
Identifying and engaging online influencers through the social web

Kathleen Stansberry
Cleveland State University

Abstract

Although widely recognised as a valuable communication tool, public relations professionals have struggled to engage with publics through social media. This study examines information flow in online, interest-based networks that have developed through the use of social media. These online communities, which consist of Internet users who are highly engaged with a particular issue, exhibit characteristics of fan communities as evidenced by the development of shared values, language, and culture (Jenkins, 2006). Using online network mapping and qualitative data analysis, this study suggests that a small number of primary influencers from within online communities are central to information collection, collation, and distribution. In contrast to the linear models of information flow that have dominated public relations research, the findings suggests that a radial model of information flow can more accurately illustrate information dissemination in online, interest-based networks.

Introduction

Americans are going online in greater percentages and for longer amounts of time than ever before and much of that time is spent participating in social activities. As of May 2013, a national survey showed that 72% of online adults in the United States use social networking sites, such as MySpace, Facebook, and LinkedIn, that facilitate the exchange of user-generated information (Brenner & Smith, 2013). Although Facebook is the most popular social networking platform, more than 40% of U.S. Internet users regularly use multiple social networking sites (Duggan & Smith, 2013). The rate of online content creation has exploded in recent years and currently more than half of adult Internet users post and share original

multimedia content such as photos or videos. Near-ubiquitous cell phone ownership, coupled with the rising popularity of photo and video sharing apps like Vine, Instagram and Snapchat, indicate that the number of audience members who also act content creators and distributors will continue to grow (Duggan, 2013).

As more social and professional interactions take place through digital interfaces, web-based communities develop around shared interests and purposes (Rheingold, 1993). Through robust communication exchange, interest-based communities can even develop shared values, language, and culture (Jenkins, 2006). The unprecedented power of web users to participate in the media production and distribution process has prompted a new wave of interest in publics research in the field of public relations (Vardeman-Winter & Tindall, 2011).

To better understand communication processes in online, interest-based communities, this study uses online network mapping to illustrate information flow through within the online community related to cancer issues in young adults. The issue of cancer in young adults was chosen as an area of study because young adults, individuals between the ages of 19 and 40, are among the most wired demographic group (PEW Research Center, 2011). Furthermore, individuals dealing with serious or long-term health issues are among the most likely demographic to engage in information seeking, production, and dissemination online (Fox, 2011). Studying the young adult cancer community allows for the examination of a network that likely has includes highly engaged contributors who are comfortable communicating through online social networks.

The research presented in this paper contributes to the study of public relations by introducing the radial model of information flow, which positions online influencers as central to the information dissemination process in web-based communities. The radial model of information flow challenges linear models of information flow that have long dominated discussion of information dissemination process. Beyond simply sharing content, online influencers are at the centre of the communication process of online, interest-based communities. A relatively small subset of the larger interest-network, these influencers create, collect, collate and redistribute content, effectively acting as information hubs for the community as a whole.

Literature review

Two-step flow, multi-step flow and one-step flow

The structure of the social web is shifting the dynamics of message development and dissemination. Such shifts call into question the explanatory power of extant theories of information dissemination and influence.

The earliest models of information flow arose from studies of propaganda techniques and posited a direct influence model (Lasswell, 1938). The one-step flow model of information dissemination, also known as the ‘magic bullet’ or ‘hypodermic needle’ model, proved difficult to validate in media effects research but set the groundwork for subsequent study of information flow and media influences (Bennett & Manheim, 2006).

The two-step flow of mediated information dissemination was introduced by Lazarsfeld (1940) when he challenged the assumption that media messages travelled from a content producer directly to the ears (or eyes) of individuals in an audience. According to two-step flow of information theory (Katz & Lazarsfeld, 1955), mass media audiences are affected both by the actual information that is distributed as news as well as influencers’ interpretation of the news. This serves to move the function of media beyond simply producing and distributing information or entertainment toward the goal of moving the masses toward

particular kinds of social objectives (Lazarsfeld, Berelson, & Gaudet, 1944).

Katz and Lazarsfeld (1955) found that opinion leaders acted as influential modifiers of information that was distributed through mass media sources. Their work showed that information distributed through mainstream media was sought out by a small subset of the general population who were particularly interested in the topic. These topic-specific influencers shape public opinion in the topic area by translating and providing context on the topic for the general public (Katz & Lazarsfeld, 1955).

While some researchers still argue for information dissemination occurring largely through two-step flow processes (e.g. Kim, Wyatt & Katz, 1999), several communications scholars (Bennett & Manheim, 2006; Burt, 1999; Gitlin, 1978; Harik, 1971; Robinson, 1976; Weiman, 1982) challenge the simplicity of the two-step flow model, which relies heavily on influencers as interpreters and disseminators of information. Many studies testing the two-step flow process have suggested that information actually tends to travel in multi-step flow processes with many different flow directions and iterations (Burt, 1999; Harik, 1971; Robinson, 1976; Weiman, 1982). The multi-step flow model has dominated research in information dissemination for the last four decades, but recent advances in communication technologies led Bennett and Manheim (2006) to posit a one-step flow of information model in which messages travel directly from an organisation to its publics.

Bennett and Manheim (2006) reconceptualised a one-step flow of information developing as a result of highly differentialised media sources. They pointed to the evolution of media formats, individual media use habits, and social distribution of media as evidence of a changing media landscape. The technological and media changes of the past 30 years have made it possible for organisations to target their messages to increasingly more specific publics. Bennett and Manheim (2006) suggest that if persuasive communication professionals can adopt narrowcasting to an extent that allows for messages delivered only to interested parties,

the direct communication paradigm may be revived and applied in hyper-mediated communication practices.

The rise of social media use may make it possible for direct communication between organisations and their publics, but competition for audience makes it difficult for messages to gain prominence in online communities. Instead of relying on direct communication methods, public relations practitioners indicate the rise of a social web has led to increased efforts to reach opinion leaders who are active social media users (Wright & Hinson, 2010). The 2014 Communication and Public Relations Generally Accepted Practices (GAP) report produced by USC Annenberg Strategic Communication and Public Relations Center (SCPRC) found over 80% of public relations practitioners consider social media participation a core function of their job (Swerling et al., 2014). Although public relations professionals report spending a growing percentage of their work time devoted to social media, only a relatively small number of organisations engage in comprehensive measurement and evaluation of social media content and activities (Wright & Hinson, 2013). Although public relations practitioners have embraced the use of social media professionally, research suggests online tools are not being used to their full strategic communication potential (Adams & McCorkindale, 2013; Kent & Taylor, 1998; Sommerfeldt, Kent, & Taylor, 2012; Taylor & Kent, 2010).

Relationship building with online influencers

Despite recognising the importance of social media influencers in online communities, public relations practitioners have struggled to define effective metrics to conclusively decide who the most influential players are. A study by Gillin (2008) showed no comprehensive agreement as to what the single best criteria is to use when determining who online influencers are. Participants named several different criteria including traffic numbers for particular websites, quality of content, relevance of content to the organisation, and search engine rankings as factors to consider when determining online influencers for particular communities. According to Basille (2009) the most successful online influencers

connect to a large network to spread their messages broadly but also recognise the importance of cultivating a smaller, more concentrated network that can be called to action for such campaigns as product boycotts, social responsibility movements, and promotional events. Already the industry has seen a spate of recent research looking at ways activists utilise online media tools (e.g. Hara & Estrada, 2005; Sommerfeldt, 2011; Sommerfeldt, Kent, & Taylor, 2012).). As activist publics are of particular concern to public relations practitioners (L. A. Grunig, 1992; Smith & Ferguson, 2001), online influencers are likely to be increasingly important targets for relationship cultivation as social media use continues to grow.

In recent years, corporate entities have started to recognise the power of influential members of online groups, most notably the surge of interest in parenting bloggers among manufacturers of household goods. In 2008, Procter & Gamble (P&G) provided 15 popular parenting bloggers an all-expenses-paid trip to its Cincinnati headquarters to educate them on the company's product lines and parenting support programmes (Neff, 2008). In 2010, P&G sent a popular mommy blogger to the Winter Olympic Games in Vancouver, B.C., Kodak sponsored a mommy blogger's trip to the Oscars, and G.M. Canada sent mommy bloggers on a road trip to Disney World in a Chevy Traverse (Mendelsohn, 2010). The flood of products and promotions offered to parenting bloggers was part of the impetus for an October 2009 requirement by the Federal Trade Commission that bloggers must disclose any and all endorsements or face fines of up to \$11,000 per post (Ostrow, 2009).

Any corporation that has tangled with an organised web-based interest group likely recognises the collective power of online networks. In 2008, Johnson & Johnson, the makers of the pain-relieving drug Motrin, enraged the online parenting community by releasing an advertisement that spoke irreverently of 'baby wearing' – i.e., carrying a child in a sling, wrap or any other contraption that keeps a child close to the wearer. Popular social media users exude a great deal of influence within the tight-knit online

community of users that blog, tweet, and post about parenting topics (Stansberry, 2011) and the resulting outcry on Twitter, Facebook, YouTube and other social networks caused Johnson & Johnson to pull the offending ad campaign and release a response to the mommy blogging community (Learmonth, 2008).

Social media and public relations

In a content analysis of the Public Relations Society of America's professional journal *Public Relations Tactics*, researchers found that between April 2008 and March 2009, 59 articles, text boxes, and columns referenced social media (Taylor & Kent, 2010). Of those 59 articles, 39 pieces (about two thirds) made claims about the power of social media and their value as public relations tools. One way social media have empowered strategic publics is by giving them a dynamic platform through which individuals can communicate and collaborate with a variety of audiences (Wright & Hinson, 2006 & 2007).

The rising popularity of a social web has created innumerable pathways through which interest-based networks addressing a nearly endless range of topics can develop and grow (Li & Bernoff, 2008). Audiences are increasingly distrustful of news and advertising messages, relying instead on peers for information and advice (Keller & Berry, 2003). Public relations practitioners are mindful of the potential of new media to communicate with increasingly elusive audiences (Avery, Lariscy, & Sweetser, 2010) but are struggling to find ways to build effective relationships online (Taylor & Kent, 2010).

The rise of participatory websites has created opportunities for people to connect with others who share similar interests. According to the social media and Internet marketing blog Traffikd (2010), there are more than 400 social media and social networking sites. Online communities are able to form online around extremely specific interests. The emergence of communities online that form around precise issues of concern opens a valuable opportunity for public relations practitioners looking to connect with publics who are highly engaged in a particular issue.

Despite the efforts of public relations professionals, individuals in the industry report difficulty using social media successfully in campaigns (Taylor & Kent, 2010). For example, regular users of the social networking site Facebook report an almost total lack of interest in engaging with impersonal corporations claiming that organisations "invade" social networks and "pollute" them (Vorvoreanu, 2009, p. 79). According to study participants, the presence of corporations on Facebook clashed with the shared purpose of the community, socialising with friends (Vorvoreanu, 2009). A better understanding of communication practices within social networks, as well as more information on the role of influencers in coordinating information process by networks, may lead to more effective use of social media in strategic communication campaigns.

This paper examines the role of influencers in highly engaged online communities. The following research questions are posited to help further our understanding of information flow through interest-based publics.

RQ1: How does information flow through online, interest-based publics?

RQ2: What role do online influencers play in information dissemination through online, interest-based publics?

Methods

This study uses online social network mapping paired with qualitative network analysis to explore how communication flows within an online network developed around a single shared concern, cancer in young adults, and how primary messages emerge in these information flows. By researching information flows in the online young adult cancer network using a case study approach, this study seeks to expand existing knowledge in online communication practices among interest-based publics.

The young adult cancer community

This research focuses on a specific online community (young adult cancer patients and survivors) in a specific, albeit virtual, space (online) to locate this study in a particular social context (Yin, 1998). The ability to ground research in a particular historical

location is a defining characteristic of the case study approach (Stake, 2005). Given the rapid evolution of emerging media technologies, positioning this study within a particular timeframe provides context for the results as they apply to public relations practice. Although single-case studies often raise concerns about generalisability, the goal of this case study is not to generalise to all online communities but rather to draw conclusions about a situation that may be applicable to other communities with similar characteristics (Yin, 1998).

Young adults with cancer are also in a cultural demographic that tends to be comfortable with online communication and frequent users of web-based resources (Madden & Zickuhr, 2011). There are several online community hubs for young adults dealing with cancer, including PlanetCancer, the I'm too Young for This! Cancer Foundation, and the Livestrong Young Adult Alliance. The young adult cancer community is web-savvy, understudied, and small enough to be a manageable community for study. Health concerns, particularly chronic health concerns, are one of the primary issues that drive people to access and share information online (Fox, 2011). Furthermore, young adults (defined for the purpose of this study as individuals ages 19-40) are among the most wired demographic group (Pew Research Center, 2011). These facts, coupled with the availability of information on current young adult cancer bloggers, led to the selection of this population for this study.

Social network analysis

Online social network mapping can be used to show the web of connections that help define a public. In this project, the interlinking nature of web presences is collected and mapped to provide visual representations of the online young adult cancer network. By mapping hyperlink connections between websites, the study first identifies the influencers in online, interest-based publics and provides insight into the communication flow process throughout the network, answering research question 1: How does information flow through online, interest-based publics?

To develop a map of this issue-based community, the seed nodes, or websites used as the starting point for the network crawl, must relate directly to the topic of interest. The seed node list for this crawl consisted of the 185 websites listed on the official website on the I'm Too Young for This! Cancer Foundation (<http://stupidcancer.com/>) blogroll. The I'm Too Young for This! Cancer Foundation is the largest support network for adolescent and young adult cancer patients and survivors in the United States. The tagline of the I'm Too Young for This! Cancer Foundation is 'the voice of young adults', and part of its mission is to find and share resources related to young adult cancer issues. As a site that finds and shares resources and user-created content related to young adults with cancer, the blogroll provided a solid starting point from which to launch a web crawl to develop a network map. Prior to launching the network crawl, all seed nodes were reviewed to confirm that the primary topic of the blog was related to young adult cancer issues. The review determined that all 185 blogs listed on the I'm Too Young for This! blogroll addressed young adult cancer issues. The overwhelming majority of blogs were first-person accounts of cancer experiences written by young adults.

IssueCrawler

IssueCrawler is a publicly available crawler system offered by the Amsterdam-based Govcom Foundation www.issuecrawler.net. Several studies of web-based networks developed using IssueCrawler have been published in media and communication journals (e.g., Gillam, 2009; Jin & Liu, 2010; McNally, 2005; Zhou, 2009), and the tool is rapidly growing in popularity.

Crawler systems record and follow the hyperlinks from a starting point indicated by the programmer. The crawler gathered the links present on the 185 seed nodes, then searched the pages these links pointed to and identified all outlinks on those pages. IssueCrawler can be programmed to run this process up to three times (known as crawl depth). This study conducted three crawls with different crawl depths to observe how the major network players changed as further iterations of links were recorded. When a crawl depth is too

shallow, there is a risk of overlooking influential nodes, but when a crawl depth is too deep, there is a risk of 'network jumping', which refers to the process of a network crawl derailing toward another strong interest-based group because the network crawl grows too large (Hanneman & Riddle, 2005).

Co-link analysis crawls were used to create network maps of the young adult cancer community, which produced a record of any site that is linked from at least two of the seed sites. In a co-link analysis, the crawler identifies and records only sites that are linked by at least two of the starting points. This filters out isolated sites and helps to ensure that crawls at deeper depths maintain ties to the original network. Co-link analyses identify larger and larger neighbourhoods of web pages for their linkage patterns, but the iterations of crawls in co-link analyses are more likely to belong to the starting interest-network than are those produced by snowball crawls.

Graphically plotting linked web pages is particularly useful in showing clusters of highly connected groups of sites. It can also be helpful in identifying key influencers within online communities (Bruns, 2008). It should be noted that IssueCrawler only shows links between sites and that no prediction is made through the program regarding actual flows of traffic between sites. The existence of links does not guarantee that web users actually follow that particular path; however, the practice of browsing the web by following interlinking pages is widespread and common among Internet users. Also, because IssueCrawler tracks inbound links, which is one of the most highly weighted criteria in search engine optimisation processes, the sites identified by IssueCrawler as dominant nodes within an interest-based network are likely also to be identified as influential by search engines such as Google. Furthermore, traffic is not the only (or even the predominant) indicator of influence within an online interest-based community. The links that young adult cancer bloggers included in their posts, sidebars, blogrolls, etc. show the information sources that are recommended by community members themselves. By tracing the links identified by the content creator sites that make up the seed

nodes for the young adult cancer community crawl, IssueCrawler creates a network map that shows the influential participants of an interest-based online community of those communicating about young adult cancer issues.

Results

On the maps created by network crawls, websites are shown as circles, and links between websites are shown as arrows. The direction of the arrows represent the linking pattern pointing from the linking site to the linked location. Variations in shading represent website domain types (i.e. .com, .org, and .gov). The size of the circles indicate the number of inbound links; the larger the circle representing the node, the greater the number of inbound links from sites within the mapped issue network (IssueCrawler Instructions of Use, 2011).

The position of the circles on the visualisations, or network maps, indicates relative strength of ties. The websites with the strongest ties are clustered together. IssueCrawler can be programmed to determine strength of ties in several different ways. The visualisations presented in this section all use the concept of degree centrality to determine strength of ties. Degree centrality is defined as the number of links connected to a node (IssueCrawler Instructions of Use, 2011).

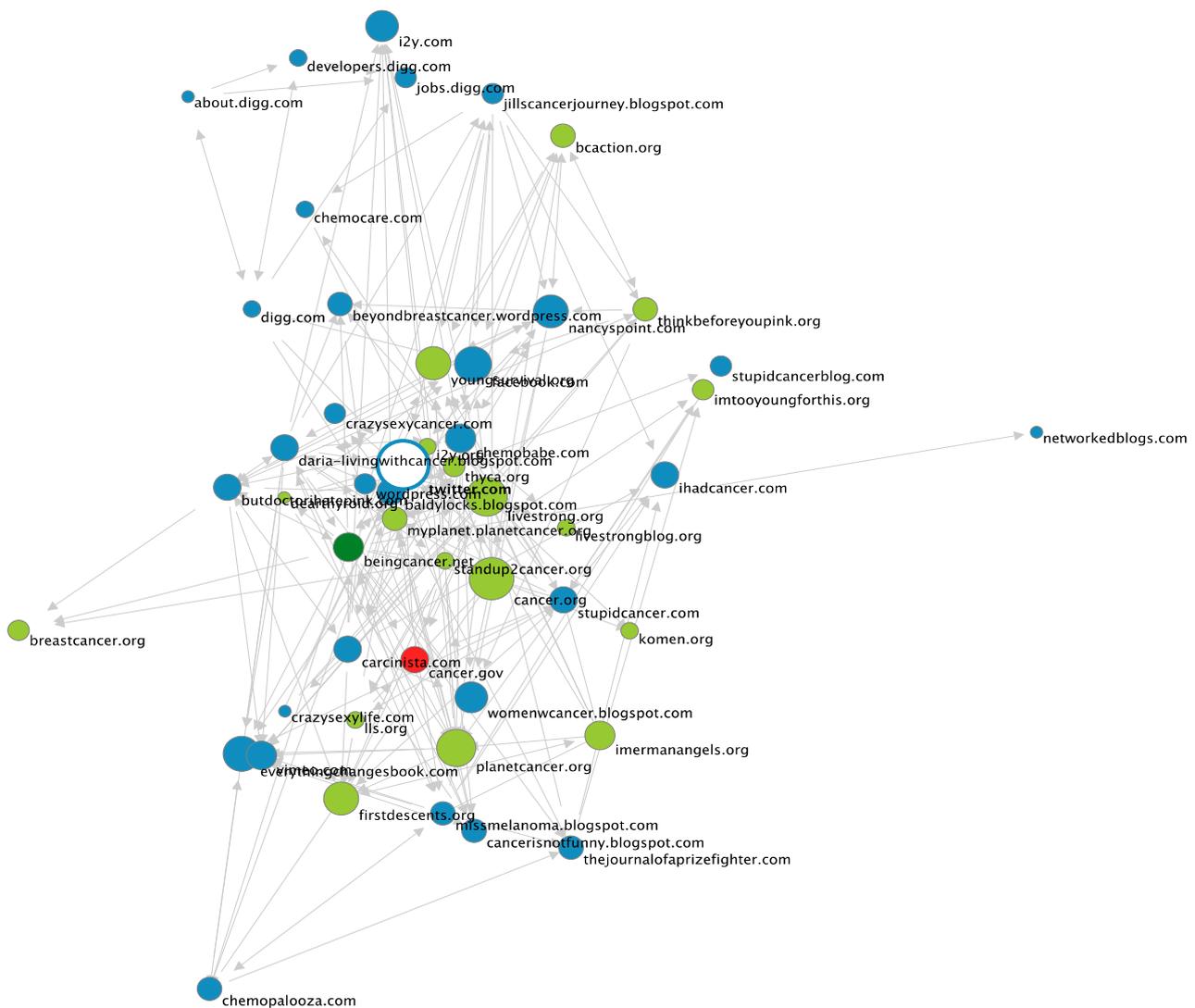
In the case of directed networks such as these, where websites post directional links to other sites, degree centrality is typically defined in two separate measures: indegree and outdegree. Indegree count refers to the number of links coming from other nodes and connecting to the site in question. Outdegree is the number of links that a network player directs to others. Because this study is concerned with the relative influence of websites in the online young adult cancer network, indegree centrality, which is often interpreted as a form of popularity, is the measure used to determine position on the network visualisations. Websites on the graphs that are most tightly clustered with one another exhibit the highest measure of indegree centrality, and information that flows through these network players is most likely to be

distributed across the full network (IssueCrawler Instructions of Use, 2011).

On January 15, 2012 IssueCrawler was programmed to run a co-link network crawl with a depth of one, producing a graph that

shows the interconnected links between all sites that are linked by at least two of the seed nodes (Figure 1).

Figure 1: Co-link analysis with a crawl depth of one showing the online young adult cancer community. Graph was created using the online link mapping tool IssueCrawler.



This visualisation shows a network that is closely tied to the original 185 young adult cancer blogs. The websites that emerge in this network represent a broad range of characteristics, including personal cancer musings, resource sites, educational web pages, and social network homepages. It is difficult to

identify the key players in the interest-based community using only a single crawl because the resulting sites are so closely tied to the personal interests of the bloggers populating the seed nodes.

The blogging platform Wordpress, microblogging platform Twitter, and popular

social network Facebook have a large number of inbound links in this network and are also among the sites with the highest measure of indegree centrality, indicating that community members are conversationalists who create and share content across platforms.

Table 1 lists the top 10 websites in the network with a crawl depth of one, excluding popular general social networking sites.

Table 1: Top 10 sites by number of inbound links in a network with a crawl depth of one, excluding social networking sites.

	Website	Number of inbound links
1.	everythingchangesbook.com	3,738
2.	beingcancer.net	3,242
3.	imtooyoungforthis.org	3,227
4.	baldylocks.blogspot.com	2,875
5.	l2y.com	2,722
6.	chemopalooza.com	2,504
7.	planetcancer.org	2,074
8.	stupidcancerblog.com	2,069
9.	myplanet.planetcancer.org	1,830
10.	imermanangels.org	1,743

Web resources designed specifically for young adults dealing with cancer, such as everythingchangesbook.com, PlanetCancer.org, and ImTooYoungForThis.com, are central players in this network, joining the general social networking sites as the most linked to and centrally positioned websites in the visualisation. The network periphery, which shows blogs with a low measure of indegree centrality, is largely populated by blogs written by individuals dealing with young adult cancer issues. While this style of blog appears to be common among the websites that make up the population of the young adult cancer network, their position at the outskirts of the network indicates that in general, personal blogs may not be the most influential style of web presence in the young adult cancer network.

To more accurately identify influencers, another co-link analysis was run with a slightly deeper crawl depth. On January 17, 2012, IssueCrawler was programmed to run a co-link analysis with a crawl depth of two iterations

(the program’s default setting) using the same set of seed nodes as the first crawl (Figure 2). The most centrally located sites in the Figure 2 crawl, which indicates high connectivity within the issue network, are a combination of general social networking sites, such as Twitter and Facebook; young adult cancer support sites, such as livestrong.org, stupidcancer.com, and youngsurvival.org; and cancer blogs, such as cancerisnotfunny.blogspot.com, butdoctorihatepink.com, and bethlgainer.blogspot.com.

To further isolate major players in the young adult cancer online community, Table 2 lists the top 10 websites in the network with a crawl depth of two. Unlike the graphic visualisation of the network map, which shows the interconnectedness of only the sites that emerge after the crawl has charted two iterations of links, the following table shows the total inbound links from all the sites recorded during each stage of the crawl.

Figure 2: Co-link analysis with a crawl depth of two showing the online young adult cancer community. Graph was created using the online link mapping tool IssueCrawler.



Table 2: Top 10 sites by number of inbound links in a network with a crawl depth of two, excluding social networking sites.

	Website	Number of inbound links
1.	everythingchangesbook.com	3,517
2.	beingcancer.net	3,432
3.	imtooyoungforthis.org	2,987
4.	l2y.com	2,770
5.	baldylocks.blogspot.com	2,656
6.	chemopalooza.com	2,599
7.	stupidcancerblog.com	1,792
8.	planetcancer.org	1,790
9.	livestrong.org	1,660
10.	carcinista.com	1,630

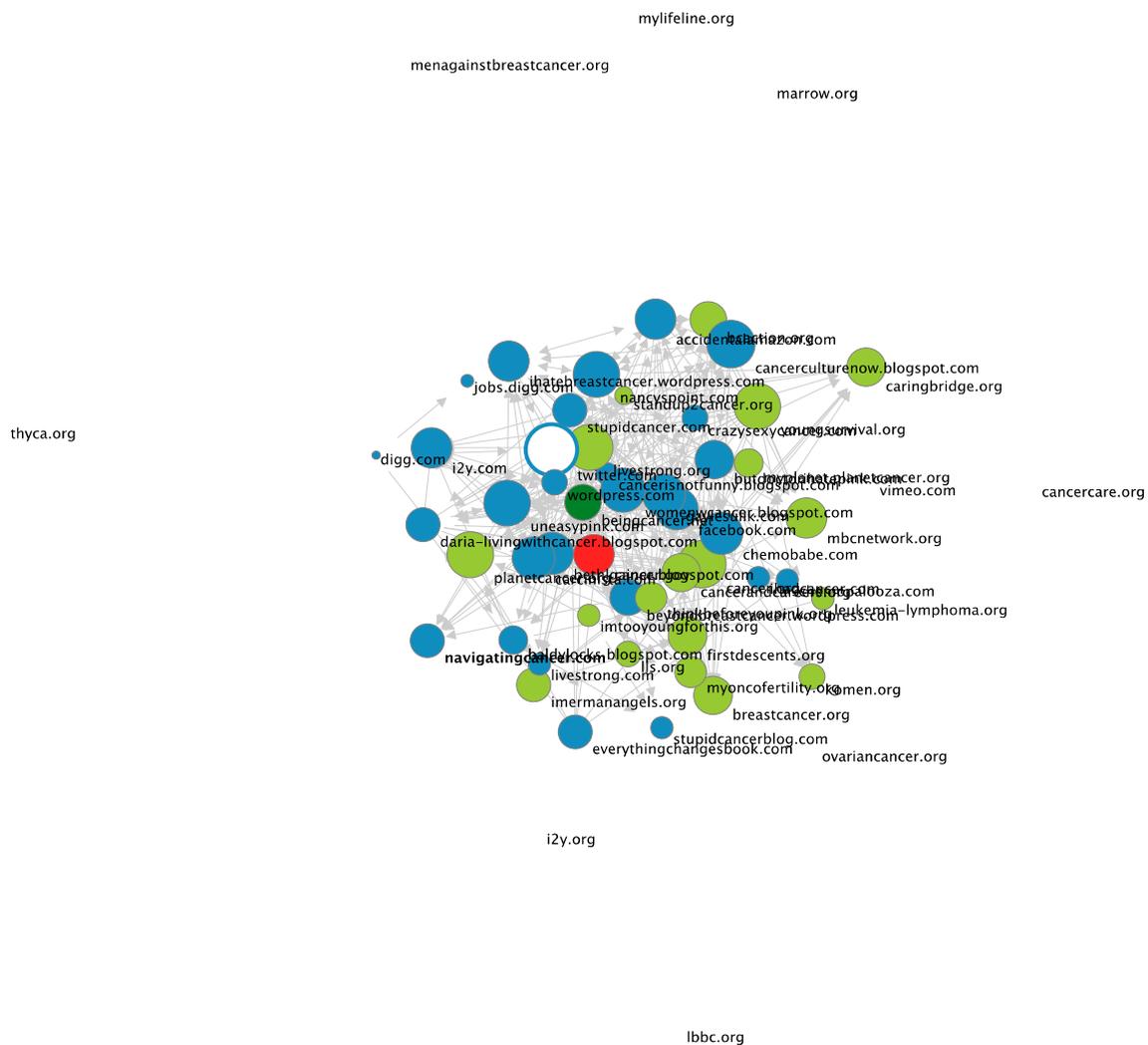
Several young adult cancer support sites, such as i2y.org and planetcancer.org, appear on the periphery of this online young adult cancer network visualisation, but they are still among the top sites as judged by inbound links within the network. This indicates that these sites are influential sources of information within the online young adult cancer network that tend to link to websites that are not central to this issue network.

Although the network crawl with a depth of two shows a clear online community with

marked influencers providing information on young adult cancer care and survivorship, a third network crawl was run to see if viewing a third iteration of links would further delineate key players in this issue network.

On January 13, 2012, IssueCrawler was programmed to a co-link analysis with a crawl depth of three. This crawl was launched before the network crawl with a depth of two was finished because deeper crawls can take longer to complete. Figure 3 is a visualisation of the network that emerged.

Figure 3: Co-link analysis with a crawl depth of three showing the online young adult cancer community. Graph was created using the online link mapping tool IssueCrawler.



Running the crawl with a depth of three produces an extremely densely connected web of social networking sites, cancer resource and community development sites, and popular cancer blogs. While mapping the first and second iteration of links produced networks with a number of lightly interconnected websites and a highly centralised core, the network that emerges with this third crawl

shows a network that appears to be almost all central core. Because the vast majority of the sites in this visualisation show a high measure of indegree centrality, the third network crawl appears to move away from showing the influencers in the young adult cancer community and instead shows the community as a whole without differentiation among influence levels (Table 3).

Table 3: Top 10 sites by number of inbound links in a network with a crawl depth of three, excluding social networking sites.

	Website	Number of inbound links
1.	beingcancer.net	3,323
2.	everythingchangesbook.com	3,228
3.	imtooyoungforthis.org	2,879
4.	cancerculturenow.blogspot.com	2,725
5.	l2y.com	2,718
6.	womenwcancer.blogspot.com	2,632
7.	nancyspoint.com	2,542
8.	baldylocks.blogspot.com	2,483
9.	chemobabe.com	2,347
10.	carcinista.com	2,295

Looking at the results as a whole, the young adult cancer blogger network does not appear to be a densely interconnected network of personal blogs. In fact, the young adult cancer blogs that were used as seed nodes are largely absent from the collection of websites that emerge after the co-link crawls recording two and three iterations of links, which indicates that personal blogs, the type of sites that make up the bulk of the community members, are not the most influential players in this network. The network crawl with a depth of one produced a visualisation showing a network with nodes distributed throughout the field. Websites with a high measure of indegree centrality are positioned in the cluster at the centre of the network, indicating their popularity within the online young adult cancer network. The network crawl with a depth of two (the default settings for IssueCrawler and the depth most commonly used to graph issue networks) showed the beginnings of a central cluster of highly interconnected sites. This crawl also

showed several sites that have low measures of indegree centrality but still show extensive linking from the crawled population. The third network crawl produced a visualisation showing the bulk of the network as a dense core of highly interlinked sites.

Analysis

Online social network mapping can help to illuminate some of the interconnected relationships between community members, but the method provides only a general view of networks. The results of the network crawls enable inferences to be made regarding the construction and interaction processes of the online young adult cancer community, but much is left to researcher interpretation. This section provides an analysis of the young adult cancer community, network maps, and crawl data, informed by existing literature on online network development and the young adult cancer community.

Setting boundaries

The boundaries of social networks are dynamic and variable. Few social networks exist as isolated bubbles; instead, individuals must be viewed as existing within many overlapping concentric circles representing various communities. For example, a paediatric oncologist may be a member of the young adult cancer community, a hospital or clinic community, the larger medical community, and innumerable other iterations of personal and professional networks.

This study looks at online interactions and describes the relationships between and among websites. Much as people hold membership in many different communities, many of the web presences that emerged during the network crawls encompass overlapping interests. For example, the blog Chemopalooza chronicles an individual's experience dealing with Hodgkin's Lymphoma. The content of the website discusses issues of young adult cancer survivorship as well as concerns specific to Hodgkin's Lymphoma survivorship. Discussion of membership in other interest communities on the websites that appear in the network crawl does not preclude or weaken membership in the online young adult cancer network, but it can make network boundaries difficult to establish.

The network graph showing one iteration of links (Figure 1) consists primarily of websites with the focus of cancer in young adults and online resources for cancer survivors. This network is closely tied to the seed nodes of websites developed by young adult cancer bloggers. Given that the seed nodes were all reviewed to ensure the primary focus was young adult cancer issues, it is unsurprising that a single iteration of links shows a network of sites closely related to young adult cancer issues. Because the nature of blogs, which were the seed nodes, is inherently social, it's also unsurprising that sites that enable sharing through social media are prominent in the network showing a single iteration of links.

The website with the largest number of inbound links (3,738), everythingchangesbook.com, is the web presence for the book *Everything changes: The insider's guide to cancer in your 20s and 30s*, a candid description of young adult cancer

experiences. Wordpress.com, the site with the second largest number of inbound links (3,623), is a popular blog publishing platform. The site with the third largest number of inbound links (3,242), beingcancer.net, is a collection of blog posts written by individuals dealing with cancer. While many of the contributors are young adults, the website addresses cancer blogging in general and is not specific to the young adult community.

A crawl with a single iteration of links shows sites that are closely linked to the interests of the seed nodes: young adult cancer issues, social networking, blogging, and cancer blogging. Given the prominence of websites that address young adult cancer issues as their primary content, as well as the vibrant blogging community focusing on the challenges of dealing with cancer as a young adult, only websites where the primary content focus is on issues specific to young adults dealing with cancer were considered as part of the young adult cancer community. Although this classification does not preclude sites with young adult specific pages, such as the National Cancer Institute's young adult cancer page at <http://www.cancer.gov/cancertopics/aya>, those sites do not emerge as among the most linked to locations in the young adult cancer issue network.

While the first network crawl is helpful in setting the boundaries of the young adult cancer community and showing the interests and issues present in the seed node population, a crawl of only one iteration of links is too shallow to clearly show influence among network members. A deeper crawl is more effective in isolating those sites that are most influential, as defined by both number of inbound links and high measure of indegree centrality, in the online young adult cancer community.

Tracking influence

The network crawl with two iterations of links further refines the online young adult cancer network. Whereas several individual blogs were prominent nodes in the network map created after one iteration of links, in this second network map (Figure 2) these personal musings are largely filtered out. Instead, the bulk of the network consists of general social

networking sites, which are some of the most frequently linked to locations on the web, and sites that provide resources for young adult cancer patients. In this second network visualisation, the resulting nodes are a mix of cancer resource sites, social media sites, and sites with the primary focus on young adults with cancer.

In looking at the total number of inbound links from the network crawl with a depth of two (Table 3), websites focusing on social networking and young adult cancer top the list. Again, because of the popularity of social network sites such as Facebook and Twitter – and the fact that the network crawl only records links to the parent social networking site and not individual profiles – the large number of links to social networking sites is to be expected in blogging communities. The influence of young adult cancer specific sites, as opposed to general cancer sites or medical resource websites, however, is a significant finding. It shows a strong community devoted to the particular issue of cancer in young adults.

The young adult cancer blogs showed a network consisting primarily of social networking sites, young adult cancer resource sites, and general cancer resource sites. The online young adult cancer community appears to have as its core a relatively small number of young adult cancer community resource sites. These sites, chemopalooza.com, baldylocks.blogspot.com, i2y.com/imtooyoungforthis.com/stupidcancer.com, planetcancer.com, and livestrong.org, were identified both by their rank in terms of number of inbound links and their position within the network visualisations.

Information flow theory

This paper was conceived in part as a response to a Bennett and Manheim (2006) article that argued for a return to a direct-effects model of communication in online communication. One of the few pieces to address the role of influencers in online networks (Bennett & Manheim, 2006), the article posits that web-based communication channels have led to the development of a one-step flow of communication from organisations to publics. Bennett and Manheim (2006) argued because online communication allows for precise

targeting of audience members, organisations are able to affordably and efficiently communicate directly with members of their key publics, effectively eliminating the role of influencer. Instead of broadcasting information to a broad audience, the distribution of content through the one-step flow of communication relies on narrowcasting, which refers to the dissemination of information to niche segments of the population. Using the assumption that two-step flow is the dominant paradigm in communication theory, Bennett and Manheim (2006) refer to one-step communication as a “new paradigm” (p. 228) of communication flow theory.

Bennett and Manheim’s (2006) hypothesis does not account for the role of influential communicators within online social networks. Public relations practitioners indicate that one of their primary ways they use social media is, in fact, to reach members of key publics who may be influential within a particular area of interest (Wright & Hinson, 2010). The results of this study indicate that, contrary to Bennett and Manheim’s (2006) theoretical musings, the rise of online communication through social networks may make communicating with online influencers an effective technique for disseminating messages within interest-based communities.

The results of the online network-mapping project of the young adult cancer community show that a small number of influencers are instrumental in the communication flow of online networks. Information does not appear to flow directly from a producer to a consumer. Instead, the online network analysis of the young adult cancer community clearly shows that members of interest-based communities primarily reference content from a few influential websites which act as communication hubs within the network.

The overarching problem in attempting to apply the one-step, two-step, or multi-step flow model of information dissemination to the communication practices of members of online communities is the inherent assumption in these models that traditional mass media resources are the primary source of information. Within interest-based communities, where members are highly engaged with a topic, media appear

to be only one of several sources of information that are introduced and disseminated through the community. This research shows that a core group of primary influencers who act as conduits within the network are more influential in introducing new messages to members of active publics online than traditional mass media sources.

Role of online influencers

With the advent of participatory media, tools that enable web-based mass communication are now widely available, and technology savvy influencers are able to spread information to other web users through an array of social media channels. The network maps show that influencers continue to play an important role in communication flows, even in web-based information dissemination, but the role of these influencers in online information flow has changed as communication technologies have advanced. Instead of passing information to an audience through interpersonal communication, online influencers are able to use web-based mass communication channels to distribute contextualised content through a wide network of links. Because online opinion leaders have access to mass distribution message channels, they have the tools to exhibit influence within networks of likeminded individuals.

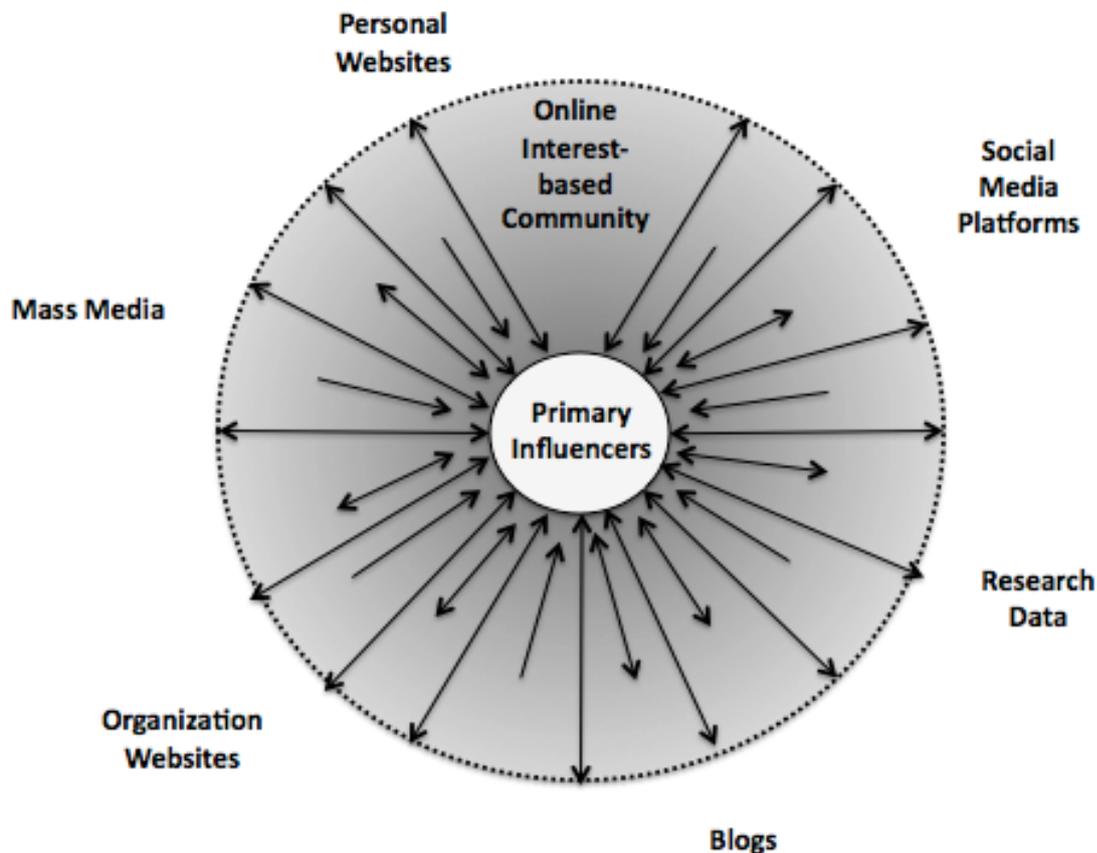
Interest-based communities are heavily influenced by a few key members who act as lynchpins of information dissemination and cultural development. Because influencers dominate communication channels for information dissemination among members of interest-based networks, their power as opinion leaders is of vital concern to those in the field of persuasive communication.

Radial model of communication flow

The online communication patterns of the interest-based community addressed in this study show that a few primary influencers act as essential connecting elements of the network. Key influencers appear to play two primary communication roles within online, interest-based communities. Their first role is of information conduits. Primary influencers collect information from a wide range of sources across the web, organise and collate it, and distribute that information to the community. Because primary influencers are also densely linked to websites outside of the community, they appear to play a prominent role in distributing information developed within the interest-based network to outside websites and users.

Figure 4 shows a model of information flow developed to better explain the communication patterns analysed in the young adult cancer network. The research in this study showed that influencers, not mainstream mass media sources such as television, newspapers, and radio, are the dominant meaning-makers in online, interest-based communities. As public relations practitioners have long relied on media relations practices for message dissemination, the shift to online influencers as information collators could have dramatic effects on the practice of online information sharing by communication professionals. This radial model of communication flow offers an alternative way to conceptualise the interactive communication patterns in online, interest-based publics.

Figure 4: Radial model of communication flow in online, interest-based networks.



The radial model of communication flow positions community influencers at the centre of the interest network. These influencers exhibit both inbound and outbound links to websites outside of the online community, such as social networking sites, nonprofit and corporate organisational websites, personal blogs and websites, traditional news publication sites, and primary source research reports such as published surveys and case studies. The primary influencers in this study are also highly interconnected within other web users identified as members of the young adult cancer community, although primarily through inbound links. The radial shading that emanates from primary influencers to the edge of the community represents the flow of influence within online interest-based communities.

Based on the nature of links identified in the online network analysis, primary influencers in online, interest-based networks appear to actively seek out and redistribute information from across the web to the interest-based community. This finding supports the notion

that highly engaged publics seek out issue-specific information from a variety of sources (Heath, Liao, & Douglas, 1995). The influencers in active publics appear to act as key sources of information for members of the online community, with information flowing primarily through influencers to community members. Instead of the top-down communication process assumed by existing models of communication flow, information in online networks appears to flow into and across communities from many different sources, and primary influencers appear to act as both content filters and communication facilitators.

The double arrows that extend from the hub of online influencers to the outer boundaries of the interest-based community illustrate the practice of information collection and redistribution. Online influencers access information from a variety of sources and introduce to the members of their interest-based network. Furthermore, the high degree of inbound links shown in the network illustrations indicates that online influencers

also distribute information to websites on the periphery of the interest-based community. The shorter double arrows that extend from the online influencers at the centre of the network to the middle of the community illustrate the similar information gathering and dissemination practice influencers appear to engage in within the network itself. The single direction arrows on the radial model connecting the middle of the network to the core influencers illustrates the use of influencers as information sources by network members.

The radial model of information flow seeks to describe information flow in communities that form around a particular shared interest. This study does not attempt to apply the radial model to information dissemination and processing in more general domains. This study does not invalidate existing models of information flow in all instances; instead this research shows a need to adjust information flow models when looking at online, interest-based communities. Online, interest-based communities, however, are of great interest to public relations and other persuasive communication professionals and it behoves researchers and practitioners in these fields to better understand their communication patterns. The central position of a few key influencers in online, interest-based networks is significant for public relations practitioners looking to engage active publics through the web.

Limitations and avenues for future study

This project examines the information flow process of highly engaged online communities by mapping the interconnected links between web pages. The method of online network analysis provides a broad overview of information dissemination patterns. By looking at web content rather than online patterns of behaviour, this study looks only at potential paths that web users could follow between pages, instead of examining the actual surfing process of web users. Furthermore, the IssueCrawler program weighs all links between sites equally so a hyperlink buried deep within a web page's archives is considered just as influential as a prominent header or sidebar link. The results of this study assume that the sheer volume of data that can be analysed using

an online web crawler compensate for the limitations of the tools used in this research.

This study only begins to explore the complicated communication processes that occur within online, interest-based publics. Recent work examining communities that are highly engaged with topics, brands, or issues have developed in conjunction with the rapid rise in popularity of digital technologies. The players in the message dissemination process are no longer divided between senders (mass media) and receivers (the audience) (McQuail, 2013). Audiences receive content, but they also produce, transform, categorise, and redistribute messages through social media platforms. Future studies that further explore communication within web-based communities and address the role of online influencers will help public relations practitioners more effectively use social media in strategic communication campaigns.

Conclusion

The results of this study suggest that efforts of public relations practitioners looking to build mutually beneficial relationships with online, interest-based communities should focus on engaging with the relatively small number of online influencers who act as lynchpins for information flow within these communities. Existing models of information flow have positioned mass media as the primary source of message dissemination, and public relations practitioners have long focused their efforts on engaging with media sources. However, as the Radial Model of Information Flow shows, for highly engaged online publics that form around a shared trait or interest, a relatively small number of influential members of the community appear to be the primary sources of message collection, collation and distribution through the community. For more effective strategic communication activities related to online, interest-based communities, public relations efforts must reach out to and engage online influencers.

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Author contact details:

Kathleen Stansberry
 Cleveland State University
 School of Communication
 k.stansberry@csuohio.edu
 (541) 228-5576
 @kstansberry

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