An Investigation of When Japanese Twitter Users Deleted Their Tweets Disclosing Their Personal Information

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Abstract—**Nowadays, many people use a Social Networking Service (SNS). Most SNS users are careful in protecting the privacy of personal information: name, age, gender, address, telephone number, birthday, etc. However, some SNS users disclose their personal information that can threaten their privacy and security even if they use unreal name accounts. In this study, we investigated how these users treated their tweets that potentially threatened their privacy and security, in other words, whether they deleted them or not. We collected 233 cases where Twitter users submitted tweets promising to disclose their personal information and they did so honestly. Then, we investigated when they submitted and deleted their tweets disclosing their personal information. The results of our three-month survey showed that 40 out of the 233 cases were deleted and 50% of them were deleted within three weeks after they were submitted.**

Keywords*–*personal information; Twitter; SNS; privacy risk; unreal name account user.

I. Introduction

Nowadays, many people use a Social Networking Service (SNS) to communicate with each other and try to enlarge their circle of friends. SNS users are generally concerned about potential privacy risks [1]. To be specific, they are afraid that unwanted audiences will obtain information about them or their families, such as where they live, work, and play. As a result, SNS users are generally careful in disclosing their personal information. They disclose their personal information only when they think the benefits of doing so are greater than the potential privacy risks. However, some SNS users, especially young users, disclose their personal information on their profiles, for example, real full name, gender, hometown and full date of birth, which can potentially be used to identify details of their real life, such as their social security numbers. In order to discuss this phenomenon, many researchers investigated how much and which type of information are disclosed in SNSs, especially on Facebook [2] [3]. Researchers might think that personal information disclosed on Facebook is reliable, or it is possible to check whether personal information disclosed on Facebook is true. This is because

- Facebook users are required to register and disclose their real names when they first start using Facebook.
- Facebook users would be criticized by their friends if they disclose their personal information dishonestly.

On the other hand, a small number of researchers investigated how much and which type of information is disclosed by unreal name account users, such as Twitter users. Researchers might think that personal information disclosed by unreal name account users is unreliable. This is because

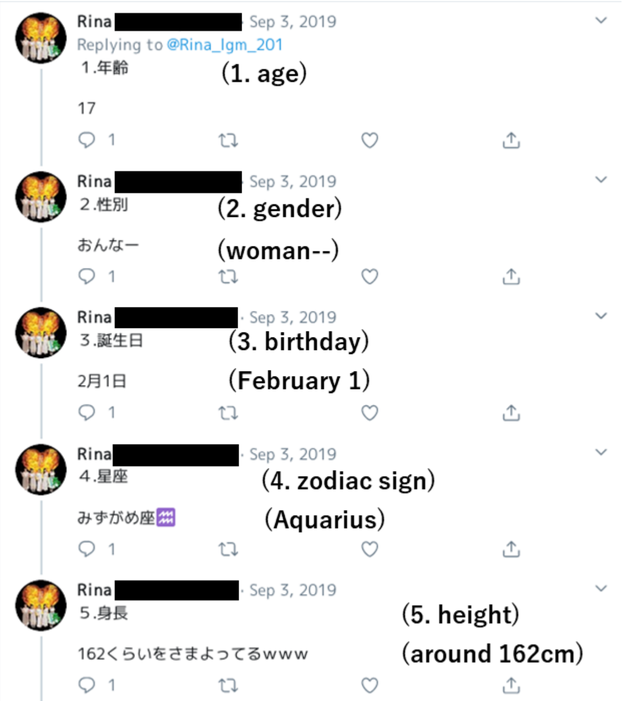
- nobody criticizes unreal name account users when they disclose their personal information dishonestly.
- true personal information can threaten their privacy and security even if they use unreal name accounts.

As a result, many of us think that it is natural for unreal name account users not to disclose their personal information honestly. However, Watanabe, Nishimura, Chikuki, Nakajima, and Okada reported that many unreal name Twitter users seemingly disclosed their personal information honestly [4]. It shows that we do not understand well what unreal name account users think about disclosing their personal information. To discuss this problem, it is important to investigate when and how they submit and delete their messages disclosing their personal information.

The rest of this paper is organized as follows: In Section II, we survey the related works. In Section III, we show how to collect tweets where submitters seemingly disclosed their personal information honestly. In Section IV, we analyze when and how these tweets were submitted and deleted, and discuss how long submitters interacted with audiences by disclosing their personal information and when they could not overlook their potential privacy risks. Finally, in Section V, we present our conclusions.

II. Related work

Personally identifiable information is defined as information which can be used to distinguish or trace an individual's identity such as social security number, biometric records, etc. alone, or when combined with other information that is linkable to a specific individual, such as date and place of birth, mother's maiden name, etc. [5] [6]. Internet users are generally concerned about unwanted audiences obtaining personal information. Fox et al. reported that 86% of Internet users are concerned that unwanted audiences will obtain information about them or their families [1]. Also, Acquisti and Gross reported that students expressed high levels of concern for general privacy issues on Facebook, such as a stranger finding out where they live and the location and schedule of their classes, and a stranger learning their sexual orientation, name of their current partner, and their political affiliations [2]. However, Internet users, especially young users, tend to disclose personal information on their profiles, for example, real full name, gender, hometown and full date of birth, which can potentially be used to identify details of their real life, such as their social security numbers. As a result, many researchers discussed the reasons why young users willingly disclose personal information on their SNS profiles. Dwyer



Rina [redacted] · Sep 3, 2019
Replying to @Rina_lgm_201
1.年齢 (1. age)

17

1

Rina [redacted] · Sep 3, 2019
2.性別 (2. gender)

おんなー (woman--)

1

Rina [redacted] · Sep 3, 2019
3.誕生日 (3. birthday)

2月1日 (February 1)

1

Rina [redacted] · Sep 3, 2019
4.星座 (4. zodiac sign)

みずがめ座♒ (Aquarius)

1

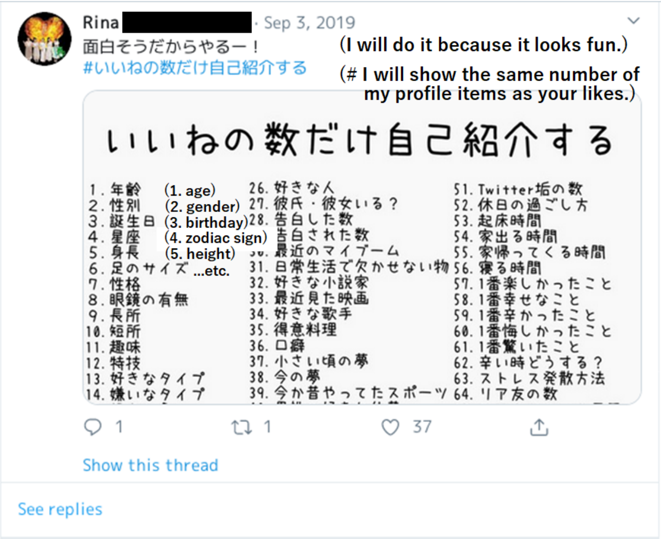
Rina [redacted] · Sep 3, 2019
5.身長 (5. height)

162くらいをさまよってるwww (around 162cm)

1

Figure 1. An unreal name account user, *Rina*, disclosed her personal profile items in her tweets.

concluded in her research that privacy is often not expected or undefined in SNSs [7]. Barnes argues that Internet users, especially teenagers, are not aware of the nature of the Internet and SNSs [3]. Hirai reported that many users had troubles in SNSs because they never thought that strangers observed their communication with their friends [8]. Viseu et al. reported that many online users believe the benefits of disclosing personal information in order to use an Internet site is greater than the potential privacy risks [9]. On the other hand, Acquisti and Gross explain this phenomenon as a disconnection between the users' desire to protect their privacy and their actual behavior [2]. Also, Livingstone points out that teenagers' conception of privacy does not match the privacy settings of most SNSs [10]. Joinson et al. reported that trust and perceived privacy had a strong affect on individuals' willingness to disclose personal information to a website [11]. Also, Tufekci found that concern about unwanted audiences had an impact on whether or not students revealed their real names and religious affiliation on MySpace and Facebook [12]. The authors also think that most students are seriously concerned about their privacy and security. However, they often underestimate the risk of their online messages and submit them. For example, Watanabe, Onishi, Nishimura, and Okada reported that many students submit tweets concerning school events and these tweets may give a chance to other people, including unwanted audiences, to distinguish which schools students go to [13]. Watanabe, Nishimura, Chikuki, Nakajima, and Okada also focused on unreal name Twitter users who promised to disclose their personal profile items, analyzed the details of their personal profile items disclosed by themselves, especially their ages, genders, and heights, and showed that most of the submitters disclosed their ages, genders, and heights honestly [4].



Rina [redacted] · Sep 3, 2019
面白そうだからやるー！ (I will do it because it looks fun.)
#いいねの数だけ自己紹介する (# I will show the same number of my profile items as your likes.)

いいねの数だけ自己紹介する

1. 年齢 (1. age)
2. 性別 (2. gender)
3. 誕生日 (3. birthday)
4. 星座 (4. zodiac sign)
5. 身長 (5. height)
6. 足のサイズ ...etc.
7. 性格
8. 眼鏡の有無
9. 長所
10. 短所
11. 趣味
12. 特技
13. 好きなタイプ
14. 嫌いなタイプ

26. 好きな人
27. 彼氏・彼女いる？
28. 告白した数
告白された数
30. 最近のマイブーム
31. 日常生活で欠かせない物
32. 好きな小説家
33. 最近見た映画
34. 好きな歌手
35. 得意料理
36. 口癖
37. 小さい頃の夢
38. 今の夢
39. 今か昔やってたスポーツ

51. Twitter垢の数
52. 休日の過ごし方
53. 起床時間
54. 家出る時間
55. 家帰ってくる時間
56. 寝る時間
57. 1番楽しかったこと
58. 1番幸せなこと
59. 1番辛かったこと
60. 1番悔しかったこと
61. 1番驚いたこと
62. 辛い時どうする？
63. ストレス発散方法
64. リア友の数

1 1 37

Show this thread

See replies

Figure 2. A tweet promising to disclose the same number of submitters' personal profile items as likes to it.

III. A COLLECTION OF TWEETS DISCLOSING SUBMITTERS' PERSONAL INFORMATION

It is difficult to collect tweets disclosing submitters' personal information, such as tweets in Figure 1, directly. To solve this problem, we focused on tweets where submitters promised their followers to disclose the same number of their own personal profile items as likes to their tweets. Figure 2 shows a tweet submitted by *Rina* on September 3, 2019. Both in Figure 1 and Figure 2, her screen name is redacted for privacy. Figure 2 shows that *Rina* promised her followers to disclose the same number of her personal profile items as likes to her tweet. Actually, *Rina* submitted 35 replies disclosing her personal profile items to her tweet shown in Figure 2 from September 3 to 9, 2019. The five tweets shown in Figure 1 were the first five replies submitted by *Rina* to her tweets shown in Figure 2. As of November 20, 2019, we confirmed that 37 likes were given to her tweet shown in Figure 2. Watanabe, Nishimura, Chikuki, Nakajima, and Okada reported that Twitter users seemingly disclosed their personal information honestly when they promised to do it, such as *Rina*'s tweet in Figure 2 [4]. As a result, it is easy to collect tweets disclosing submitters' personal profile items when we collect tweets promising to disclose submitters' personal profile items. The reasons why many Twitter users submitted tweets promising to disclose their personal profile items might be

- they thought they looked fun,
- they wanted to draw attention, and
- they wanted to know how much attention was paid to their tweets.

In other words, they seemingly felt like they were taking part in a game. As a result, most of them kept their promises, like a game rule, and disclosed the same number of their own personal profile items as likes to their tweets. Also, they often used the same sentence in their tweets, like a game password, as shown in Figure 2, *I will show the same number of my profile items as your likes*. In order to collect tweets promising

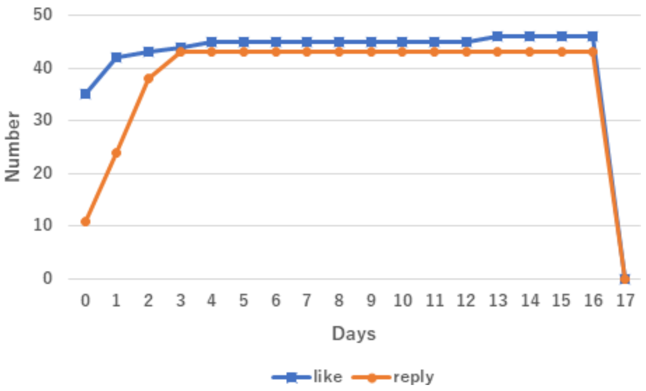


Figure 3. The changes of likes and replies to *okazu_a5*'s December 18, 2020 tweet promising to disclose her personal information.

to disclose submitters' personal profile items, we used the shared sentence as key to collect them. To be specific, we collected these tweets by using twport [14]. Twport helps us to collect tweets where the given sentence is used. By using twport, we collected 233 Japanese tweets promising to disclose submitters' personal information. These tweets were submitted from October 3, 2020 to December 20, 2020. We observed the obtained tweets, likes to them, and their replies once a day at midnight from October 3, 2020 to January 7, 2021.

IV. An analysis of tweets disclosing submitters' personal information

Most of us might think that it is difficult to determine whether unreal name account users disclosed their personal information honestly, and so, it is useless to investigate them. However, Watanabe, Nishimura, Chikuki, Nakajima, and Okada found many unreal name Twitter users who seemingly disclosed their personal information honestly [4]. As a result, we have a chance to investigate unreal name account users who disclosed their personal information on Twitter. In this section, we investigate when and how unreal name Twitter users submitted and deleted their tweets seemingly disclosing their personal information honestly. We think the result shows what they thought about disclosing their personal information honestly. To be specific, we survey Twitter users who promised to disclose their personal information and investigate

- periods from promising to disclose their personal information to deleting their tweets,
- periods from promising to disclose their personal information to submitting their last replies disclosing them, and
- periods from submitting their last replies to deleting their tweets.

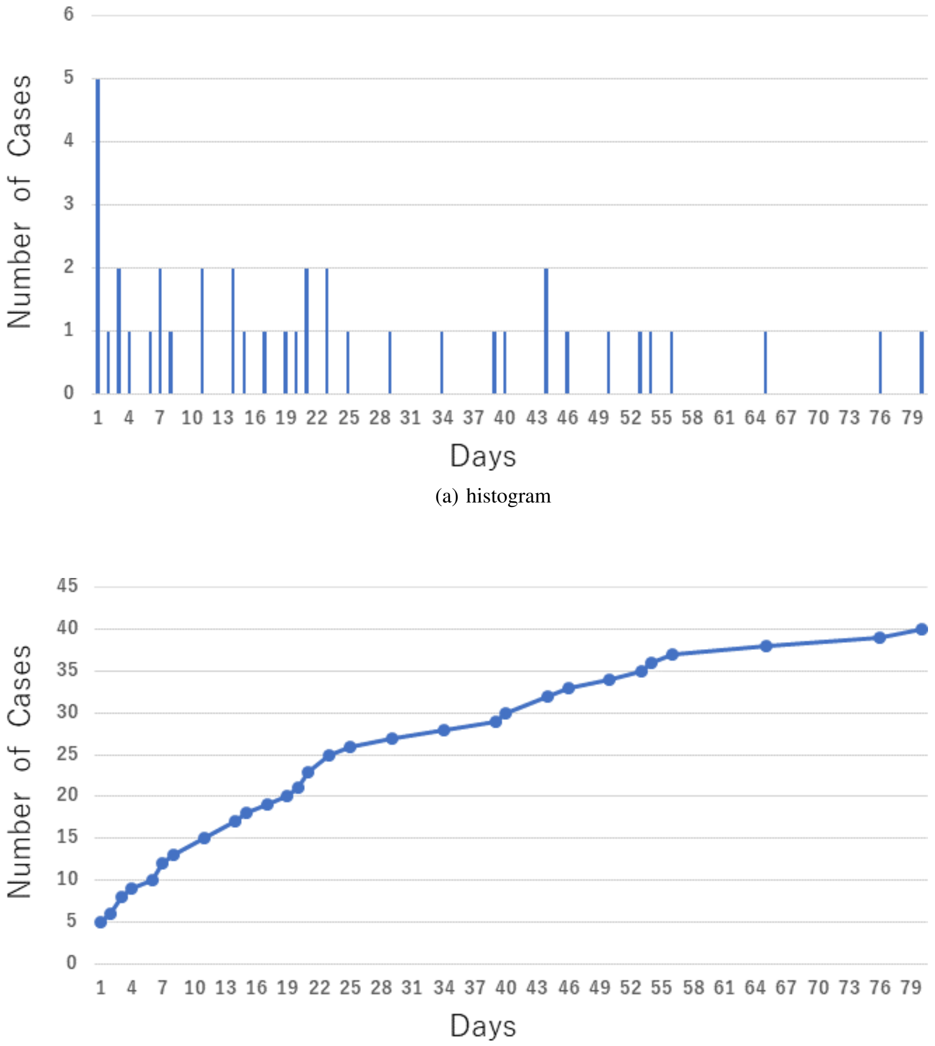
Let us consider one example. A Twitter user, *okazu_a5*, submitted a tweet promising her followers to disclose the same number of her own personal profile items as likes on December 18, 2020. Figure 3 shows when *okazu_a5* received likes from audiences and submitted her replies disclosing her personal information. We detected her tweet promising to disclose her personal information at midnight on December 19, 2020, and recorded that she received 35 likes and submitted 10 replies on December 18, 2020 (Day 0 in Figure 3). By December 20, 2020 (Day 2), she received 43 likes and submitted 43 replies disclosing her personal information. Her last reply was submitted on December 21, 2020 (Day 3). After December 21, 2020, she received three more likes, however, submitted no more replies. Figure 3 also shows when *okazu_a5* deleted her tweets: She deleted them on January 4, 2021 (Day 17). She also deleted her tweet promising to disclose her personal information, and so, the number of likes was reduced to zero. In this case, the period from promising to disclose her personal information to deleting her tweets was 17 days. Also, the period from promising to submitting her last reply was three days. The period from submitting her last reply to deleting her tweets was 14 days.

A. *Periods from promising to deleting tweets*

At first, we discuss the periods from promising to disclose submitters' personal information to deleting their tweets. We found 40 cases where submitters deleted their tweets disclosing their personal information. These 40 cases accounted for 17% of all the cases in the survey. Figure 4 shows the histograms of the periods from promising to disclose submitters' personal information to deleting their tweets. As shown in Figure 4 (a), the most popular day to delete tweets disclosing submitters' personal information was Day 1, the next day when they promised to do it. As shown in Figure 4 (b), 25%, 50%, and 80% of the 40 cases were deleted within four days, three weeks, and six weeks, respectively. One thing to note is that we observed tweets once a day at midnight. As a result, we could not collect cases where submitters deleted their tweets before the end of the day when they submitted tweets promising to disclose their personal information. As mentioned, the most popular day to delete tweets disclosing submitters' personal information was Day 1, the next day when they promised to do them. We think there were many cases where submitters deleted their tweets on Day 0, in other words, before the end of the day when they submitted tweets promising to disclose their personal information.

B. *Periods from promising to submitting last replies*

Next, we discuss the periods from promising to disclose submitters' personal information to submitting their last replies disclosing them. We think that they regarded these periods as times to interact with their audiences. We found 206 cases where submitters submitted replies disclosing their personal information. These 206 cases accounted for 88% of all the cases in the survey. Figure 5 shows the histograms of the periods from promising to submitting their last replies. As shown in Figure 5 (a), the most popular day to submitting their last replies was Day 0, the day when they promised to disclose their personal information. Furthermore, as shown in Figure 5 (b), in 75 % of the 206 cases, last replies were submitted in Day 0 or Day 1. In more than 90 % of the cases, the periods from promising to submitting last replies, in other words, the periods to interact with their audiences, were within four days. On the other hand, there were 27 cases where we could not find replies, however, it does not mean that submitters submitted no replies in these cases. As mentioned, we observed tweets once a day at midnight. We could not detect their replies submitted on the day when they deleted their tweets.



(a) histogram

(b) cumulative histogram

Figure 4. The periods from promising to disclose submitters' personal information to deleting their tweets.

C. Periods from submitting last replies to deleting tweets

Finally, we discuss the periods from submitting last replies to deleting tweets disclosing submitters' personal information. We think these periods show how long it took for submitters to think that they could not overlook their potential privacy risks. We found 31 cases where submitters submitted replies disclosing their personal information and deleted them. These 31 cases accounted for 13% of all the cases in the survey. Figure 6 shows the histograms of the periods from submitting last replies to deleting tweets disclosing submitters' personal information. As shown in Figure 6 (a), the most popular day to deleting their tweets after submitting last replies was Day 1, the next day when they submitted last replies. As shown in Figure 6 (b), in 50 % and 80 % of the 31 cases, their tweets were deleted within 18 days and 42 days after submitting last replies, respectively. In this survey, there were nine cases where we found no replies before submitters deleted their tweets promising to disclose their personal information. However, it does not mean that submitters submitted no replies in these cases. This is because, as mentioned, we could not detect replies submitted on the day when submitters deleted their tweets.

V. Conclusion

It is important to investigate how unreal name account users treat their SNS messages that potentially threaten their privacy and security. In this paper, we investigated how Twitter users treated their tweets seemingly disclosing their personal information. To be specific, we investigated when submitters deleted their tweets disclosing their personal information after they promised to do it. The results of our three-month survey show that 18 % of the surveyed cases were deleted, and 25 %, 50 %, and 80 % of the cases were deleted within four days, three weeks, and six weeks, respectively. The most popular day to delete tweets disclosing submitters' personal information was the next day when they promised to do it. Furthermore, in 90 % of the surveyed cases, submitters interacted with audiences within four days. We intend to survey tweets disclosing submitters' personal information many times

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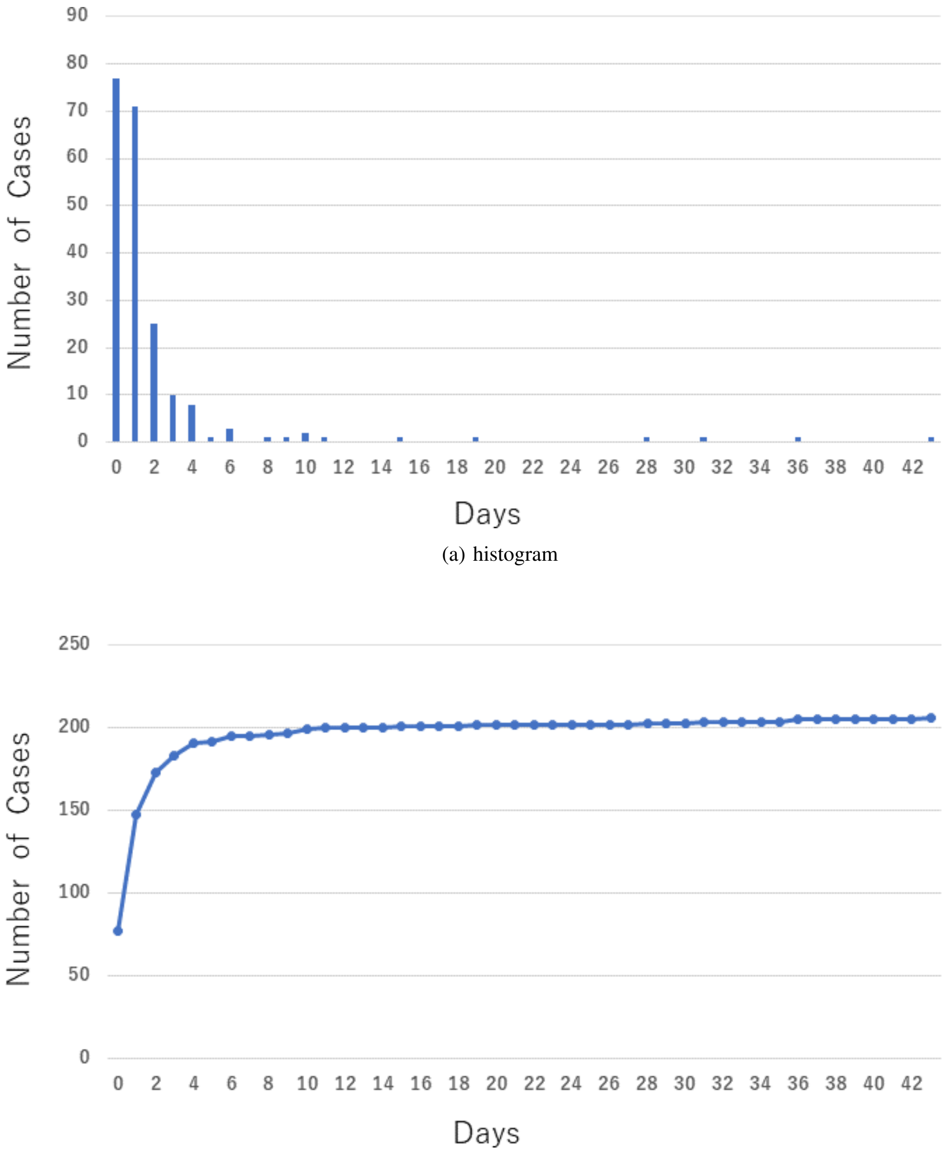


(a) histogram

(b) cumulative histogram

Figure 5. The periods from promising to disclose submitters' personal information to submitting their last replies disclosing them.

in a day. This is because we do not want to miss tweets submitted on the day when submitters deleted them.

References

[1] S. Fox et al., Trust and Privacy Online: Why Americans Want to Rewrite the Rules, The Pew Internet & American Life Project, 2000. [Online]. Available: http://www.pewinternet.org/2000/08/20/trust-and-privacy-online/ [accessed: 2021-06-10]

[2] A. Acquisti and R. Gross, "Imagined communities: Awareness, information sharing, and privacy on the facebook," in Proceedings of the 6th International Conference on Privacy Enhancing Technologies, ser. PET'06. Berlin, Heidelberg: Springer-Verlag, 2006, pp. 36–58. [Online]. Available: https://doi.org/10.1007/11957454_3 [accessed: 2021-06-10]

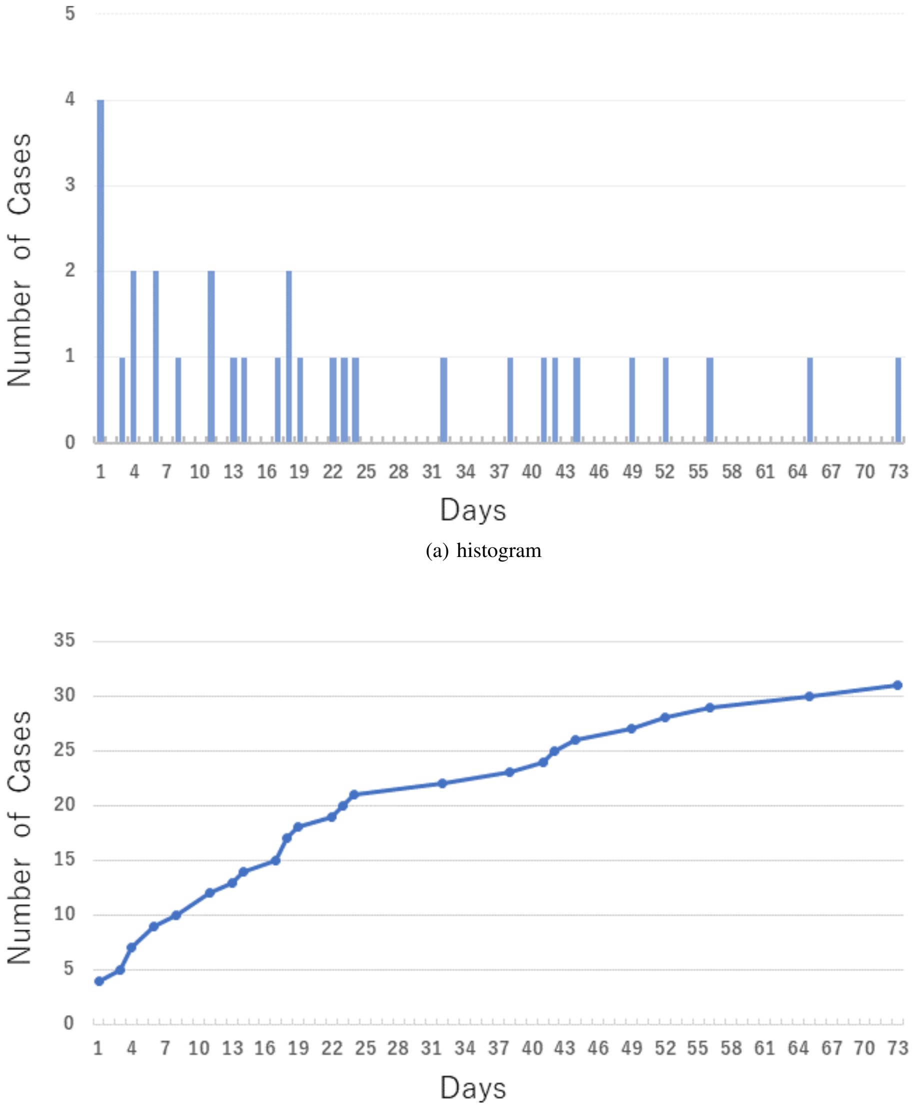
[3] S. B. Barnes, "A privacy paradox: Social networking in the United States." First Monday, vol. 11, no. 9, 2006. [Online]. Available: http://firstmonday.org/article/view/1394/1312 [accessed: 2021-06-10]

[4] Y. Watanabe, H. Nishimura, Y. Chikuki, K. Nakajima, and Y. Okada, "An investigation of twitter users who disclosed their personal profile items in their tweets honestly," in Proceedings of the Sixth International Conference on Human and Social Analytics (HUSO 2020), Oct 2020, pp. 20–25. [Online]. Available: http://www.thinkmind.org/index.php?view=article&articleid=huso_2020_1_40_80035 [accessed: 2021-06-10]

[5] C. Johnson III, Safeguarding against and responding to the breach of personally identifiable information, Office of Management and Budget Memorandum, 2007. [Online]. Available: https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/omb/memoranda/fy2007/m07-16.pdf [accessed: 2021-06-10]

[6] B. Krishnamurthy and C. E. Wills, "On the leakage of personally identifiable information via online social networks," Computer Communication Review, vol. 40, no. 1, 2010, pp. 112–117. [Online]. Available: https://doi.org/10.1145/1672308.1672328 [accessed: 2021-06-10]

[7] C. Dwyer, "Digital relationships in the "myspace" generation: Results



(a) histogram

(b) cumulative histogram

Figure 6. The periods from submitting last replies disclosing submitters' personal information to deleting their tweets.

from a qualitative study," in Proceedings of the 40th Annual Hawaii International Conference on System Sciences, ser. HICSS '07. Washington, DC, USA: IEEE Computer Society, 2007, p. 19. [Online]. Available: https://ieeexplore.ieee.org/abstract/document/4076409 [accessed: 2021-06-10]

[8] T. Hirai, "Why does "Enjyo" happen on the Web? : An Examination based on Japanese Web Culture," Journal of Information and Communication Research, vol. 29, no. 4, mar 2012, pp. 61–71. [Online]. Available: http://doi.org/10.11430/jsicr.29.4_61 [accessed: 2021-06-10]

[9] A. Viseu, A. Clement, and J. Aspinall, "Situating privacy online: Complex perception and everyday practices," Information, Communication & Society, 2004, pp. 92–114. [Online]. Available: https://doi.org/10.1080/1369118042000208924 [accessed: 2021-06-10]

[10] S. Livingstone, "Taking risky opportunities in youthful content creation: teenagers' use of social networking sites for intimacy, privacy and self-expression." New Media & Society, vol. 10, no. 3, 2008, pp. 393–411. [Online]. Available: https://journals.sagepub.com/doi/10.1177/1461444808089415 [accessed: 2021-06-10]

[11] A. N. Joinson, U.-D. Reips, T. Buchanan, and C. B. P. Schofield, "Privacy, trust, and self-disclosure online." Human-Computer Interaction, vol. 25, no. 1, 2010, pp. 1–24. [Online]. Available: https://www.tandfonline.com/doi/abs/10.1080/07370020903586662 [accessed: 2021-06-10]

[12] Z. Tufekci, "Can You See Me Now? Audience and Disclosure Regulation in Online Social Network Sites," Bulletin of Science, Technology & Society, vol. 28, no. 1, 2008, pp. 20–36. [Online]. Available: https://journals.sagepub.com/doi/abs/10.1177/0270467607311484 [accessed: 2021-06-10]

[13] Y. Watanabe, H. Onishi, R. Nishimura, and Y. Okada, "Detection of school foundation day tweets that can be used to distinguish senders' schools," in Proceedings of the Eleventh International Conference on Evolving Internet (INTERNET 2019), Jun 2019, pp. 34–39. [Online]. Available: https://www.thinkmind.org/index.php?view=article&articleid=internet_2019_2_30_40026 [accessed: 2021-06-10]

[14] yager. twport. [Online]. Available: https://twport.com/ [accessed: 2021-06-10]