Graphicon Evolution on the Chinese Social Media Platform BiliBili

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Abstract

This study examines the evolutionary trajectory of graphicons in a 13-year corpus of comments from BiliBili, a popular Chinese video-sharing platform. Findings show that emoticons (kaomoji) rose and fell in frequency, while emojis and stickers are both presently on the rise. Graphicon distributions differ in comments and replies to comments. There is also a strong correlation between the types of graphicons used in comments and their corresponding replies, suggesting a priming effect. Finally, qualitative analysis of the 10 most-frequent kaomojis, emojis, and stickers reveals a trend for each successive graphicon type to become less about emotion expression and more integrated with platform-specific culture and the Chinese language. These findings lend partial support to claims in the literature about graphicon evolution.

1 Introduction

Graphicons are graphical icons used in text-based computer-mediated communication (Herring & Dainas, 2017). From the first use of :-) in 1982 (Evans, 2017) to the varied and colorful stickers on social media today, graphicons have changed dramatically. ASCII emoticons, the first graphicons, were composed of keyboard symbols and were typically used for expressing emotion. Emoticons in the Western context emphasize the mouth and are read at a 90-degree angle to the words (e.g., :-) for a smiley), while kaomoji (literally 'face letters'), a style of emoticon that arose in Japan and also became popular in China, are read in-line with words and emphasize the eyes (e.g., ^_^ or ^^) (Katsuno & Yano, 2002). Kaomojis express not only emotions, but also actions, objects, and story lines.[1]

Emojis were adopted globally after Apple included them in the iPhone in 2010 (Danesi, 2016). Emoji are more colorful, more representational (as opposed to schematic), and express a wider array of concepts than ASCII emoticons. Stickers, which were introduced a few years after emojis, take these trends further (Konrad et al., 2020). Usually larger than emoticons and emojis, stickers may include text; this is typical of stickers used on Chinese social media (e.g., see the examples in de Seta, 2018; Ge, 2020). Stickers are character-driven illustrations or animations that are typically offered as thematic sets on social media platforms (de Seta, 2018), although social media users in China may also create their own stickers (Ge, 2020).

Extensive studies have addressed the meaning, function, and usage of each type of graphicon in different cultural contexts (e.g., Al Rashdi, 2018; Ge, 2020; Ge & Herring, 2018; Logi & Zappavigna, 2021; Sampietro, 2019). Interrelations among the three types, however, have not attracted much attention until recently. Studies have explored the uses of the three graphicon types (de Seta, 2018), user perceptions of the three types (Tang & Hew, 2018), and the evolutionary trends they follow (Konrad et al., 2020). While these studies provide rich insights, the first two mainly used qualitative methods, and the latter analyzed contemporary data, despite making diachronic claims. Their findings remain to be verified by empirical comparison of graphicon use in longitudinal data.

2 Background

2.1 Graphicon evolution

As graphicons continue to grow in popularity worldwide and shape social media and mobile communications, it is important to understand

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[1] http://kaomoji.ru/en/, retrieved April 5, 2022.

how and why they evolve, and the implications of their evolution for where they are headed in the future. Konrad et al. (2020) posit that graphicons tend to follow an evolutionary trajectory consisting of three phases: an early phase, a high (or peak) phase, and a phase of decline and/or conventionalization. One of the main criteria for determining which phase a graphicon is currently in is frequency of use; another is pragmatic changes in graphicon use. For Western graphicons, according to Konrad et al. (2020), emoticons are in the third phase, emoji are in the second phase, and stickers are in the first phase. The authors predict that emoji will eventually reach the third phase, following the path of emoticons, and that stickers may eventually reach the second (and eventually the third) phase and overtake emoji in popularity.

The history of ASCII emoticons and emoji provide evidence in partial support of this trajectory. Pavalanathan and Eisenstein (2016) analyzed emoticons and emoji on Twitter in the 17 months after emoji were first introduced on the platform. They found that emoticon use dramatically decreased as emoji use increased. Furthermore, a number of studies have reported that emoticons have become conventionalized as a type of punctuation (Markman & Oshima, 2007; Provine et al., 2007). That is, emoticons have declined in frequency of use and have become conventionalized, evidence that they are in the third phase of Konrad et al.'s (2020) evolutionary trajectory. Meanwhile, emojis in the West remain at the peak of their popularity.

While this evidence is compelling, it is limited. As yet no comparable evidence exists for all three graphicon types, or for the relationship of emojis to stickers. Konrad et al. (2020) interviewed and surveyed Facebook Messenger users about their use of emoji and stickers, identifying many areas of overlap in function of the two graphicons. They also noted some differences: participants described emojis as better suited for expressing emotion, whereas stickers were considered more specific and better at expressing the user's personality. However, Konrad et al. (2020) did not quantify emoji and sticker use over time. What is needed is a longitudinal corpus of data involving the use of emoticons, emojis, and stickers, in order to be able to map the evolutionary trajectory of the three types of graphicons.

2.2 Graphicon on Chinese social media

Graphicons on Chinese social media are distinctive in their design and usage. They are designed in creative ways by and for Chinese social media users to enliven conversations (Ge, 2020), resolve the tension between the openness of social media and constraint-bounded social norms (Zhang et al., 2021), and playfully subvert reality and avoid internet surveillance and censorship (Li & Zhu, 2019). The design of graphicons carries rich cultural messages (de Seta, 2018) and interacts with the Chinese national character (Li & Zhu, 2019).

Users of Chinese social media use the umbrella term 表情 *Biaoqing* (a contraction of 表达情感 'expressing emotions') for all types of graphicons, suggesting a popular understanding of the shared usage of graphicons for emotion expression (de Seta, 2018). Yet different types of *Biaoqing* are distinguished. Kaomojis were introduced to Chinese users in the mid-1990s; emojis were first used in the early 2000s in Chinese discussion boards, instant messaging services, and social networking web sites; and stickers first became available on the QQ and WeChat platforms in 2012 (de Seta, 2018). As in the West, all three types of graphicons are currently available for use.

In terms of frequency of use, Konrad et al. (2020) suggest that graphicon evolution is more advanced in Asia than in the West. They predict that stickers should be catching up with or surpassing emoji use in Asia, in contrast to the West, where stickers are still much less popular than emojis. The evidence to support this prediction so far is limited and primarily anecdotal. Fifteen years ago, Markman and Oshima (2007) reported that the use of kaomojis as punctuation was more conspicuous in Japan than the United States. Emojis are used more frequently by Chinese social media users compared to their Western counterparts (Zhang et al., 2014); however, comparable statistics about the frequency of sticker use have not been found. Several studies have pointed out that stickers are now very popular among Chinese social media users (e.g., de Seta, 2018; Ge, 2020), but their frequency has not been compared with that of emojis. In this paper, we quantify the relative frequency of the three different types of graphicons in Chinese social media over time.

2.3 Research questions

Based on the gaps delineated in the above literature review, this study addresses the following research questions:

RQ1: What are the relative frequencies of each type of Chinese graphicon, and how have their frequencies changed over time?

RQ2: What trends are evident from the most frequently-used graphicons of each type?

3 Methodology

3.1 Data

Our corpus is composed of 13 years of longitudinal data from the BiliBili platform. BiliBili is a video-sharing platform that, like YouTube, allows users to post comments below the videos and also features short *danmu* messages that are overlaid on the video itself.

The BiliBili platform was chosen for several reasons. First, it is one of the most popular Chinese social media platforms. The users of the platform are mainly under the age of 35,[2] and its average monthly active users reached 272 million (almost one-fifth of the Chinese population) by the end of 2021.[3] Second, the comments can include emoticons, emojis, and stickers (although stickers did not become available on the platform until 2016). Third, BiliBili is well-established, having been launched in 2009 as a platform for sharing ACG-related (Anime, Comics, and Games) content,[4] and it has expanded over the years to cover more general topics. Last and most relevant for this study, the platform preserves a historical record of the comments posted below the videos, including the graphicons in the comments, and the comments can be captured automatically. We considered other popular Chinese social media platforms (e.g., Sina Weibo, WeChat) as possible data sources, but none of them would have allowed automatic capturing of longitudinal data containing all three graphicon types.

The data consist of comments and replies to comments (hereafter, replies) from the channel of BiliBili's annual Spring Festival Gala Show

(hereafter, the BiliBili show).[5] This channel was chosen because it is the only one that includes comments dating back to 2010, and the comments are all on videos on the same topic. The BiliBili show started in 2010 and soon became an important annual event on the platform.[6] The show consists of a mash-up video of content provided by professional users to celebrate the Chinese New Year, and is released on the eve of the Chinese New Year. It is considered by BiliBili users to be the online equivalent of the Spring Festival Gala produced by the China Media Group, which is broadcast annually on Chinese New Year's Eve and has the largest audience of any entertainment show in the world. Besides the show videos, the BiliBili show channel includes a number of videos related to the gala show, such as trailers, teasers, and outtakes. These videos include older comments and replies, like the gala show videos do, and are thus included in our data.

Comments and replies from all 42 videos available in the channel, covering the years from 2010 to 2022, were captured and stored in February 2022 using Python and the Scrapy tool. A total of 1,031,183 messages (including both comments and replies) were collected.

3.2 Methods

The three types of graphicons in the corpus were identified using different methods. The emoticons in our corpus are Japanese-style kaomoji. The recognition of kaomojis was carried out by a semi-supervised process of deep learning and manual identification. Manual annotation of kaomojis in a sample corpus was done, and this was used to train deep learning models of BiLSTM and CRF (Qin et al., 2019) to learn and develop a list of kaomoji types. Kaomoji types identified by the algorithm were checked manually. Three rounds of manual and machine iteration were conducted before a final set of kaomoji types was obtained for the purpose of examining kaomoji use in the corpus.

The set of sticker types was developed based on the package of BiliBili stickers available on GitHub.[7] The set of Yellow Faces [小黄脸] from the GitHub sticker package (see Figure 1)

[2] https://socialbeta.com/t/reports-bilibili-marketing-planning-2021-02-22, retrieved April 4, 2022.

[3] https://m.jiemian.com/article/7167482.html, retrieved April 4, 2022.

[4] https://zh.wikipedia.org/wiki/Bilibili, retrieved April 4, 2022.

[5] https://space.bilibili.com/1868902080

[6] https://www.bilibili.com/read/cv1069082, retrieved April 5, 2022.

[7] https://github.com/amtoaer/bilibili-stickers, retrieved February 25, 2022. The GitHub collection was updated on January 31, 2022; all comments and replies in our data were

Figure 1: Examples from the set of Yellow Faces.

contains a number of graphicons that we reclassified as emojis, as described below. The set includes three kinds of images: 1) iconic representations of objects (e.g., Koi [锦鲤], the second from the top left in Figure 1); 2) yellow faces that are more elaborated than Unicode emojis (e.g., Astonished face [惊讶], the second from the top right; and 3) stickers that are character-driven (e.g., the Laigu [来古] series of three girls expressing contemplation [沉思] (the third from the bottom right), dullness [呆滞] (second from the bottom right), and doubt [疑问] (bottom right). However, the iconic images and yellow faces are displayed in the corpus the same size as emojis, which are smaller than stickers, and they are not character-driven. Therefore, we removed them from the sticker package and added them to the set of emojis prior to analysis. The set of emojis also includes Unicode emojis from the Python emoji module with a character length of 1.

Using the above methods, a list of the three types of graphicons was derived for obtaining graphicon occurrences in the corpus. The frequencies of graphicon types and tokens in each year were obtained. We also conducted a thematic content analysis of the 10 most frequently occurring graphicons of each type in the corpus.

4 Findings

The findings are presented in two parts. The first part reports the frequency distribution of the graphicons over time. The second part presents a qualitative analysis of the most frequently used graphicons in terms of what they suggest about trends in Chinese graphicon evolution.

4.1 Frequency distribution of graphicons

Three types of graphicon were identified in the corpus: kaomoji, emoji and sticker. Definitions and descriptions of each types are provided in the
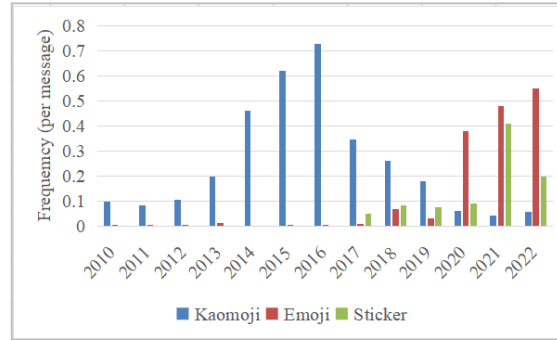

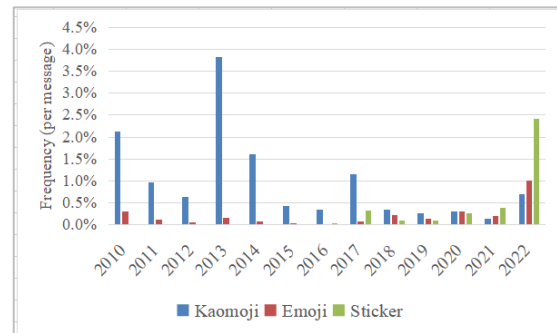Figure 2: Frequencies (tokens) of three graphicons.

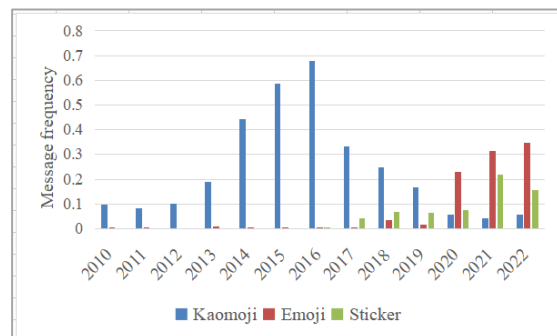Figure 3: Frequencies (types) of three graphicons.

Figure 4: Frequencies of messages containing at least one graphicon.

Introduction and in Section 3.2.

The frequency of each graphicon type was normalized as a ratio in relation to the number of messages in the corpus. This was done because some messages lack text and include only graphicons. Normalized frequencies of all graphicon tokens for each of the 13 years are shown in Figure 2, and normalized frequencies of graphicon types are in Figure 3.

These statistics provide partial support for the evolutionary trajectory proposed by Konrad et al. (2020). The use of kaomojis shows a clear trajectory of an early phase, a high phase, and decline. The peak of kaomoji tokens appears in

2016, and the peak of kaomoji types comes earlier in 2013.

Moreover, kaomojis have been replaced by emojis and stickers. Emojis experienced a dramatic increase in occurrences in the most recent three years (the red bars in 2020, 2021 and 2022 in Figure 2), and the types of emoji also show a notable uptick in 2022 (the red bars in 2020, 2021 and 2022 in Figure 3). The picture for stickers is somewhat less clear. After stickers appeared on BiliBili in 2016, their usage increased and rose sharply in 2021. Although the frequency of sticker tokens dropped off in 2022, the types increased steeply. That is, fewer stickers were used in 2022 than in 2021, yet many more varieties of stickers appear in the 2022 data.

It is possible that stickers use has started to decline in 2022. But it is also possible that the sharp rise in 2021 is due to unconventional usage of graphicons by the large number of new users who joined BiliBili during the Covid-19 pandemic. User numbers increased by 55% to 202 million in 2020,[8] as a result of intensive branding promotion of the platform.[9] The new users might have initially used stickers more frequently than older users but gradually accommodated their graphicon use to the norms of the community. The frequencies of messages (comments or replies) that contain at least one of the three types of graphicon is shown in Figure 4. The nearly identical pattern of kaomojis in Figure 2 and Figure 4 suggests that a kaomoji was mostly used only once per message. However, two or more emojis are commonly used in a message. In the statistics from 2022, for example, 55 emojis appear per 100 messages (the red bar in 2022 in Figure 2), but these emoji only appear in 35% of the messages (the red bar in 2022 in Figure 4). Stickers tend to be used once per message in early years (see the similar frequencies in 2016-2020), but they are used on average more than once in 2021 (41 stickers appear per 100 messages, but they appear in only 22% of the messages).

Further, graphicon usage differs in comments and replies, as summarized in Figure 5. Kaomojis and stickers appear more frequently in comments, while emojis are used with similar frequency in comments and replies.
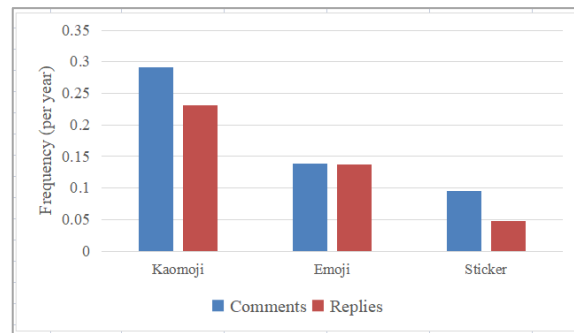

Figure 5: Frequencies (tokens) of three graphicons in comments and replies.
Note: The calculation excludes the data from the years 2010 and 2011, since there were no replies in those years.
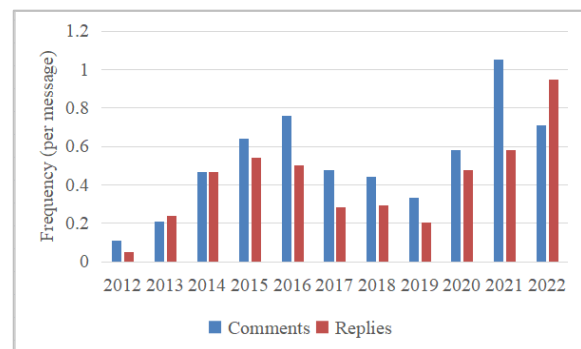

Figure 6: Frequencies of graphicon use in comments and replies.
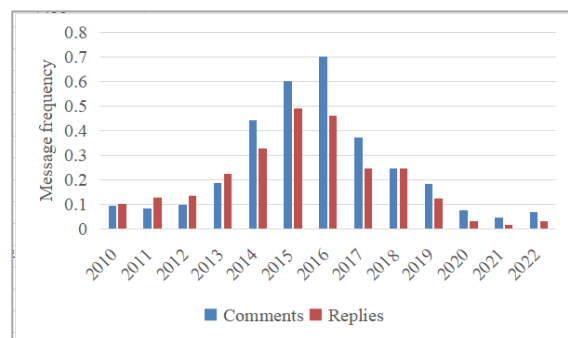*Note: No replies were made in 2010 and 2011.*

Figure 7: Frequencies of comments and replies containing at least one kaomoji.

Meanwhile, as displayed in Figure 6, a consistent pattern is found whereby more graphicons were used in comments than in replies every year except for 2022. It is also worth noting that stickers were available on the platform in 2016, but they were not used in replies until 2018; the reasons for this lag are unclear.

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[8] Graphicon usage of commenters who joined in 2020 is reflected in the data of 2021. This is because the show was released in January 2021, and a majority of comments was made within the first month of the video release.

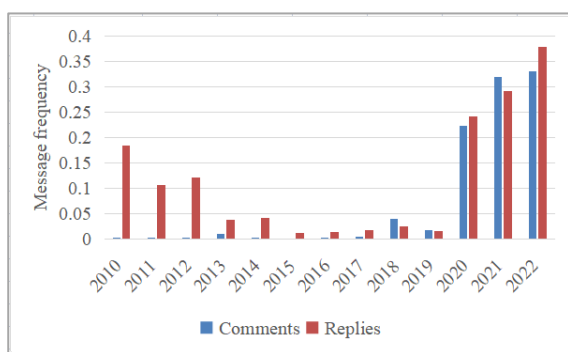[9] https://www.sohu.com/a/452506920_153054, retrieved April 7, 2022.

Figure 8: Frequencies of comments and replies containing at least one emoji.

Another interesting phenomenon is the strong correlation between the frequency of each graphicon type in the comments and their corresponding replies. This is evident for kaomojis in Figure 7 and for emojis in Figure 8. Frequencies for stickers are not presented here because stickers were not available on BiliBili until 2016. The years of the replies in Figures 7 & 8 refer to the year when the corresponding comments were made rather than the year when the replies were made (as in Figure 6). For instance, for a reply made in 2022 to a comment from 2010, the year of the reply was counted as 2010 in Figures 7 & 8 but counted as 2022 in Figure 6. The frequencies of kaomoji usage in comments and replies (Figure 7) show a very similar pattern; the correlation is 0.93. The frequencies of emojis (Figure 8) show a less consistent pattern, but the correlation between comments and replies is still strong at 0.89. The strong correlations between graphicon usage in comments and replies suggest a "priming effect" (Molden, 2014) of graphicon usage, meaning that the occurrences of graphicons in comments have an impact on the usage of graphicons in corresponding replies.

4.2   The top 10 graphicons

Next, we qualitatively examined the most frequently occurring graphicons in the corpus. The top 10 occurrences of each graphicon in each category are listed in Table 1. In general, the progression from kaomojis to emojis to stickers reveals a trend of movement from general emotion expression to meanings localized in the discourse practices of the BiliBili platform.

Kaomojis are borrowed from Japanese to express emotions, and indeed, the most frequently used kaomoji types in our corpus mainly express emotion. Four kaomojis express joy (Nos. 3, 4, 7 & 10). Five kaomojis perform actions with incorporated affect (Nos. 1, 5, 6, 8 & 9). There is no explicit encoding of affect in the kaomojis of cheering (No. 1) or dancing with music (No. 6), but these two actions are strongly conventionally associated with a happy mood.

In contrast, fewer of the 10 most popular emojis focus on emotions. Rather, several of the emojis reference culture-specific information about the New Year's celebration event and the BiliBili platform. Four emojis (Nos. 2, 6, 7 & 9) are for the Chinese new year celebration. Two of them (Nos. 6 & 9) integrate the shape of a TV set, the icon that symbolizes BiliBili, in their design (see Nos. 4 & 5 in stickers). It is worth noting that only one of the popular emojis are Unicode emojis (No. 7, Sparkles), supporting previous findings that platform-specific sets of graphicons are more popular in China than Unicode emojis (de Seta, 2018; Y. Zhang et al., 2021). Even the Unicode (Sparkles) emoji is localized in meaning, in that it is frequently used in Chinese New Year's wishes as a symbolic representation of firecrackers.

Integration with platform discourse practices is most evident in stickers. Four stickers belong to the Popular Words Series (Nos. 1, 2, 3 & 8), which are graphic representations of selected popular expressions from comments or *danmu* (messages that are overlaid on the video itself). In addition, the stickers include two variants of the platform's icon (Nos. 4 & 5 in the "Tiny TV" set) and two virtual spokespersons of BiliBili[10] (Nos. 6 & 10 in the "2233 Girls" set).

The themes expressed by the three types of graphicons are summarized in Table 2. Emotion expression becomes less prominent as we move from kaomoji to emoji and to sticker. In contrast, references to platform discourse and the integration of Chinese characters become more apparent as we move from the older to the newer graphicons. Relatedly, action decreases somewhat. For most of the themes, emoji serves as a transition between kaomoji and sticker.

	Kaomojis	Meaning	Freq	Emojis	Meaning	Freq	Stickers	Meaning	Freq
1	-(°- °)つ口	Cheers	108691		Playful dog face	28495		PWS: Wonderful	27179
2	(=・ω・=)	Cat	19217		Being blessed	19420		PWS: Hooray	16853
3	(̄▽ ̄)	Joy	14668		Cheering for someone	6603		PWS: Obtaining trivia	8041
4	(` ・ω・´)	Joy	12815		Wonderful	6077		Tiny TV set: smile	4920
5	(°∀°)/	Greeting happily	11427		Smile	5740		Tiny TV set: like	4439
6	(⌒ ̄△ ̄)⌒	Dancing with music	7319		Year of the Ox	5599		2233 girls: laugh out loud	4369
7	(⌒▽⌒)	Joy	6642		Sparkles	5230		Happy new year	4318
8	(ノ °口°)ノ (┴┴	Flipping the table	5742		Crying with laughter	5154		PWS: moving glow sticks for someone	3273
9	ε=ε=(ノ≧∇≦)	Moving forward happily	4997		Year of the Rat	4777		2021 gala show	2528
10	⌒(̄▽ ̄)⌒	Joy	4459		Wailing	4198		2233 girls: act cute	1994

Table 1: Top 10 graphicons in the corpus.

Notes: 1) The meanings of most of the kaomojis were derived by referring to the kaomoji dictionary (Kaomoji-Japanese Emoticons, http://kaomoji.ru/en/). The first kaomoji is not found in the dictionary; its meaning was derived from the fact that it is always used together with the Chinese expression 干杯 'cheers/toast'. 2) The kaomojis of Nos. 5, 6, 8 and 9 are a combination of at least two kaomoji elements from the kaomoji dictionary. For example, [°∀°] refers to joy, while [/] refers to a hand waving to greet someone, suggesting that the meaning of [(°∀°)/] is greeting happily. 3) PWS in the sticker category is short for Popular Word Series, the meanings of which can be found on the BiliBili platform: https://www.bilibili.com/read/cv4332187

	Kaomoji	Emoji	Sticker
Emotion	70%	30%	20%
Action	50%	40%	40%
Chinese character	0	10%	40%
New Year's celebration	10%	40%	20%
Platform discourse	10%	20%	100%

Table 2: Themes of the top 10 graphicons.

	Kaomoji	Emoji	Sticker
Graph-icon	(⌒▽⌒)		

Table 3: Graphicon evolution for *smile*.

The trajectory from generalized emotion expression to localized platform discourse practices is illustrated by the example of 'smile' in Table 3. The kaomoji represents smile in an abstract and general way, using ⌒ to indicate eyes and ▽ for nose. The emoji smile is different from the smiles on other Chinese social media platforms such as Weibo and WeChat, but still it is somewhat generic and does not encode any platform information. In contrast, the sticker smile is unique to BiliBili, in that it is embedded in the BiliBili icon of a tiny TV set.

Another example is the concept 'wonderful,' which is expressed with a dog face emoji (No. 4 in emojis; see Table 1) but represented by a combination of the Chinese character 妙 and an exclamation point, an example of the Popular Words Series set of stickers (No. 1 in stickers in Table 1). These examples illustrate that the discourse practices of the platform have increasingly been encoded in graphicons.

5 Discussion

5.1 Research questions revisited

We asked how the frequencies of each of the three types of Chinese graphicons are changing over time and what trends are evident from the most frequently-used graphicons of each type. The use of kaomojis shows a clear trajectory of rising to a peak and then declining. Kaomojis have been replaced by emojis and stickers. These

results support Konrad et al.'s evolutionary trajectory. It is less clear, however, whether stickers are overtaking emoji in frequency of use on BiliBili; rather, both appear to be on the rise. Moreover, in the last three years (2020-2022), emojis were used with high frequency but with a limited number of types, and it is common to find more than one emoji in a message. As for stickers, there is a decrease in tokens but an increase in types. We propose that frequency of type be included as a criterion for determining which phase a graphicon is currently in.

The trend revealed by the most frequently-used graphicons of each type suggests an evolution from general emotion expression to meanings localized in platform discourse practices. This supports Konrad et al.'s (2020) finding that stickers express more specific meanings than emojis.

We also find an increasing integration of Chinese characters in emojis and stickers. The logographic nature of Chinese characters (Li & Zhu, 2019) makes such integration possible. Though we did not find integration of Chinese characters in the most frequently-used kaomojis, Chinese users in the 1990s were inspired by the practice of using keyboard symbols in kaomojis to create unique graphic representations of Chinese characters for festival celebrations, as shown in the examples in Kozar (1995).

These findings suggest a somewhat different evolutionary trend than that for Western graphicons proposed by Konrad et al. (2020). The types and tokens of emojis and stickers are both on the rise, although stickers do not seem to be overtaking emojis. It is highly possible that emojis have not reached their peak yet. Meanwhile, features of stickers, such as specific references and more detailed graphics, are increasingly being incorporated into emoji design (e.g., the Astonished face in Figure 1). If this trend continues, it is likely to expand the functions of emojis and blur the distinction between emojis and stickers. The icons in the set of Yellow Faces in the GitHub package of BiliBili stickers that we reclassified as emojis (as discussed in Section 3.2) are somewhat ambiguous between the two graphicon types. Meanwhile, the fact that more than one sticker is used per message suggests that users are borrowing from emojis the practice of repeating graphicons in one message. Thus the interrelation of emojis and stickers, as the examples and statistics in this study show, is more complex than one replacing the other.

5.2 Unanticipated findings

Unexpectedly, our results showed different patterns of graphicon usage in comments and replies. More graphicons were used in comments than in replies overall. This finding differs from that of Kaneyasu (2022), who conducted a qualitative study of the use of kaomojis in a Japanese user-generated recipe sharing site. Kaomojis appeared more frequently in replies that were directed at individuals than in comments directed at more general readers. It remains to be explored further using both qualitative and quantitative methods how and why graphicon are used in different ways in comments and replies.

Furthermore, we found that more kaomojis and stickers were used in comments, but the use of emojis was roughly the same in comments and replies. At the moment, we do not have a plausible explanation for this finding, but it at least suggests that certain properties are shared between kaomojis and stickers. This phenomenon also requires further study.

Last, our statistics suggest a "priming effect" of graphicon usage in comments and replies. The use of kaomojis and emojis in replies shows strong correlations with the occurrences of these two types of graphicon in their corresponding comments. Emotion expressions tend to demonstrate priming effects (e.g., Neumann, 2000), but studies about the priming effects of graphicons have focused mainly on the functions of graphicons as primes on language use and processing. For instance, it has been found that emoji primes function as paralanguage to facilitate the processing of relevant emotive linguistic expressions (Yang et al., 2021). Our findings provide evidence that priming is taking place as regards graphicon forms.

6 Conclusion

6.1 Contributions

This paper makes several novel contributions. It presents what we believe is the first longitudinal, comparative study of graphicon use on a Chinese social media platform. It provides support for Konrad et al.'s (2020) evolutionary model concerning the relationship between emoticons (kaomoji) and other graphicons. However, the

BiliBili data do not show stickers leading or taking over from emoji, contrary to Konrad et al.'s intriguing speculation that Chinese graphicons would show that trend. Moreover, our qualitative analysis of the top 10 most frequently used graphicons reveals a trend of graphicon evolution from general emotion expression to meanings localized in the discourse practices of the BiliBili platform.

Further, our analysis of a large longitudinal dataset went beyond reporting overall frequencies of occurrence to explore more fine-grained distinctions between types and tokens and differences in graphicon usage between comments and replies to comments. We also provided statistical evidence for priming effects on graphicon usage in comments and replies. These contributions reveal the complexities of graphicon evolution on BiliBili and generate additional research questions.

6.2 Limitations

A number of limitations potentially affect the generalizability of the patterns of graphicon evolution identified in this study. First, trends in Chinese graphicon usage might differ on a different platform such as WeChat or Weibo, because Chinese social media users are inclined to use platform-specific sets of graphicons. Kaomoji usage is likely more frequent on BiliBili than on any other platform, given that the platform was initially set up to share Japanese anime, comics, and games. Stickers from users' collections cannot be used on BiliBili like they are on WeChat and Weibo. Meanwhile, only a very limited number of sticker sets are free to users, which is likely to have an impact on the varieties of stickers in use. For instance, all of our top 10 stickers are from free sets rather than paid ones. The landscape of sticker usage in WeChat or Weibo, therefore, could be very different. Meanwhile, a majority of BiliBili users are under the age of 35, and this demographic might use graphicons differently from older groups.

Second, our data center on the topic of the Chinese New Year, which is both a strength and a limitation of our study. The topic provided straightforward clues for interpreting the meaning of graphicons, and the fixed content allowed us to focus on graphicon forms. However, while kaomoji meanings are rather general, the denotations of emojis and stickers are increasingly content specific; thus their usage might vary for different topics. We would not expect, for instance, to find as many graphicons on the theme of the Chinese New Year in comments on videos on other topics. More topics, and different platforms, should therefore be analyzed in order to increase the generalizability of our evolutionary findings.

Another factor that might have impacted the evolutionary trajectory is the limited data from 2022. In order to have as much longitudinal data as possible, we included data from 2022; however, these were from only the first two months of the year, so the number of messages from 2022 is relatively small compared with the preceding years. We therefore should be cautious in interpreting the statistics about graphicon usage in 2022, as they might not fully represent the graphicon usage of the year. Follow-up study with future data from BiliBili is needed to develop a fuller picture of graphicon evolution on the platform, particularly with regard to emojis and stickers.

6.3 Future directions

The findings from this study suggest a number of directions for further research. First, a more detailed description of graphicon evolution could be obtained by establishing a relationship between graphicon usage and user demographics such as gender. Second, the differences in graphicon usage between comments and replies could be investigated further by examining the pragmatic functions of the graphicons and their positions in sentences. Qualitative analysis could also shed light on how and why the priming effect takes place in graphicon usage.

Last, as Chinese language features are increasingly integrated with graphicons, it is important to examine the impact of graphicons on textual language and language use. Pavalanathan and Eisenstein (2016) found that creative spelling and typography decreased on Twitter as emoji use increased. We have informally observed a decrease in the use of Chinese words that express attitude on BiliBili as graphicon use has increased over time. This suggests that as graphicons evolve, they are not just supplementing text but are partially replacing it. A study of graphicon frequencies in relation to word frequencies at different points in time could provide empirical evidence in support of this proposition.

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