

Understanding User Behavior on Pinterest: Findings and Insights

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Abstract

Pinterest, as one of the largest social curation sites, has gained tremendous momentum recently. All Pinterest users collaboratively create a large and valuable pool of image-based web contents with certain structure and annotation. This form of "wisdom of crowds" can reduce users' search cost if one knows where and how to look. In addition, the implicitly formed networks among Pinterest users and resources signify potential channels for contents to be discovered and transmitted more effectively and efficiently. Thorough understanding of Pinterest is required before it can be utilized for purposes such as marketing. In this study, we perform analysis on data collected from Pinterest site to provide a better and deeper understanding of usage patterns. A unique focus of our study is to explore whether how a user presents herself on Pinterest has impact on her status in the community, i.e., her "popularity". The presentation is partially determined by the sophistication of the user-generated profile. Our findings provide potential benefits to several stakeholders including: How Pinterest can improve their site to better serve the community? How users can enhance their status in the community through better representation? and How businesses can identify more influential figures on Pinterest and conduct targeted marketing.

Keywords: Pinterest, Social Curation, Network, Analytics, Marketing, User Profile.

1. INTRODUCTION

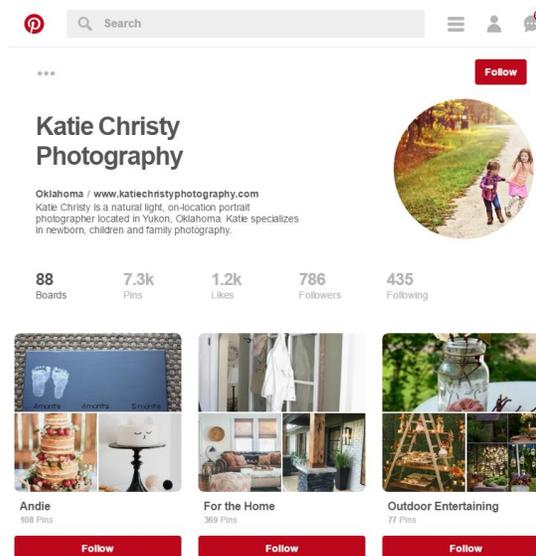
Social networking sites (SNS) such as Facebook, Twitter, and Pinterest have attracted approximately 29% of the world's population (Kemp, 2015) and has become a predominant mode of communication, particularly between young adults (Balaji, Khong, & Chong, 2016). For example, for every minute of a day, Twitter users generate 277,000 tweets; Facebook users share 2,460,000 pieces of contents; Pinterest users pin 3,472 images, and Instagram users post 216,000 new photos (Humbarger, 2014). Among the most popular and fastest growing SNS is Pinterest. Launched in 2010, Pinterest is a new breed of social network site compared to Facebook and Twitter. On Pinterest, users can save, share, retransmit, annotate, and organize images, either

from their own collection or from the Internet. Together with the pictures that are shared, often annotation and organization are added for various purposes. This practice is called "social bookmarking" or "social curation". According to a recent survey, 56% of adult Internet users have shared photos or videos online, as either the content creators or curators (Rainie, Brenner, & Purcell, 2012). With its unique image-centered social platform, Pinterest has attracted nearly 100 million registered users by September 2015 (Griffith, 2015). There have been other "social curation" sites such as Delicious.com (Stolley, 2009) and CiteULike (Emamy & Cameron, 2007). But the image-centered service makes Pinterest unique and interesting, to users, businesses, and researchers.

The large user base and heavy traffic have made Pinterest one of the most attractive marketing channels for businesses. For example, businesses such as Etsy, The Gap, Allrecipes, etc. are using Pinterest to advertise their products and services (Mittal, Gupta, Dewan, & Kumaraguru, 2014). According to recent surveys (Vaughan, 2014; Zwelling, 2012), higher proportion of Pinterest users click through to e-commerce sites, and when they go there, they spent significantly more money than people who come from sites like Facebook or Twitter. As results, clicks on Pinterest generate four times more revenue than clicks on Twitter. Understanding the usage behaviors and patterns on Pinterest will help businesses utilize Pinterest as marketing tool more effectively.

In addition, when signing up for Pinterest, each user needs to create a user profile during registration. This creates a large pool of demographic information with hidden value. For Pinterest, there are 100 million profiles with huge amount of self-generated information. Researchers believe that user profiles provide important insights into user interests and demographics (Mittal et al., 2014), interactions and connections between users (Lampe, Ellison, & Steinfield, 2007), and personalities (Hughes, Rowe, Batey, & Lee, 2012). For example, a study of user profiles has been done on Facebook users (Lampe, Ellison, & Steinfield, 2007). However, to the best of our knowledge, little is known about the specific relationships between user profiles and user activities on Pinterest.

A typical Pinterest account is as shown in Figure 1. On this homepage of a pinner's account, we are able to see the name and profile created by the pinner to represent herself in the community. Note that not all pinners are interested in investing time into creating content to tell others who they are and what they do. We can also see general statistics of her activities and "implicit social status", for example, this specific pinner has 88 pinboards containing 4,300 pins. There have been 1,200 other pinners liked her pins/pin boards. In total 786 other pinners are following her and she is also following 435 others. Therefore, she has quite a network on Pinterest. Because the pinner is a business owner, as suggested by her account name and personal profile, the more followers she gets, higher chances for her to get business. Meanwhile, she may be following others on Pinterest to get ideas and inspiration for her line of work. As a business owner, this Pinner would be interested in knowing what impact her profile has on her social status on Pinterest, which is essential to the success of



promoting her service to the Pinterest community.

In this study, we studied data collected from Pinterest. The focuses are the usage pattern and the characteristics of user profiles created by users. We are interested in finding out how these characteristics relate to other user behaviors and activities on Pinterest. Specifically, we investigate the following research questions:

Figure 1 A Sample User Account and Profile from Pinterest

- How the general usage patterns on Pinterest are similar to or different from other SNS sites?
- How do Pinterest users present themselves through user profile creation, if they choose to do it at all?
- Can we use Pinterest users' profiles to predict their behavior and social status in the user community?

The rest of the paper is organized as follows. We discuss the related work in Section 2. We then describe our data collection methodology in Section 3. Data analysis and findings are covered in Section 4. Finally, we summarize the implications, limitations, and future work in Section 5.

2. RELATED WORK

In this section, we provide an overview of Pinterest and then explore prior work that helps establish the basis for this study.

Overview of Pinterest

Pinterest is an image-based social curation tool that allows users to save, annotate, and disseminate image-based contents. Pinterest is already one of the top popular social media sites in the US and ranked the highest in customer satisfaction in the US (Statista, 2016). By September of 2015, Pinterest had crossed the threshold of 100 million monthly active user (Griffith, 2015).

Users (often called “pinners”) collect images and create “pins” (basically a bookmark) using them. Images may be uploaded from users’ local photo library or obtained from other websites. Each pin created has a unique identifier and the pinners could pin as many items as they wish. All the pins are organized around the metaphor of a pin board, usually all pins on the same “pin board” follow the same theme such as recipes, crafts, wedding dress etc. Users may comment on and/or “re-pin” pins from the boards of other users. Pinterest users can follow each other, “re-pin” and “like” others’ pins. Pinterest also allows its users to follow other users (or their boards) or to be followed. One of the distinguished features of Pinterest is that majority of the publications on Pinterest are from pre-existing web sources or re-pins from other users (Bernardini, Silverston, & Fester, 2014; Mittal et al., 2014), which is very different from other image-based social networking sites such as Flickr. When signing up for the services, the user has the choice to provide information include user name, full name, picture, short self-description, location, URL of website, etc. to be included in her profile. Some profile entries are required such as user name, while some are optional such as picture and a personal statement.

Prior Research on Pinterest

Pinterest has attracted a lot of research interests. However, compared to other popular SNS, Pinterest is one of the least studied ones. At the early phase, studies focus on the usage behavior of Pinterest users (Cheng & Cosley, 2013; Feinberg, Geisler, Whitworth, & Clark, 2012; Hall & Zarro, 2012; Whitecavage, Widgeon, & Overbey, 2012; Zarro & Hall, 2012). Researchers are also interested in utilization of Pinterest in more specialized domains such as science (Bik & Goldstein, 2013), education (Thornton, 2012; Webb et al., 2013), library science (Dudenhoffer, 2012; Hansen, Nowlan, & Winter, 2012; Stellrecht, 2012; Wilkinson, 2013), and even politics (Weber & Pennacchiotti, 2013). Because Pinterest has great potential as an effective marketing tool, lot of studies are concerned with

how more value can be derived from the pinning activities (Sevitt & Samuel, 2013). Topics along this line include what impact does user gender difference have on Pinterest usage (Ottoni et al., 2013); How businesses can best structure their social media content to maximize adoption (Sago, 2013); How to boost online sales through social media clicks by using effective user-user collaborative filtering (Kamath, Popescu, & Caverlee, 2013; Saaya, Rafter, Schaal, & Smyth, 2013; Zhang & Pennacchiotti, 2013; Zoghbi, Vuli, & Moens, 2013); and What are the emotional traits that can help with personalization and customization of marketing and goods by conducting sentimental analysis (Guerra, Wagner Meira, & Cardie, 2014). Other types of research done on Pinterest include information retrieval (Zarro, Hall, & Forte, 2013) and content discovery (Alvarez, Yamada, & Kimura, 2013; Kimura et al., 2013). In addition, the networking aspects of Pinterest are also studied to understand how communities are formed and information gets propagated (Popescu, 2012).

Prior Research on SNS User Profiles

User profiles are an integral part of SNS including Pinterest. Previous research suggests that self-generated profile information on Facebook can be used to identify some personality traits (Gosling, Augustine, Vazire, Holtzman, & Gaddis, 2011). Furthermore, self-generated profile information, along with friends’ profiles and system-generated information (such as number of friends), plays an important role in forming basic impression of profile owners on SNS (Utz, 2010). Prior work has examined the association between profile structure and the formation of online connections and shows that populating profile fields on Facebook is positively related to the number of friends a user has (Lampe et al., 2007). Although user profiles have often been included in previous Pinterest-related studies, the analysis of profile information has been done mainly for basic demographic purposes (Feng, Cong, Chen, & Yu, 2013; Mittal et al., 2014). Little is known about how Pinterest users utilize their profiles and whether or not there is any association between profile entries and user activities on Pinterest.

3. DATA COLLECTION AND PROCESSING

We developed a web crawler using Java and Jsoup, a Java HTML parser, to collect data from Pinterest starting during March 2015. We used snow-balling sampling method started with a small set of seed pins collected from the “popular” pin list on Pinterest. Using the ID of each seed pin, we generated 1,000 other random pins for

collection. Starting from the URL of each pin, the crawler program parsed the webpage to extract attributes such as name and source of the pin, image link, number of times the pin has been repined, ID, and name of the pinner, URL of the pinner homepage, title of pinboard where the pin is located, and the URL of the pinboard. Then following the URLs of the pinner and the pinboard, the crawler fetched the pinner homepage and pinboard webpage, respectively, to extract attributes such as location and biography of the user, and number of pins and followers of the pinboard. A complete list of attributes we collected for each pin can be found in Appendix A. The web crawler program was running on three Windows 7 PCs with Intel Core i5 and i7 processors for 4 weeks and collected 1.1 million pins including descriptive attributes of pins and pinboards, and profile attributes of pinners (Pinterest users).

The semi-structured data is not “clean” and needs pre-processing before it can be analyzed with tools. Therefore, cleansing of data was conducted for several purposes: (1) Remove invalid pins and partial pins due to network and unexpected exceptions. An important contributing factor to the exceptions is the constantly changing Pinterest service design; (2) Duplicate records are removed. The cleansed data is stored in .csv file. The data set ready for analysis contains 399,889 unique pins and 232,688 unique pinners. The data analysis was conducted using R.

4. DATA ANALYSIS AND RESULTS

In this section, we describe and interpret our findings from the analysis of data collected from Pinterest.

General Pinterest Usage Patterns

In our collected data, we discovered that only 14.35% of the pins are originally created by Pinterest users, majority of the pins are just bookmarked from some other online resources, thanks to the easy-to-use Pinterest web browser add-on and smart devices. The top ten popular websites from which pins are created are as shown in

Table 1. All are popular websites where images are major ways to convey information. For example, Etsy.com is the largest website where crafts lovers showcase and sell their productions. Houzz.com provides great information for remodeling and decoration of various residences.

When a pinner is browsing on Pinterest and discovers a pin from another user

useful/interesting, she can simply repin it so it will be collected into her own account. For all the collected pins, majority of them received zero (71.43%) to very few repins. Only a very small portion of them are very popular and gets repined by others.

Rank	Website	Weight
1	Etsy.com	3.79%
2	Flickr.com	2.30%
3	Buzzfeed.com	1.87%
4	Youtube.com	0.66%
5	Indulgy.com	0.55%
6	Themetapicture.com	0.54%
7	Someecards.com	0.47%
8	Polyvore.com	0.41%
9	Houzz.com	0.41%
10	Bhg.com	0.38%

Table 1 Most Popular Websites to Provide Pin Source

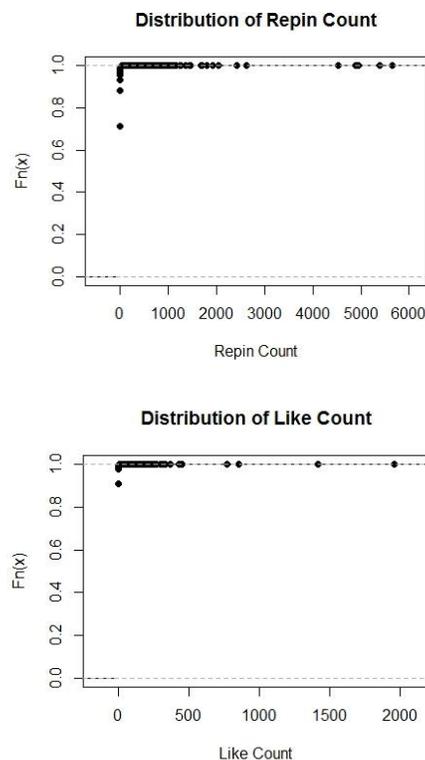
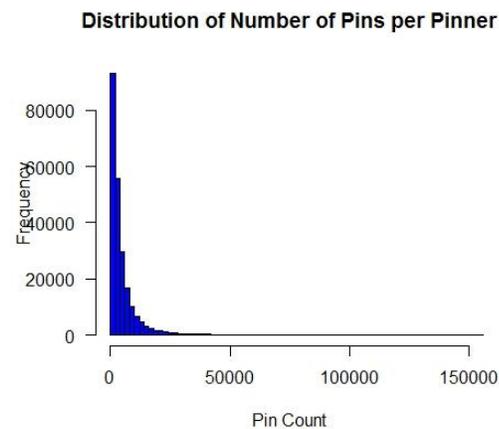


Figure 2 Distribution of Number of Re-pins and Likes Received by a Pin

Averagely speaking, each pin receives 1.22 repins, while the most popular pin we collected was repined 5,659 times by others. Similarly,

most of the pins (90.63%) are not "Liked" by others. The average "Likes" received by a pin is 0.22 and the most liked pin receives 1,964 likes. The cumulative density function of the repin and like counts are as shown in Figure 2. These results correspond well to the long-tail effect.

Though there are 100 million Pinterest users, some of them are very avid users while others remain relatively dormant. Pinner can create pins and pinboards in their accounts. Pinboard is the way of organizing large number of pins in one's account. It acts like a bucket to contain pins that the pinner deems belong together. Usually, all pins in a pinboard fall under certain domain of interests of a pinner. Based on our data, though there do exist empty accounts, the average number of pins per pinner is nearly 5,000. And the "biggest pinner" has over 200K pins. The number of pinboard a pinner owns range from 2 to 1,229. Though we understand some people may have a lot of interests, over 1,000 board is a number hard to manage. Upon checking this specific pinner, seems that she does not use relationships and hierarchies between topics to organize pins into boards, many of the boards have overlapping focuses. It may be possible that this account is shared among many who deposits pins with no concern of other content as long as they can come up with unique board names. The distribution of these two measures among all collected pinner are shown in Figure 3.



Altogether, we have collected 237,238 unique pinboards. The number of pins located on one board varies greatly across pinner and the average number of pins per board is around 500. Usually, the name of the board is a good indicator of the theme that is used to organize those pins, they are also symbols of the pinner's interested areas and/or expertise. The top 10 board themes

are My Style, For the Home, Food, Recipes, Quotes, Fashion, DIY, Favorite Recipes, Christmas, and Hair. These are all areas in which visualization is highly desired and hence popular on Pinterest.

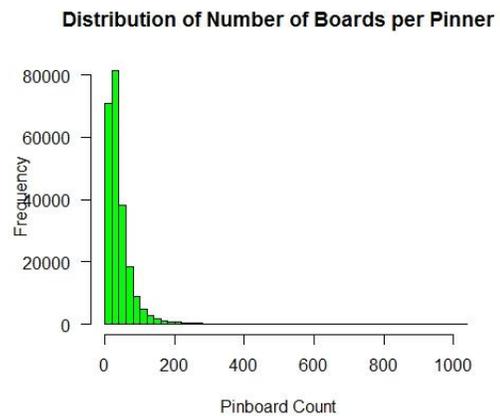


Figure 3 Pin and Pinboard Count Distribution

A very important function on Pinterest is the "social networking" function through the "following" activities. When a user identifies a pinner or a specific board as useful/interesting, she may choose to follow them. Once the following relationship is created, updates from followed entities can be pushed to the subscribers, this helps reduce the cost of content discovery on Pinterest substantially. The number of followers speaks well of the fact that one's content has great appeal to Pinterest community. About 2.23% of pinner have 10 or less followers. Nearly 25% of pinner have 76 or less followers. In the extreme cases, one pinner has over 5 million followers. This very popular pinner has 38.5K pins saved to 18 boards. Her list of themes are various creative artistic work that have broad appeal to people of all trades. Another indicator of a pinner's popularity is how many "Likes" all her pins received from others. Among pinner we collected, only 2.74% do not have any of their pins liked by others. However, there are some pinner who receives 100K likes.

With preliminary knowledge of general pinning activities, we are interested in, especially from marketing point of view, what makes things/people on Pinterest attractive? In order to answer this question, we analyzed the data to see if any correlation exist between indicators of popularity (number of time being liked and/or followed) and possible contributing factors. The hypothesis and respective correlation results are

summarized in Table 2. The results suggest that there are several weakly positive correlations between popularity indicators and other factors. It is intuitive that whoever has more pins would receive more likes as long as the pinner does not have “awful taste”. The higher number of likes one receives creates more fans, i.e., more pinner will come and follow. It is interesting that those who are followed the most probably follow many others. These following activities generate lots of transferring of content and will greatly help increase the reach of a pinner in the user community. Identifying the composition and structure of such a following-followed network can bring in several benefits to marketers: (1) Understand the formation of and utilize the “electronic word-of-mouth”; (2) Identify and target “authorities” in specific domains in the community to improve effectiveness of marketing activities.

Variable 1	Variable 2	Corr. (Pearson)	Sign. Level
# of pins	# of likes	r=0.31	p<0.001
# of boards	# of likes	r=0.29	p<0.001
# of pins	# of followers	r=0.27	P<0.001
# of boards	# of followers	r=0.28	p<0.001
# of likes	# of followers	r=0.32	p<0.001
# of pins	# of followings	r=0.27	p<0.001
# of followers	# of followings	r=0.36	p<0.001

Table 2 Correlation Tests Results

Pinterest User Profiles

When creating user account with Pinterest, users have the option to provide extra information about themselves other than an identifier and a name. The information includes the location of the user and a brief description as a self-introduction. Though other types of information including gender, address, email etc. can be obtained indirectly if Facebook account is linked to Pinterest account, they are not explicitly displayed with one’s Pinterest account.

While the major function of Facebook is to “socialize and publicize”, main purpose of using Pinterest is to collect, curate, and share content. Therefore, the significance of presenting yourself include who you are and what do you like to the community, is less important on Pinterest, the idea is mainly “let what I pinned speak for me.” A

user is usually not concerned with establishing and validating her identity. Therefore, the follower-following network on Pinterest is more content-based (I follow you because I like what I see on your boards) rather than identity-based (I know you well enough to befriend/defriend you). For example, Facebook profile (Lampe et al., 2007) has nearly 20 attributes while similar content on Pinterest is very minimal.

Out of the over 200K pinners, only 18% provide some information for their locations. Some provided location information are invalid and/or meaningless. For example, there are numbers, URLs, and even “.” and “nulls” for physical location. In addition, some use this as an opportunity of self-expression and left idiosyncratic messages such as “None of your business”, “Universe”, and “somewhere far away” etc. Even for the meaningful location information, some interesting finds emerge: (1) Some user has no intention to protect their real identity and actually gave the full street address of their residences; (2) Valid location information is provided at different levels ranging from Country, State, City, to Street; (3) Because information is provided free-format, data heterogeneity problems such as synonyms are normal. For example, Texas US, Texas, and TX are all used to represent the state of Texas in the United States. As straightforward as they are to human beings, they cause problems in data processing conducted through machines. Based on our collected data, we found out that the top 10 countries where pinners are from are shown in Table 3, included are also each country’s relative weight. We see that more than 80% of the users are from the United States.

Rank	Country	Percentage
1	United States	80.76%
2	Canada	4.88%
3	United Kingdom	4.48%
4	France	4.22%
5	Australia	3.24%
6	New Zealand	0.59%
7	South Africa	0.51%
8	Germany	0.48%
9	Spain	0.45%
10	Netherlands	0.41%

Table 3 Top Country Origins of Pinterest Users

The other piece of profile information on Pinterest is personal statement. It is the statement that shows on pinner’s page, at the most prominent place right under the pinner name and headshot. It can be interpreted as a personal statement

made to the Pinterest community. The willingness to issue a statement somehow measures how much the pinner wants an identity and makes herself known. From our collected data, about 26% of the users provided some sort of statement. Majority of the statements fall under categories such as "mottos and personal beliefs", "Self-introduction", "Pin content introduction", and "borrowed texts such as quotes and song lyrics". The shortest introduction is one character with a ".", and the longest one has 191 characters. Average introduction length is about 77 characters. The distribution is as shown in Figure 4. Many of the users probably are not aware that the content they put will show up as their personal statement as they provide symbols "☺" and "<3" for introduction.

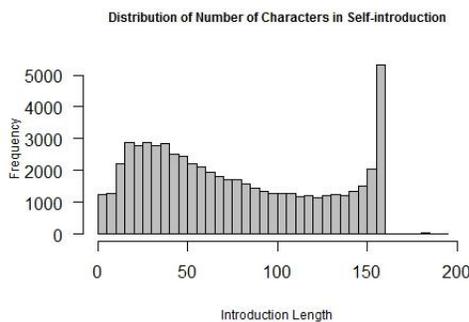


Figure 4 Distribution of Length of Self Introduction

If we consider the time and efforts spent in providing the location and introduction information of oneself as an investment, then the desired return would be higher level of recognition from the community. The forms of the recognition could be being "liked" and/or "followed". We are interested in finding out whether a richer user profile can make a difference. We compared the "popularity measures" between those who provided extra profile information and those who didn't and the results are summarized as follows.

Hypothesis	Results
H₀ : Pinner who have location information have same number of Likes as those who don't.	Rejected t=17.8645 p <0.001
H₀ : Pinner who have location information have same number of Followers as those who don't.	Rejected t=8.5707 p <0.001
H₀ : Pinner who have personal statement have same number of Likes as those who don't.	Rejected t=21.3727 p <0.001

H₀ : Pinner who have personal statement have same number of Followers as those who don't.	Rejected t=4.5033 p <0.001
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Table 4 Profile Hypothesis Testing Results

As seen in Table 4, whether the user provides location and personal statement makes differences in their popularity. The effect may not be causal, however, because users who care to take time filling profile information may be just more serious about pinning and spend more time creating useful contents and gain higher popularity. One way to tap and utilize the profile information is to provide service features to allow ad hoc search on user location and personal statement. This will greatly help content seekers identify potential users to follow and in turn create more opportunities to find useful pins. The bond created will be at more personal level and stronger.

5. CONCLUSIONS

In summary, we conducted some detailed analysis on collected Pinterest data including pins and pinners. The findings help us better understand why and how people pins. Because Pinterest is an image-based social curation tool, the prevailing topics are the ones that go well with visual aids. This makes Pinterest a much better candidate to do marketing or achieve higher level of engagement for industries such as Fashion. We also studies pinners' profile data and found out majority of the users choose not to invest into their "image". We also discovered those who have more complete profiles are usually better Pinterest "citizens", i.e., they are more prominent in the community. Based on our findings, we make following recommendations: (1) Methods to encourage users provide more profile information may stimulate their activities on Pinterest; (2) Since we are already asking users to provide profile information, why not implement search functions on profile data to help users better identify whatever interests them, faster and more precise? (3) Business users may use the profile to find more authoritative figures and conduct targeted marketing.

The quality of any data-driven research relies on the quality of data collected. We fully understand that we cannot escape from sampling bias and we wish to compensate this with larger amount of data in the future.

This study is preliminary and we have set up plans for future projects including but not limited to the

following: (1) Conduct in-depth studies of the implicit user- and content- based networks on Pinterest; (2) Use Pinterest as an example to illustrate how to instantiate a social media analytics framework and what are the challenges, as well as respective solutions; (3) Explore the possibility of utilize Pinterest to create class projects for curriculum in data analytics, as a way to alleviate the situation where "real data" is highly desired but hard to obtain in a cost-effective manner.

6. ACKNOWLEDGEMENTS

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Appendix A: Attributes of Pinterest Dataset

Attribute	Description
<i>Collected from pin page</i>	
pinURL	URL of the pin
repin	Number of times the pin has been repinned
like	Number of times the pin is liked
pinName	Name of the pin
pinSource	Source of the pin
imagePointer	Link of the image
pinnerID	ID of the pinner/user
pinnerName	Name of the pinner/user
viaPinner	ID of the user where the pin is from
viaPinnerName	Name of the user where the pin is from
pinboardTitle	Title of the pinboard
pinboardAuthor	Author of the pinboard (same as pinnerID)
<i>Collected from pinboard page</i>	
boardURL	URL of the pinboard
boardName	Name of the pinboard
boardPinCount	Number of pins on the board
boardFollowerCount	Number of followers of the board
<i>Collected from user homepage</i>	
userHomepage	URL of the user's homepage
userName	Same as pinnerName
userLocation	Location of the user
userBio	Bio of the user
userBoardCount	Number of boards created by the user
userPinCount	Total number of pins created by the user
userLikeCount	Total number of likes the user has received
userFollowerCount	Total number of followers of the user
userFollowingCount	Total number of other pinners this user is following