number and size of connected components in the graph can help reflect subgroup structures.

*Single-node Connected Components:* This refers to the number of connected components that have only one vertex. This variable can reflect isolated members in a network.

*Graph Density:* This is a ratio that compares the number of edges in the graph with the maximum number of edges the graph would have if all the nodes were connected to each other. Duplicate edges and self-loops are excluded. This variable can represent the extent to which network members are connected to each other.

#### Network members' significance

*Betweenness Centrality (BC):* This is a quantified measure of the centrality of a member (node) in a particular network based on calculating the paths passing through a node (Freeman, 1977; Hansen et al., 2011). A path is measured as the distance from a member to another member in terms of the number of hops. The BC of a member in a network is the total number of shortest paths from all members to all others that pass through that member. The greater the BC of a member, the greater the number of other members relying on that member. For example, for calculating individual members' centrality in a communication line having 5 nodes  $A \rightarrow B \rightarrow C \rightarrow D \rightarrow E$ , we need to take every pair of nodes, and see which node(s) a path between the two must pass through.

[Table 1]

In this example, the centrality value for each node will be as follows:  $A=0$ ,  $B=3$ ,  $C=4$ ,  $D=3$ ,  $E=0$ . Based on these numbers, we know that node "C" is the most influential one because

most paths between other nodes have to pass through it. In a complex network, the BC of a node (n) is given by the expression:  $\sum \sigma_{st}(n) / \sigma_{st}$ , where  $\sigma_{st}$  is the total number of shortest paths from a node to another node and  $\sigma_{st}(n)$  is the number of those paths that pass through that node. This metric, therefore, helps represent the importance (in terms of centrality) of individual members in a network.

### **Social Workers' Perceptions**

#### **Fan page content popularity**

Social workers indicated their levels of agreement with the statement: Posts about face-to-face activities (e.g., news about face-to-face gatherings, photos after activities) are more often 'liked' by users than posts about online activities (e.g., online voting, online counselling services) (Q1). The objective was to examine to what extent social workers' perceptions regarding the popularity of the fan page was in line with the statistics from SNA.

#### **Overall social network development**

Social workers indicated their levels of agreement with several statements, including: Q3. The number of the project's Facebook fans has increased over the year; Q4. The number of relationships/connections between the project's Facebook fans has increased over the year; Q5. On the project's Facebook fan page, all your fans have been increasingly connected with all other fans over the year, and; Q6. On the project's Facebook fan page, subgroups have become more obvious over the year, fans in the same subgroup are closely connected with each other, but fans in different subgroups are just loosely linked or unlinked with fans in other subgroups.

#### **Network members' significance (centrality)**

The full definition of BC will confuse workers in the questionnaire, and therefore it was not used. Using the closest non-technical wordings, the meaning of BC is "widely connected". In

the questionnaire, social workers were invited to indicate their level of agreement with the statement: This Facebook fan page user [name] is widely connected with other Facebook fan page users (Q2) in regard to 10 randomly selected fan page users. Ten were selected in order to offer a straightforward comparison showing to what extent workers' rating are in line with SNA findings. In other words, how many answers out of ten are in line with SNA findings. Among these 10 randomly selected users, five were among the top 10% having the highest BC, and five were among the lowest 10% having the lowest BC. The sequence of these 10 users were randomly listed on the questionnaire. This analysis examined to what extent users with high BC scores would be considered by workers as widely connected with other users; and to what extent the users with low scores were considered by workers as not widely connected with other users.

## Results

### The SNA Findings

SNA metrics including the total number of nodes, total number of edges, number of connected components, number of single-node connected components, graph density, and BC at the four different time points were calculated (Table 2). These figures were visualised into four sociogram graphics representing network structures in four different time points (Figures 1, 2, 3, 4). The nodes are represented as discs, and the size of a node is proportional to the significance of that node (in terms of BC). The edges are represented as lines. Subgroups are identified based on common connections. The solid squares represent workers' accounts (W1-W7). The circles represent user accounts, and the solid discs represent the 10 users (U1-U10) reported in the validation test. As indicated in the four diagrams, the workers were in different subgroups in the first quarter (Jan to Mar 2016), and they gradually merged in a large core group (G1) over the year, and the biggest square, W1, was the official project

account. The 10 users were in different groups in the first quarter (Jan to Mar 2016), and U5, U6, U7, U8, U9, U10 were gradually absorbed into the central core group (G1).

[Table2]

[Table3]

[Figure01]

[Figure02]

[Figure03]

[Figure04]

### **Social Workers' Perceptions**

All five social workers from the Infinity Teens project team (i.e., 100% of the total number of social workers in the project) managing the fan page responded to the online questionnaire, validating the results computed by SNA. Average ratings of the levels of agreement indicated by all the social workers ( $N=5$ ) were indicated beside each item (see Table 2). Key observations are as follows:

First, social workers' perceptions regarding the tendency of page content popularity was in line with the results from SNA. There were 400 posts on the fan page. The analysis of the top 10% of posts liked by users indicated that posts about face-to-face activities (e.g., news about face-to-face gatherings, photos after activities) were more often favoured by users than posts about online activities (e.g., online voting, online counselling services). This finding is in line with the social workers' rating (3.2/5.0), in which social workers tended to agree that posts about face-to-face activities are more often liked by users than posts about online activities (see Table 2).

Second, social workers' perceptions of the overall development of the fan page network was also in line with the SNA results. Both the number of the Facebook fans (from 207 to 1,458 users, i.e., an increase of over 600%) and the number of relationships/connections between the Facebook fans increased over the year (from 17,247 to 134,230, representing an increase of almost 700%). This is in line with the social workers' subjective rating (4.2/5.0 and 3.8/5.0 respectively), which indicated that social workers agreed that both the number of the Facebook fans and the number of relationships/connections did increase over the year. In addition, when asked whether their fans have been increasingly connected with all other fans over the year, social workers tended to disagree (2.6/5.0). The SNA findings did show that overall density of these connections decreased (from 0.08 to 0.04, representing a decrease of 50%), which indicated that as the group became bigger, the connections among members became irregular with some only loosely connected. Further, the SNA findings showed that subgroups became more obvious, with larger ones becoming bigger and smaller ones decreasing in size. Most fans in the network connected to the same set of worker accounts, suggesting that there was a single leadership centre. This is in line with the social workers' rating (3.6/5.0) that they believe the connections among members became more concentrated, and subgroups were getting smaller over the year.

Third, social workers' assessments of the significance of individual members based on their daily contact experiences were in line with the SNA results. That is, all the selected users belonging to the top 10% BC group were considered by social workers as widely connected with other users; and all the selected users belonging to the bottom 10% BC group were considered by social workers as not widely connected with other users (see Table 3). A simple correlation test indicated the BC scores of the 10 selected users and the social workers' average ratings were highly correlated ( $r=.93$ ), though the sample size was not large enough to claim statistical significance.



## Discussion

This article particularly aims to illustrate how SNA can be used for social work practice purposes. The findings basically showed that: i) SNA software can capture publicly available information supported by the API of social media, ii) BC and other SNA measure can systematically show the change of network behaviours over time, iii) SNA findings can reflect network situations perceived by network coordinators (social workers who run the fan page). Major implications for practice and research are as follows:

### Using SNA to Interpret Social Networks

This analysis showed that SNA results largely agree with social workers' ratings in their assessments of fan page content popularity, overall social network development, and network members' significance. These preliminarily results suggest the validity of SNA in social work research, and imply that SNA can be used to estimate the situation of an online social network without relying on social workers' interpretations. Therefore, this study adds to the emerging knowledge base of how practitioners and researchers might use SNA to support longitudinal studies of groups/networks, to support cross-sectional studies between different groups/networks, and compare different working strategies.

It is worth noting that there are studies questioning to what extent findings from social media can accurately represent an individual's view of the real situation. Fake information can be generated by humans or robots (Allcott & Gentzkow, 2017; Bessi & Ferrara, 2016), and some researchers noted that people are less likely to express their true views on social media than in person (Hampton et al., 2014). However, many of these SNA limitations do not necessarily apply to social work research. While many social media studies predict social trends based on information from anonymous individuals, social work researchers and practitioners usually assess the behaviours of known individuals. As such, social work researchers may not

necessarily view SNA findings as facts reflecting the reality experienced by unknown users, but rather as a window revealing a particular version of the reality experienced by service users, which may help triangulate findings from other data sources.

### **Using SNA to Assess Changes in Service Users' Social Networks**

In the Introduction of this article, it is noted that the methodologies of studies researching social media use in social work were relatively limited compared to studies investigating other forms of information and communication technology (Chan, 2016). This is partly because of a lack of objective measures assessing behavioural changes (Chan, 2016). Social work interventions generally refer to activities purposely designed to produce changes, and intervention research is the systematic study of purposive change strategies (Fraser & Galinsky, 2010; Rothman & Thomas, 1994). In general, intervention research should have some sort of pretest-posttest design, and behavioural change should be assessed over time (M. J. Holosko, 2016).

This study showed that it is possible to evaluate network behaviours over time. SNA provides quantified metrics that help track individuals' behaviours in a network, such as the number of individual nodes, the number of edges associated with individuals, and BC. The analysis indicated that researchers did successfully track the results of these metrics over time (See Table 1), and these metric results are in line with practitioners' perceptions.

As such, online behaviours can be quantified and tracked, and they can be compared with other quantified variables in experimental designs. Therefore, bivariate analysis and multivariate analysis become possible, and it is possible to examine to what extent service users' self-reporting outcomes at different time points correlate with various online behaviours and/or network events.

### **Concluding Remarks: Social Networking for Social Work Practice**

This study has some limitations. First, the case studied here is an online youth outreach project, which is not (yet) a practice method widely adopted in social work, and therefore the generalisability of the findings is limited. Second, SNA applied to one platform may not work equally well in another platform, since different social media platforms support a different set of networking capabilities. Third, this study merely examined to what extent SNA agreed with social workers' perceptions, but not service users' perceptions. Notwithstanding these limitations, this study has explored analysis methods that have not previously been addressed in social work literature, and suggests it has potential for further research in the field.

It is worth noting that this study analysed a social work project that purposefully used a Facebook fan page for practice method purposes, and not merely for general NGO marketing purposes. As claimed by the service agency, social workers participating in the project used the project's Facebook fan page to enable individuals to reach their potential, and to facilitate effective interactions between individuals and local social systems (Chan & Holosko, 2017). Although this online practice method is in its infancy, it suggests that social networking is an intervention component, rather than an unimportant fringe component, in practice. In social services, there are emerging practices which work with transactions, relationships, networking, and resource matching, rather than clinical therapeutic interventions (Chan & Ho, 2017; Chan & Holosko, 2016a; M. Holosko, 2017; Martin, Upham, & Budd, 2015; Newton, 2014). There are also well-known commercial examples that use social networking methods to meet various types of needs and demands, such as online dating sites for specific sexual orientations (e.g., MyLadyboyDate), transportation services (e.g., Uber), or short-term accommodation services (e.g., Airbnb). Similarly, social networking methods may contribute to social work, as the very nature of social work focuses on both enabling individuals to better reach their potential and on facilitating more effective interactions with local social systems (M. Holosko, 2017; Moore,

1990), social networking can provide a range of resources for service users to experiment new roles and opportunities. For example, in the Infinity Teens project researched in this study, practitioners engaged participants online, they assessed their needs and suggested a variety of online and/or offline support services, such as counselling, social activities, and job referrals (Chan & Ngai, in press).

In some way, the insights from this study are nothing new. Social work has long been advocating such an idea. Based on a person-in-environment principle, social work scholars see that the purpose of social work is to improve the quality of transactions among people and their physical and social environments (Mattaini & Huffman-Gottschling, 2012). Social work has long emphasized the role of social network systems in assessments and interventions. Such system perspectives are almost universally accepted in social work (at least on paper), as they provide a framework for exploring and intervening in such networks in their complexity (Mattaini & Huffman-Gottschling, 2012). This orientation is also important in making social work different from other intervention-oriented disciplines, which either focus on social functioning (e.g., counselling, clinical psychology, psychiatry) or social change (e.g., social activism, social revolution).

Unfortunately, such system perspectives have been criticised for lacking substance. In the 90s, Wakefield (1996) dealt a devastating blow to the credibility of systems theory, claiming that systems theory is clinically useless. Recently, Thyer, Dulmus, and Sowers (2012) also stated that social workers' disastrous embrace of the vague principles of systems theory has "side tracked the profession" for years, because this provides a vague theoretical rationale for just about anything one chooses to do in practice (p. 465).

Nevertheless, recent advances in social media technologies and SNA invite us to reimagine what we can do with social network systems in social work practice. Social networking technologies have already been used to help people solve real life problems for almost two

decades, and data analytics technologies have recently become more advanced and user-friendly. SNA software, such as NodeXL as used in this study, can support researchers when tracking and evaluating social network behaviours, which provide empirical support to systems which focus on understanding networks of transactional relationships (rather than objects per se) and self-organizations in those networks (Mattaini & Huffman-Gottschling, 2012).

Taken together, we see that advances in social media technologies and SNA have unquestionably brought fresh opportunities for social work practice. Of course, it is questionable whether offline social networks can also be tracked and analysed equally well. Nonetheless, it may be important for the social work field to notice that however much social networking technologies matter today, they may be going to matter even more in the future. Driven by our growing connectedness, social network data will penetrate further into our daily lives, and it may become more openly available. That is, tomorrow, even more than today, social network analysis may be an important skill for any social worker who cares about an issue, who wants to build a reputation, and who wants to connect with others around the world who share a vision. Further research and discussion are indeed necessary.

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Table 1. An Example of Calculating the Centrality of a Node in a Network

Paths of a pair of nodes	Node (s) between the two ends of the path
A → B	None
A → C	B
A → D	B, C
A → E	B, C, D
B → C	None
B → D	C
B → E	C, D
C → D	None
C → E	D
D → E	None

Table 2. SNA Findings at Different Time Points

	Mar 2016	Jun 2016	Sep 2016	Dec 2016
Total number of nodes	207	962	1324	1458
Total number of edges	17247	105708	121471	134230
Connected components	1	1	3	3
Single-node connected components	0	0	1	1
Graph Density	0.08	0.07	0.04	0.04
BC of User 1	381.46	13865.89	43898.41	46591.65
BC of User 2	NA	14801.69	28971.02	45255.70
BC of User 3	NA	7852.20	35578.74	36561.89
BC of User 4	1101.05	20510.41	23128.39	29264.92
BC of User 5	0.00	156.02	13951.18	28304.38
BC of User 6	NA	NA	0.00	0.00
BC of User 7	NA	0.00	0.00	0.00
BC of User 8	NA	0.00	0.00	0.00
BC of User 9	NA	0.00	0.00	0.00
BC of User 10	NA	0.00	0.00	0.00

Notes: BC = Betweenness Centrality.

Table 3. Social Workers Ratings in Relation to Content Popularity, Network Development, and Individual Members' Significance

Items	Average rating (over 5)	In agreement with SNA findings
1. Posts about face-to-face activities (e.g., news about face-to-face gatherings, photos after activities) are more often liked by users than posts about online activities (e.g., online voting, online counselling services)	3.2	YES
2.1. User 1 is widely connected with other fan page users	4.2	YES
2.2. User 2 is widely connected with other fan page users	4.4	YES
2.3. User 3 is widely connected with other fan page users	3.2	YES
2.4. User 4 is widely connected with other fan page users	4	YES
2.5. User 5 is widely connected with other fan page users	3.2	YES
2.6. User 6 is widely connected with other fan page users	2.4	YES
2.7. User 7 is widely connected with other fan page users	2.6	YES
2.8. User 8 is widely connected with other fan page users	2.4	YES
2.9. User 9 is widely connected with other fan page users	2.4	YES
2.10. User 10 is widely connected with other fan page users	2.6	YES
3. The number of fans has increased over the year	4.2	YES
4. The number of relations/connections of fans has increased over the year	3.8	YES
5. ALL fans have been increasingly connected with ALL other fans over the year	2.6	YES
6. Subgroups have become more obvious over the year, fans in the same subgroup are closely connected with each other, but fans in different subgroups are just loosely linked or unlinked with fans in other subgroups	3.6	YES

*Notes:* BC = Betweenness Centrality; Average ratings of the levels of agreement indicated by the  $N=5$  workers, using a 5 point Likert scale, in which 1 = Strongly Disagree, and 5 = Strongly Agree.

Figure 1: Network structure in March 2016

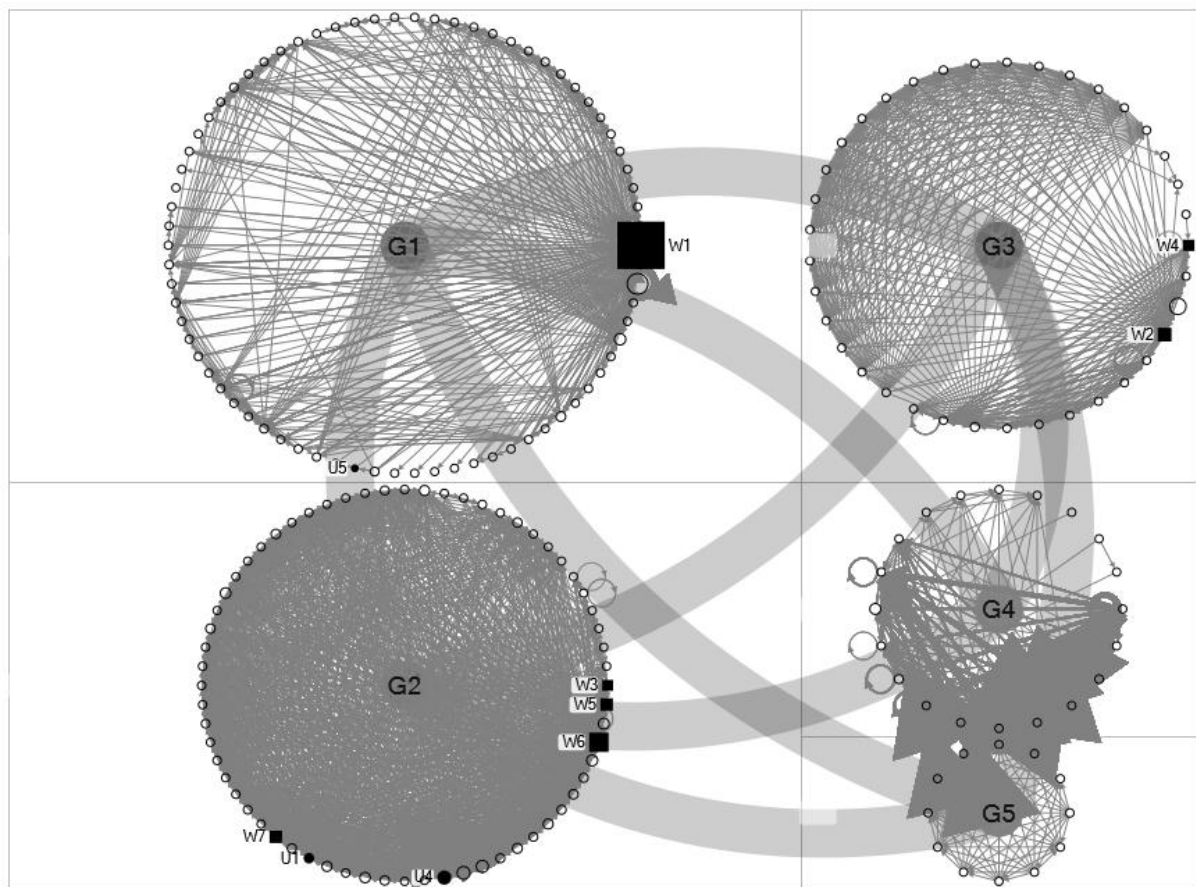


Figure 2: Network structure in June 2016

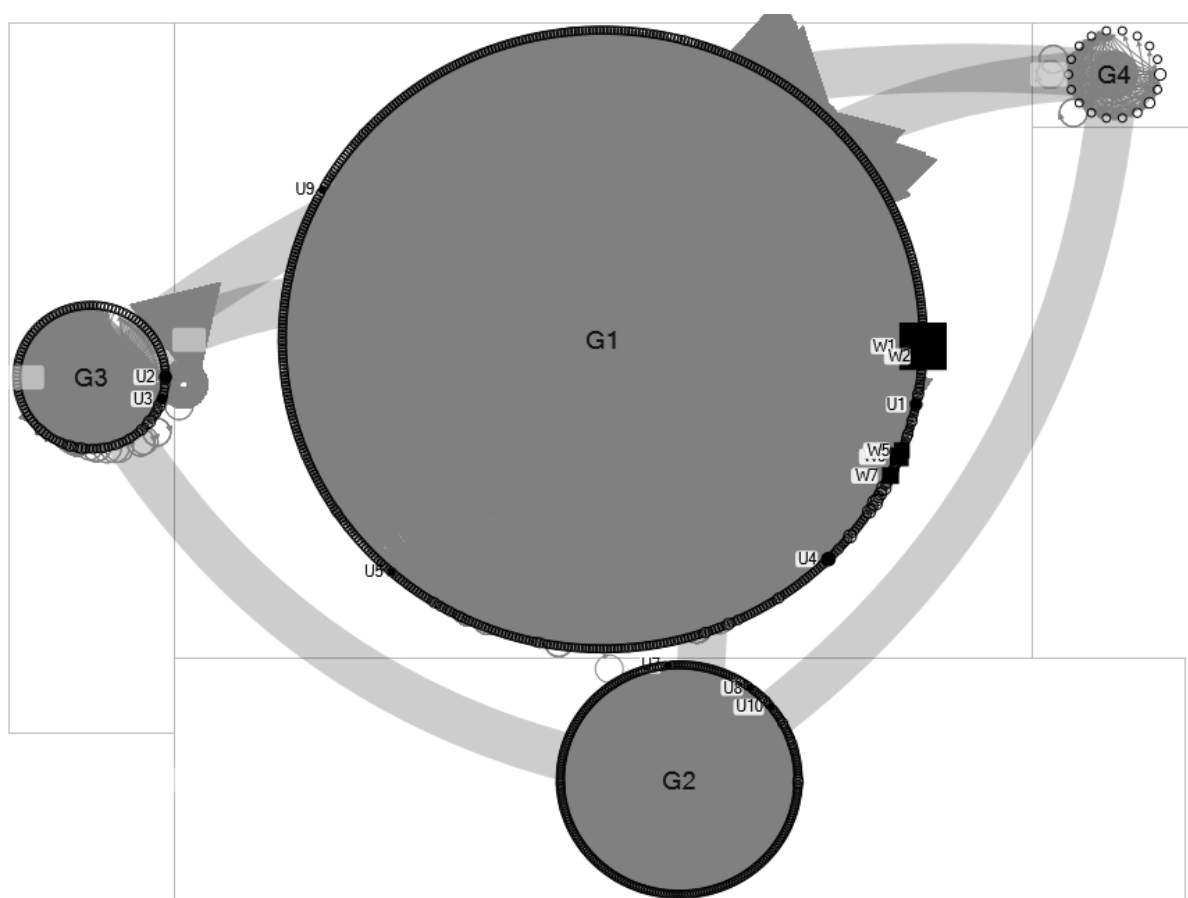


Figure 3: Network structure in September 2016

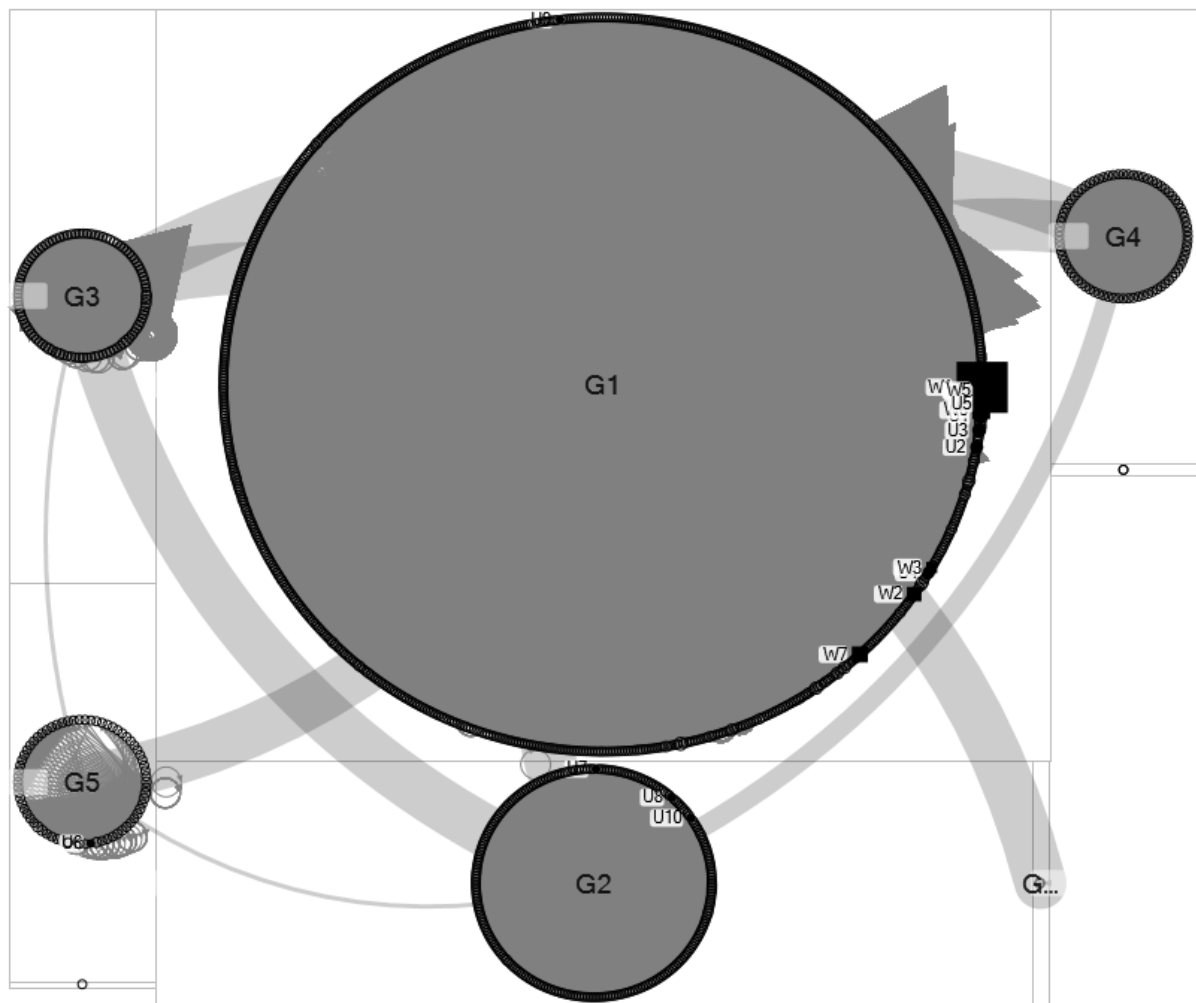
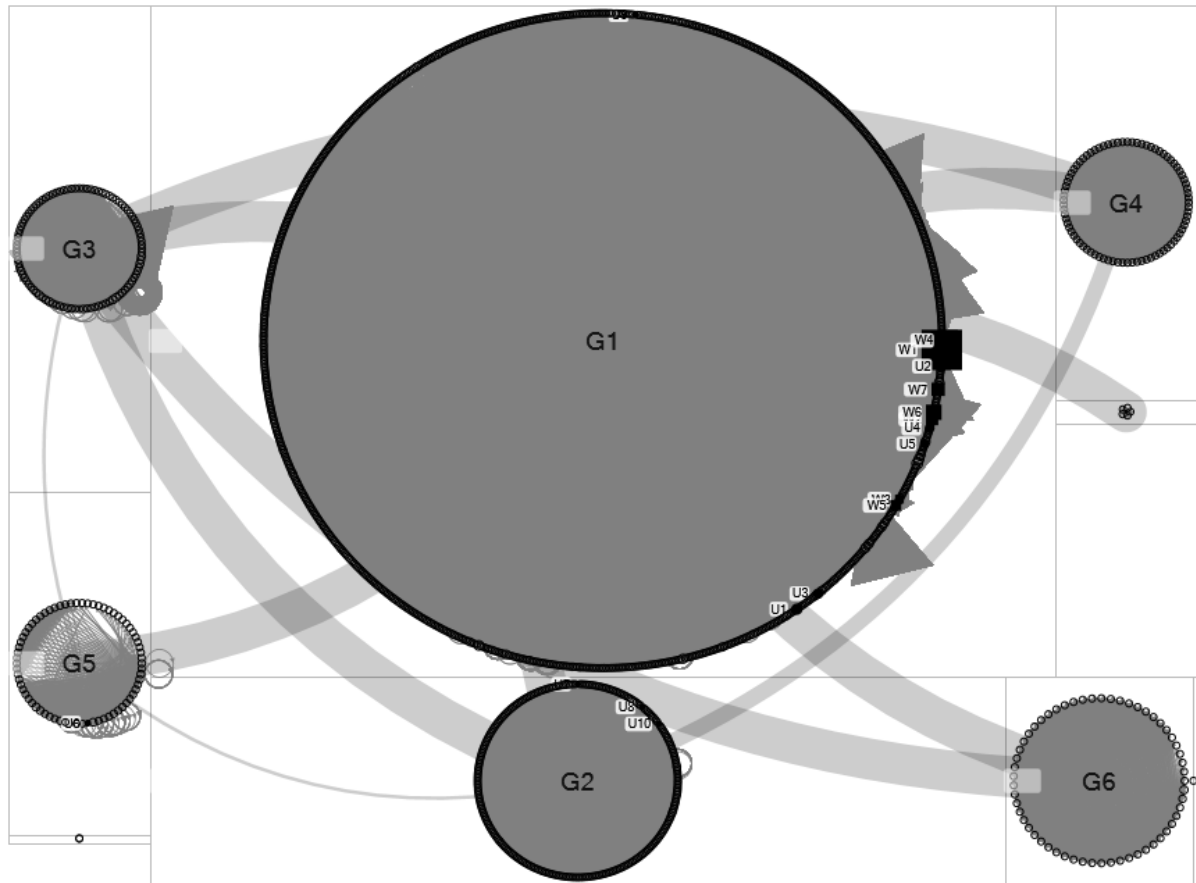


Figure 4: Network structure in December 2016



**Highlights**

- This study adopted social network analysis (SNA) software can capture publicly available information supported by the API of social media
- Betweenness Centrality, and other SNA measure can systematically show the change of network behaviours over time
- SNA findings can reflect network situations perceived by network coordinators (social workers who run the fan page).
- This study adds to the emerging knowledge base of how social work practitioners and researchers might use SNA to assess social networks, supplement need assessments, and evaluate services.