The 1% Rule in Four Digital Health Social Networks: An Observational Study

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Abstract

Background: In recent years, cyberculture has informally reported a phenomenon named the 1% rule, or 90-9-1 principle, which seeks to explain participatory patterns and network effects within Internet communities. The rule states that 90% of actors observe and do not participate, 9% contribute sparingly, and 1% of actors create the vast majority of new content. This 90%, 9%, and 1% are also known as Lurkers, Contributors, and Superusers, respectively. To date, very little empirical research has been conducted to verify the 1% rule.

Objective: The 1% rule is widely accepted in digital marketing. Our goal was to determine if the 1% rule applies to moderated Digital Health Social Networks (DHSNs) designed to facilitate behavior change.

Methods: To help gain insight into participatory patterns, descriptive data were extracted from four long-standing DHSNs: the AlcoholHelpCenter, DepressionCenter, PanicCenter, and StopSmokingCenter sites.

Results: During the study period, 63,990 actors created 578,349 posts. Less than 25% of actors made one or more posts. The applicability of the 1% rule was confirmed as Lurkers, Contributors, and Superusers accounted for a weighted average of 1.3% (n=4668), 24.0% (n=88,732), and 74.7% (n=276,034) of content.

Conclusions: The 1% rule was consistent across the four DHSNs. As social network sustainability requires fresh content and timely interactions, these results are important for organizations actively promoting and managing Internet communities. Superusers generate the vast majority of traffic and create value, so their recruitment and retention is imperative for long-term success. Although Lurkers may benefit from observing interactions between Superusers and Contributors, they generate limited or no network value. The results of this study indicate that DHSNs may be optimized to produce network effects, positive externalities, and bandwagon effects. Further research in the development and expansion of DHSNs is required.

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KEYWORDS
social networks; Superusers; eHealth; 1% rule; Pareto Principal; 90-9-1 principle; moderated support

Introduction

Background

Research examining digital health social networks (DHSNs) and their feasibility to improve health began in the mid-1980s [1,2]. As these networks became increasingly available, studies focused on relationships between network size, structure, program sustainability [3-5], and motivations of participants [6].

Terminology also developed to define common roles and behavior. For example, members of social networking sites (SNS) are now commonly referred to as actors [7]. Lurking (or passively reading social network conversations without actively participating) is the most common behavior [8]. Conversely,
common to SNS are actors who frequently generate content and facilitate discussions [9-12]. In practice, these actors are often referred to as Superusers [13]. The impact or value that Lurkers, Superusers, or other actors have within DHSNs has not been empirically examined.

**Network Effects and Positive Network Externalities**

To frame their value, it may be beneficial to view Lurkers, Contributors, and Superusers and other actors through the lens of sociology, political science, economics, and finance where there is a rich history of examining network effects. A network effect occurs when an individual's use of a good or service influences its perceived value [14,15].

An example of a network effect can be seen in the popularity and growth of the fax machine. When few organizations had fax machines, the value of having a fax machine was low. However, as more organizations purchased fax machines and quickly and efficiently communicated with other departments or organizations, the network of fax machines grew and so did the value of owning one. Over time, having a fax machine in the workplace became essential. This is also known as the bandwagon effect, where the demand for a good increases because others are consuming it [16].

In the above example, the addition of each fax machine created a positive externality [17]. Positive externalities contribute to growth and popularity of a product or good, and social science research is now beginning to investigate this phenomenon within SNS [18].

Introducing the concept of network effects and positive externalities can help explain the importance of recruiting, retaining, and managing different types of actors to help grow DHSNs. If growing a DHSN increases program efficacy, it is important to understand the mechanisms behind content generation and how to increase network effects.

**The 1% Rule (90-9-1 Principle)**

Mirroring the well-established Pareto Principle, also known as the 80-20 rule [19], cybertculture and digital marketing have informally adopted a phenomenon named the 1% rule, or 90-9-1 principle [20,21]. Following the principals of a power law, the Pareto Principle is a natural observation illustrating that roughly 80% of effects come from 20% of causes [22]. Similarly, the 90-9-1 principle states that 90% of SNS visitors observe and do not participate, 9% contribute sparingly, and 1% create the vast majority of new content. This 90%, 9%, and 1% are also known as Lurkers, Contributors, and Superusers. To date very little empirical research has been conducted to verify the 1% rule.

The purpose of this study was to examine if the 1% rule applied to moderated DHSNs designed to facilitate behavior change. Paid employees who were trained in social cognitive theory [23], motivational interviewing [24], the stages of change [25], and cognitive behavioral therapy (CBT) [26] actively moderated the four DHSNs in this study. Moderator roles focused on facilitating discussions, encouraging problem solving among members, administering compliance with privacy protection rules, protecting the community from spam, and ensuring that all discussions focused on adherence to behavior-change principles.

Furthermore, if DHSNs are efficacious, is it possible to create network effects to increase wellness on a population level? If size of the network matters, how are positive externalities created? More importantly, how do different actors interact and is it possible to create bandwagon effects?

**Methods**

**Settings and Program Descriptions**

To verify the 1% rule, this observational study analyzed descriptive data from four eHealth interventions that contain large social networks. The four Internet interventions are AlcoholHelpCenter (problem drinking) [27], DepressionCenter (depression) [28], PanicCenter (panic) [29], and StopSmokingCenter (smoking cessation) [30].

All four DHSNs are online, free to participants, do not offer advertising, do not promote any products, and are a part of Evolution Health Systems Inc’s (EHS) social business model. EHS is a private, research-based organization that builds evidence-based digital programs designed to increase medication and treatment adherence. The four DHSNs analyzed in this study were originally built by EHS for research purposes.

During the study period, moderators consistently monitored each DHSN, reviewed all 578,349 DHSN posts, and checked for their accuracy and consistency. Posts that did not specifically address behavior change or comply with program rules were removed.

Full descriptions of each intervention appear elsewhere [31-34]. The oldest of the four DHSNs was nearly 11 years in operation at time of this study, and functionality of each DSHN has been enhanced over time. For explanatory purposes, Table 1 outlines the main features of each program.

Retrospective data were extracted from each program’s structured query language (SQL) database. Descriptive statistics were analyzed in SPSS version 19 for Mac.

All data collection procedures adhered to international privacy guidelines [35-37] and were in accordance with the Helsinki Declaration of 1975, as revised in 2008 [38]. The study was consistent with the University Research Ethics Committee procedures at Henley Business School, University of Reading, and was exempt from full review.
Table 1. Program features and functionality.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Problem drinking</th>
<th>Depression</th>
<th>Panic disorder</th>
<th>Smoking cessation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderated social network</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tailored behavior-change program</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Brief intervention/screener</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Blogs</td>
<td>✓</td>
<td>–</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Private messaging among members</td>
<td>–</td>
<td>✓</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td>Video testimonials</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Public profile</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Symptom diary/tracker</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Gamification (techniques to increase usability leveraging desire for achievement, rewards, and competition)</td>
<td>–</td>
<td>✓</td>
<td>–</td>
<td>✓</td>
</tr>
</tbody>
</table>

Registrants and Study Duration

The four DHSNs had varying numbers of members and life spans (see Table 2). Periods of analysis ranged from 4.0 years (problem drinking) to 10.9 years (smoking cessation).

The dataset was purged of moderator accounts to ensure that all content originated only from registered members. Only registered members could actively contribute to discussions; however, registration was not required to read or review all existing or newly generated content.

Table 2. Subjects and study duration.

<table>
<thead>
<tr>
<th></th>
<th>Problem drinking</th>
<th>Depression</th>
<th>Panic disorder</th>
<th>Smoking cessation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of first post</td>
<td>July 25, 2008</td>
<td>April 5, 2003</td>
<td>January 7, 2002</td>
<td>September 17, 2001</td>
</tr>
<tr>
<td>Date of last post</td>
<td>August 7, 2012</td>
<td>August 5, 2012</td>
<td>August 7, 2012</td>
<td>August 7, 2012</td>
</tr>
<tr>
<td>Number of days</td>
<td>1474</td>
<td>3411</td>
<td>3866</td>
<td>3978</td>
</tr>
<tr>
<td>Years</td>
<td>4.0</td>
<td>9.3</td>
<td>10.6</td>
<td>10.9</td>
</tr>
<tr>
<td>Registrants, n</td>
<td>2597</td>
<td>5151</td>
<td>11,372</td>
<td>44,870</td>
</tr>
</tbody>
</table>

Results

Summary

Descriptive statistics revealed that less than 25% of actors in each DHSN authored one or more posts (see Table 3).

Table 3. Number and percentage of actors making one or more posts.

<table>
<thead>
<tr>
<th></th>
<th>Problem drinking</th>
<th>Depression</th>
<th>Panic disorder</th>
<th>Smoking cessation</th>
<th>Total</th>
<th>Mean</th>
<th>Weighted mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total actors</td>
<td>2597</td>
<td>5151</td>
<td>11,372</td>
<td>44,870</td>
<td>63,990</td>
<td>15,998</td>
<td>31,934</td>
</tr>
<tr>
<td>Actors who made at least one post, n (%)</td>
<td>449 (17.3)</td>
<td>1230 (23.9)</td>
<td>2767 (24.3)</td>
<td>7963 (17.7)</td>
<td>12409 (19.4)</td>
<td>3102 (19.4)</td>
<td>6193 (19.4)</td>
</tr>
</tbody>
</table>
Table 4. Analysis of the 1% rule.

<table>
<thead>
<tr>
<th></th>
<th>Problem drinking</th>
<th>Depression</th>
<th>Panic disorder</th>
<th>Smoking cessation</th>
<th>Total</th>
<th>Mean</th>
<th>Weighted mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population (n)</td>
<td>2597</td>
<td>5151</td>
<td>11,372</td>
<td>44,870</td>
<td>63,990</td>
<td>15,998</td>
<td>40,875</td>
</tr>
<tr>
<td>Total social network posts</td>
<td>7148</td>
<td>12,583</td>
<td>45,032</td>
<td>513,586</td>
<td>578,349</td>
<td>144,587</td>
<td>369,434</td>
</tr>
<tr>
<td>1% of population (Superusers)</td>
<td>26</td>
<td>52</td>
<td>114</td>
<td>449</td>
<td>641</td>
<td>160</td>
<td>415</td>
</tr>
<tr>
<td>Total posts by Superusers</td>
<td>4219</td>
<td>7,432</td>
<td>28,403</td>
<td>385,361</td>
<td>425,415</td>
<td>106,354</td>
<td>276,034</td>
</tr>
<tr>
<td>Percentage of posts by Superusers, %</td>
<td>59.0</td>
<td>59.1</td>
<td>63.1</td>
<td>75.0</td>
<td>73.6</td>
<td>73.6</td>
<td>74.7</td>
</tr>
<tr>
<td>9% of population (Contributors)</td>
<td>234</td>
<td>464</td>
<td>1023</td>
<td>4038</td>
<td>5759</td>
<td>2880</td>
<td>3572</td>
</tr>
<tr>
<td>Total posts by Contributors</td>
<td>2674</td>
<td>4,170</td>
<td>13,814</td>
<td>122,408</td>
<td>143,066</td>
<td>35,767</td>
<td>88,732</td>
</tr>
<tr>
<td>Percentage of posts by Contributors, %</td>
<td>37.4</td>
<td>33.1</td>
<td>30.7</td>
<td>23.8</td>
<td>24.7</td>
<td>24.7</td>
<td>24.0</td>
</tr>
<tr>
<td>90% of population (Lurkers)</td>
<td>2337</td>
<td>4636</td>
<td>10,235</td>
<td>40,383</td>
<td>57,590</td>
<td>14,398</td>
<td>27,246</td>
</tr>
<tr>
<td>Total posts by Lurkers</td>
<td>255</td>
<td>981</td>
<td>2815</td>
<td>5817</td>
<td>9868</td>
<td>2467</td>
<td>4668</td>
</tr>
<tr>
<td>Percentage of posts by Lurkers, %</td>
<td>3.6</td>
<td>7.8</td>
<td>6.3</td>
<td>1.1</td>
<td>1.7</td>
<td>1.7</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Figure 1. Network content according to the 1% rule.

**The 1% (Superusers)**

On average, the top 1% (n=160) of Superusers created 73.6% (n=106,354) of posts. On an individual program level, the top 1% varied in their overall contributions, but in all cases accounted for the majority of activity, with a weighted average of posts being 74.7% (n=276,034).
The Next 9% (Contributors)
The second highest group of contributors, or the next 9% of the
population, accounted for an average of 24.7% (n=35,767), with
a weighted average of 24.0% (n=88,732) of posts.

The Remaining 90% (Lurkers)
The remaining 90% of the population accounted for an average
of 1.7% (n=2467) of posts, with a weighted average of 1.3%
(4668) of posts.

Cumulative Participation
Cumulatively, Lurkers accounted for the vast majority of the
population in the four DHSNs (n=57,590); however, this
population created only 1.7% (n=9868) posts. Conversely,
Superusers accounted for a small amount of actors (n=641) but
created 73.6% (n=425,415) posts (see Figure 2).

Figure 2. Cumulative DHSN population distribution and content creation according to the 1% rule.

Discussion
Principal Findings
Superusers accounted for a weighted average of 74.7% of
content and generated the vast majority of posts within the four
DHSNs. These findings match criteria of the 1% rule and may
be comparable to the Pareto Principle.

Conversely, Lurkers generated limited or no network value.
Although Lurkers may benefit from observing interactions
between Superusers and Contributors, they do not generate
network effects nor do they contribute to the network growth.

In regards to Superuser participation, motivations and posting
patterns in the DHSNs have been previously examined. A 2008
analysis of the problem drinking DHSN found that common
themes included introductions, greetings, general supportive
statements, suggested strategies, success stories, and discussion of
difficulties [9]. In addition, this study found that the amount of
discussions varied over time and clustered around nodes
consisting of one or more Superusers. A 2010 publication on
the smoking cessation DHSN found that the majority of first
posts were from recent quitters who were struggling with their
quit attempts. Responses were rapid and from seasoned quitters,
indicating that the social network may be particularly beneficial

Content analysis has also been conducted on the four DHSNs.
A 2009 academic presentation found that a high proportion of
first posts in the panic disorder DHSN resembled “panic stories”,
suggesting that the network may act as an expressive writing
forum [39]. A 2010 academic presentation on the same
community found that the support group was used more often
by those reporting greater intensity of panic symptoms,
absenteeism from work, and that Lurkers completed a greater
number of the program’s CBT treatment sessions compared to
Contributors and Superusers [40]. A recent University of
Toronto PhD dissertation found that depression DHSN users
generally sought informational support, various types of
emotional support, coaching support, and social companionship
[41]. Future research should focus on possible differences
between post frequencies and content themes that may be
prevalent in different indications, disease states, or actor types.

Based on the observations in this study, health care organizations
should focus efforts on recruiting and retaining Superusers.
Superusers may have a wide range of options to focus their
participation, whether on health-related social networks or those
of general interest. Moreover, they may exhibit different patterns
of network behavior in different communities [42]. The
motivations, needs, and participatory patterns of Lurkers and
Contributors should also be examined. Future research should
focus on the demographic and psychographic characteristics of
these three actor-types.

It is also important to consider that the actions of some
Superusers may result in negative network externalities. This
type of behavior may result in negative network effects and
decrease the size of the network. Conversely, Superusers may generate positive network effects in digital resources that are negatively oriented towards health, promoting illness, or disease [43].

An increasing number of health care organizations are making digital health care tools available to their patients, policyholders, or consumers, and many of them contain social networks. While some DHSNs flourish, many suffer from little or no traffic [44]. Strategies increasing Superuser and Contributor participation can increase the effectiveness of these programs.

A successful DHSN requires active managers who not only guide discussions but also facilitate growth [45]. The findings from this paper indicated that managers of DHSNs should identify Superusers early, encourage their participation, and target their recruitment through offline initiatives. Managers should not expend resources on promoting engagement with Lurkers.

Strengths and Limitations

A strength of this study is that the four DHSNs have never been promoted or advertised as they are not commercial entities. Participants in the four programs in this study could find the DHSNs only through extensive search efforts, links from other websites, or word-of-mouth. Profit-driven commercial entities focus considerable efforts and budgets on recruitment and promotion (free trials, banner advertising, celebrity endorsement, offline promotion, and other incentives) and most likely attract much larger populations with different motivations [46]. As a result of non-promotion, the four DHSNs in this study may have attracted only naturalistic, self-seeking health populations.

However, lack of advertising or promotion may also be a limitation. The naturalistic self-seeking population of actors within these networks may not be representative of populations that are typically reached from well-promoted programs. Many organizations or trials have promotional or recruitment budgets, thus casting a wider net and attracting a variety of health populations.

Especially in a climate of limited budgets and funding, the influence of promotion or non-promotion should encourage organizations with DHSNs to carefully consider the role of advertising and recruitment, and if those efforts should be strategically targeted.

Finally, only data from registered users were examined. Any visitor could browse the DHSNs without registering, but it is not possible to reliably examine this data nor combine it with the behavior of registered users.

Conclusions

The 1% rule was consistent across the four DHSNs. However, as individuals can lurk without registering, the 1% (Superusers) may represent an even smaller population. As social network sustainability requires fresh content and timely interactions, these results are important for organizations actively promoting and managing DHSNs.

Superusers generate the vast majority of traffic and create value, so their recruitment and retention is imperative for long-term success. Although Lurkers may benefit from observing interactions between Superusers and Contributors, they generate limited or no network value.

The results of this study indicate that DHSNs have the potential to be optimized to produce network effects, positive externalities, and bandwagon effects. Further research in the development, expansion, and management policies of DHSNs is required.

Acknowledgments

The author would like to thank Dr Douglass Hyatt, Professor of Business Economics at the Rotman School of Management at the University of Toronto for his input on network effects and comments on the study design.

Conflicts of Interest

Trevor van Mierlo is the CEO & Founder of Evolution Health Systems Inc, the owner of the sites AlcoholHelpCenter, DepressionCenter, PanicCenter, and StopSmokingCenter, as well as other eHealth and mHealth platforms.

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Abbreviations

AHC: AlcoholHelpCenter.net
CBT: cognitive behavioral therapy
DC: DepressionCenter.net
DHSSN: digital health social networks
PC: PanicCenter.net
SNS: social networking sites
SSC: StopSmokingCenter.net
SQL: structured query language

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