Twitter as a Technical Communication Platform: How IT Companies' Message Characteristics Relate to Online Engagement

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ABSTRACT

Purpose: Twitter is a promising technical communication platform for companies, but a thorough understanding of how it works best is lacking. This study analyzes characteristics of IT companies' technical communication tweets and relates them to users' online engagement (likes, retweets, replies). Three message characteristics were included: content, message elements, and communication strategies.

Method: We collected technical communication tweets posted by four IT companies in two weeks (N = 1,604). We developed a content categorization and also coded the tweets for message elements, communication strategies, and online engagement. Message elements and communication strategies were compared with those used in the companies' corporate and marketing communication tweets. Negative binomial regression analyses were used to map relationships between message characteristics and online engagement.

Results: Ten content types were distinguished, illustrating the versatile nature of technical communication on Twitter. Hyperlinks were the most prominent message element; two types of elements were less prevalent: elements enhancing attractiveness (photos, videos, emojis) and elements connecting to a broader Twitter discourse (hashtags, mentions). Communication strategies did not include community-building tweets; evoking action was most prominent. Several links were found between message characteristics and online engagement: Providing user instructions or updates and feedback opportunities, including photos or videos, and providing one-way information promoted online engagement.

Conclusion: Although Twitter might work differently for technical communication than for other domains, it seems fruitful to add more attractive message elements and explore community-building strategies within technical communication. However, there is also reason to relativize the importance of online engagement indicators for technical communication.

KEYWORDS: microblogging, online engagement, social media, technical communication, Twitter

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Practitioner's Takeaway

- Provides an overview of the way large IT companies use Twitter for technical communication purposes, which can be a source of inspiration for technical communicators working for technology companies.
- Suggests that, particularly on Twitter, technical communication involves more aspects of the human-technology relationship than just offering user support.
- Shows that technical communication tweets might underuse message elements that could enhance their attractiveness (photos, video, emojis).
- Shows that the communication strategy of community-building is not used in the technical communication domain, suggesting that it might be worthwhile to consider using it.
- Relativizes the universal importance of online engagement indicators (likes, retweets, replies), especially in the domain of technical communication.

INTRODUCTION

Communicating about technology is increasingly important and multifaceted in our technologized society. Technology is engrained in most aspects of our private and professional lives. User-friendliness may be valued more than ever before, but the affordances of technology are getting progressively more complex. Branding and competition have gained importance in the technological domain and technology firms have become big and influential players in society. The prominent position of technology calls for a broad conception of technical communication, beyond providing user support.

Various developments in the literature reflect the higher demands currently placed on technological products and technical communication. The evolution from usability engineering to a user experience (UX) orientation is an example (Haaksma, De Jong, & Karreman, 2018; Hassenzahl & Tractinsky, 2006). Compared to usability, UX stretches ambitions from optimizing task execution to realizing gratifying experiences, acknowledging that such experiences encompass more than smooth interactions with the product and also depend on, for instance, product usefulness, aesthetics, image, service quality, word of mouth, and news coverage. Abel (2018) therefore argued that the value of technical communication involves every stage of the customer journey.

Another development is an increased attention to technology acceptance (Davis, 1989; Venkatesh, Thong, & Xu, 2016) and appropriation (Dourish, 2003; Zamani et al., 2020). Technology acceptance suggests that people's decision to start using certain products depends on several factors, which may be affected by communication (for instance, social influence or perceived ease of use and usefulness). Technology appropriation draws attention to the way users actually co-create technology-in-use by developing their own ways of using it, underusing some of its affordances or finding new and creative usage possibilities. appropriation can be seen as an individual process, but social influence and exchanges of experiences might play important roles.

Effective technical communication accommodates technology to users (Dobrin, 1983), builds relationships with relevant stakeholders (Andersen, 2014; Bailie & Urbina, 2013), and helps companies to maintain a strong image in competitive markets (Andersen, 2014; Willerton, 2007). Several scholars suggested that social networking sites (SNSs) can help companies to improve and expand technical communication in practice. Companies, for instance, could use SNSs to provide information about software updates and specific tips and tricks (Katajisto, 2010). The direct link to users makes SNSs suitable for providing timely information, for instance in times of crises and emergencies (Bowdon, 2014; Potts, 2013). The potential of two-way communication gives opportunities for collaborating with users to improve products or manuals (Andersen, 2014; Swarts, 2018), promote user engagement, and build and maintain relationships with stakeholders

(Saffer, Sommerfeldt, & Taylor, 2013; Zhang, De Jong, & Gosselt, 2022).

This article focuses on the use of Twitter for technical communication purposes. Twitter is the most prominent microblogging platform worldwide, involving real-time dissemination of short messages (up to 280 words); text may be complemented with visuals, video, or emojis. Hyperlinks can be used to connect tweets to other internet sources, hashtags (#) may connect tweets to larger discussions on the platform, and mentions (@) may link them to other persons or organizations on Twitter.

So far, only two studies empirically investigated how companies use Twitter for technical communication purposes. Lam and Hannah (2017) analyzed how customers seek technical support on Twitter. They found that Twitter was often used for user-support questions, although these help-seeking processes were rather ineffective, were often alternated with complaints about products, and did not lead to engagement or a sense of community. Taking a broader perspective, Zhang, Gosselt, and De Jong (2020) investigated how large information technology (IT) companies use Twitter. They found that the technical communication domain was well-represented in the IT companies' tweets: Roughly one-third of all tweets involved technical communication content (the other domains being corporate and marketing communication). However, this study only provided a general overview of types of tweets and did not explore technical communication in-depth. Moreover, it was entirely descriptive and did not relate the tweets to user responses.

Companies that want to benefit from SNSs in the domain of technical communication need to gain an understanding of the range of possible technical communication content and their effects, and learn how communication strategies (e.g., one-way information sharing vs. action- or community-oriented tweets) and message elements (e.g., hyperlinks, visuals, and emojis) may affect user engagement. A dominant view on user engagement in SNSs research involves online engagement: the extent to which likes, retweets, and replies provide evidence of active use and appreciation, further dissemination, and willingness to interact (e.g., Abitbol & Lee, 2017; Araujo & Kollat, 2018; Saxton & Waters, 2014).

In this article, we describe a first attempt to gather such knowledge for IT companies using Twitter. Taking Zhang et al.'s (2020) corpus of tweets as a starting point, we developed a more detailed categorization of technical communication content and analyzed how different types of content, message elements, and communication strategies relate to online engagement, specifically in terms of likes, retweets, and replies. We thus tried to answer the following research questions:

RQ1: How do large IT companies use Twitter (in terms of content, message elements, and communication strategies) for technical communication?

RQ2: What are the effects of different types of content, message elements, and communication strategies on users' online engagement (likes, retweets, and replies)?

LITERATURE REVIEW

Below, we first discuss earlier research on SNSs within technical communication. After that we give an overview of earlier findings on the message characteristics we studied: content, message elements, and communication strategies. These earlier findings largely originate from other research fields, such as public relations, marketing communication, and human-computer interaction.

Technical Communication and SNSs

Technical communication researchers have regularly paid attention to SNSs, but their research mainly focused on the pedagogical uses of SNSs and the roles SNSs play for practitioners and academics. Pedagogical studies addressed the importance of SNS literacy for future technical communicators as well as the way SNSs can be integrated in courses and curricula, often connecting both angles. Based on reflections on social media, the notion of media literacy, and classroom practices, Daer and Potts (2014) developed guidelines for incorporating social media in technical and science communication curricula. Vie (2017) conducted a survey among program administrators of technical and professional communication programs, showing that SNSs have found their way to academic curricula, not only as a recruitment and teaching tool, but also as a topic of interest. Verzosa Hurley and Kimme Hea (2014) argued that a critical disposition toward SNSs is an essential competence for technical communication practitioners

and presented a teaching case encouraging students to use and evaluate social media critically. Bowdon (2014) focused on the role of ethos in SNSs and described a classroom project in which students coded Twitter feeds to improve their social media expertise.

Regarding the benefits and consequences of SNSs for practitioners and academics, Ferro and Zachry (2014) explored which types of SNSs are used by knowledge workers in professional settings. They found that various types were popular; Twitter was particularly used for developing associations, learning about topics, conversing with others, and sharing information. On the basis of a case study, Longo (2014) argued that technical communicators should take the participatory nature of SNSs into account, without making the mistake to assume that social media can replace face-to-face interactions. Pigg (2014) studied how SNSs are ingrained in the work practices of a technology consultant: The process of writing documents involved a constant switching between producing text and accessing SNSs. The consultant used SNSs to maintain an online presence and gain access to and leverage communities of practice. Lam (2021) analyzed the themes, members, and networks in the #TechComm community on Twitter. The themes found underline the platform's versatility in members' professional lives, including hands-on work support (authoring tools, DITA, and software documentation), professional development, job opportunities, academic perspectives, and the STC (plus the STC Summit). Members appeared to be diverse. Analyzing the networks, he discerned a practitioners and an academics network. He then suggested possible bridges between both networks, one of which uses Twitter to gather feedback on academic research, aiming at spreading research findings among practitioners, deepening them with practical insights and experiences, and potentially influencing the research agenda.

A few conclusions can be drawn from these earlier studies. First, many academics and practitioners acknowledge the potential of SNSs for the field of technical communication. Second, the role of Twitter in the external communication of technology companies is a neglected area of research. The attention to SNSs in technical communication programs suggests that future technical communicators will have to consider the possibilities of SNSs, but research to support their future decisions is still scarce. Third, the majority of insights on SNSs are based on reflection and analysis, not on systematically collected empirical data. Research further exploring what technology companies do on SNSs and how this relates to user engagement is needed. This is the contribution we aimed for with our study.

Earlier Findings on SNS Content

Zhang et al. (2020) distinguished three types of technical communication content that companies share on Twitter: (1) information on specialized topics, focusing on technological developments and their implications, (2) user instructions, offering procedural and operational information for using products, and (3) updates and feedback, using the platform's interactivity and timeliness to seek input from users or alert them of software updates and warnings. These broad categories sketch an overall picture of technical communication content but could be detailed further. Taking this categorization as a starting point, we therefore further analyzed the technical communication content shared by IT companies.

Zhang et al. (2020) did not investigate how users react to the various types of content. The aforementioned study by Lam and Hannah (2017), focusing on the use of Twitter for user support, underlines the importance of considering user responses. Their results showed that Twitter is not the effective and straightforward platform for user support as might be expected. The online engagement associated with the posts appeared to be extremely low; most tweets had zero likes, retweets, and replies. We therefore analyzed how various types of technical communication content relate to online engagement.

Earlier Findings on Message Elements

Message elements that can be added to tweets include visuals, video, emojis, hyperlinks, hashtags (#), and mentions (@). The use of such additional elements has been linked with user-friendliness (Abitbol & Lee, 2017), interactivity (De Vries, Gensler, & Leeflang, 2012; Liu et al., 2017), and vividness (De Vries et al., 2012; Liu et al., 2017). Several studies, conducted almost ten years ago, examined companies' use of such message elements, finding higher percentages for hyperlinks (60%-79%) and hashtags (22%-55%) and lower percentages for mentions (16%-18%), visuals (3%-14%), videos (2%-9%), and emojis (1%-6%) (Lovejoy, Waters, & Saxton, 2012; Mamic & Almaraz,

2013; Swani et al., 2013; Waters & Jamal, 2011). The more recent study by Zhang et al. (2020) suggested that the use of these message elements has become more common than before: Tweets consisting of text without additional elements are exceptional. However, none of the earlier studies focused specifically on tweets in the technical communication domain, in which the role of message elements might differ from that in other domains. We thus analyzed message elements used in tweets with technical communication content.

Research into the effects of message elements on user engagement had mixed results. Several studies found that visuals contributed to likes and retweets (Abitbol & Lee, 2017; Ji et al., 2019; C. Kim & Yang, 2017; D.-H. Kim, Spiller, & Hettche, 2015; Liu et al., 2017; Saxton & Waters, 2014), but did not affect the number of replies (Abitbol & Lee, 2017; De Vries et al., 2012; D.-H. Kim et al., 2015; Liu et al., 2017; Saxton & Waters, 2014). Videos, which may be considered to be even more vivid than visuals, also help to generate online engagement, but not necessarily more than visuals (Abitbol & Lee, 2017; D.-H. Kim et al., 2015). Emojis, too, can lead to more likes and retweets (McShane et al., 2021). Brubaker and Wilson (2018) and C. Kim and Yang (2017), however, found a negative effect of visuals on the number of replies.

Luarn, Lin, and Chiu (2015) found that adding hyperlinks to tweets might result in more likes, retweets, and replies and that hyperlinks are much more effective than visuals and videos. Abitbol and Lee (2017) only found a positive effect on replies, not on likes and retweets. On the other hand, Liu et al. (2017), Sabate et al. (2014), De Vries et al. (2012), and Schultz (2017) found that hyperlinks did not influence likes and retweets and even decreased the number of replies. Schultz (2017) found that hashtags increased the numbers of likes and replies but did not influence the number of retweets. Ji et al. (2019) suggested that including too many interactive elements (hyperlinks, hashtags, and mentions) might decrease the likelihood of online user engagement due to a higher cognitive load.

In all, there is too little consistency in previous research findings to formulate hypotheses about the effects of message elements on online engagement. It seems likely that discrepancies between studies are at least partially caused by differences in context. None of the earlier studies focused on technical communication. Our research was therefore exploratory.

Earlier Findings on Communication Strategies

The most researched message characteristic on Twitter is the communication strategy used. Given the interactive possibilities of Twitter, several researchers argued that an optimal use of Twitter (and other SNSs) would involve more than one-way information provision (Culnan, McHugh, & Zubillaga, 2010; Li et al., 2013; Morsing & Schultz, 2006). To make sense of differences in communication strategies, Lovejoy and Saxton (2012) distinguished between the strategies of information (sharing and distributing info), community (creating a feeling of the community), and action (mobilizing people and encouraging them to take action), a framework that was later adopted in other studies (Saxton & Waters, 2014; Wu et al., 2019; Zhang et al., 2020). Araujo and Kollat (2018) used the somewhat related distinction between broadcasting, reacting, and engaging. The main difference involves the two interactive strategies: Engaging might be a strategy aiming for community and action; reacting might be part of a community strategy and a logical follow-up to an action strategy. Other researchers used the broad terms interactivity (Abitbol & Lee, 2017; Luarn et al., 2015; C. Kim & Yang, 2017) or dialogic communication (Rybalko & Seltzer, 2010; Watkins, 2017) for messages exceeding one-way communication provision. Brubaker and Wilson (2018) used the term "crowdsourcing" for soliciting participation and requesting responses.

Most empirical studies on the use of communication strategies on company SNSs found that companies predominantly used SNSs for one-way information provision (Carim & Warwick, 2013; Gomez & Vargas-Preciado, 2016; Guo & Saxton, 2014; Lovejoy & Saxton, 2012; Rybalko & Seltzer, 2010; Shin, Pang, & Kim, 2015; Waters & Jamal, 2011; Zhang et al., 2020). However, these studies did not focus specifically on the domain of technical communication. Lam and Hannah's (2017) study, entirely focusing on user support via Twitter, suggests that the choice of communication strategies might be different in tweets within the technical communication domain. We, therefore, analyzed the communication strategies used in the corpus of tweets with technical communication content.

Many studies investigated the effects of communication strategies on online user engagement. Several of them found positive effects of interactive and engaging communication strategies on all or some of the online engagement indicators (likes, retweets, and replies) (Abitbol & Lee, 2017; Araujo & Kollat, 2018; C. Kim & Yang, 2017; Luarn, Lin, & Chiu, 2015; Saxton & Waters, 2014; Wu et al., 2019). In general, community strategies seemed to have more positive effects than action strategies, which in some studies even scored lower than the baseline information strategy (Saxton & Waters, 2014; Wu et al., 2019; Zhang et al., 2022). Other studies, however, did not confirm that engaging and interactive strategies had a positive effect on online engagement (Read et al., 2019; Watkins, 2017), or even found negative effects of engaging and interactive strategies (Brubaker & Wilson, 2018; Zhang et al., 2022).

In our view, the research findings on the effects of communication strategies are too inconsistent to formulate hypotheses, especially because the content of the tweets might play a role. All earlier studies predominantly involved the domains of corporate and marketing communication, not of technical communication. Therefore, this part of our study was exploratory as well.

METHOD

To answer our research questions, we conducted a content analysis of large IT companies' tweets with technical communication content. Zhang et al.'s (2020) coding scheme formed the starting point for our analysis, which was inductively complemented with subcodes that emerged when analyzing tweets. Below, we will describe the corpus of tweets, the coding scheme, the intercoder reliability assessment, and the data analysis.

Corpus of Tweets

The companies included in our study were selected from the Fortune 500 Technology and Telecommunications Companies. After excluding companies without Twitter accounts, social media companies, and online retailers and using the requirement that companies should at least have ten different Twitter accounts, we included four companies in our sample: HP (Hewlett-Packard), IBM, Intel, and Microsoft.

We used the company names as search terms in the "Account/ People" tab to gather all company-owned accounts of the companies. Some accounts were officially verified (with a blue verified badge), but others were not. We included all official accounts in the sample. If unverified accounts linked to the companies' Web sites and routinely published official company information, we included them as well. To set aside variations due to national backgrounds, we excluded accounts specifically focusing on certain countries or regions (e.g., Microsoft UK). The final sample consisted of 108 different Twitter accounts:

- HP: 18 accounts
- IBM: 38 accounts
- Intel: 13 accounts
- Microsoft: 39 accounts

Many tweets contained hyperlinks to external materials (e.g., reports about technological developments or videos discussing new software features). As such hyperlinks might illuminate the tweet content, we followed them, read or viewed the materials, and incorporated their content in the analysis.

Data were collected in the weeks of January 10–16, 2018 and April 18–24, 2018. All tweets posted in these weeks were included in the analyses (N = 5,277 tweets). Based on Zhang et al.'s (2020) categorization, we limited our analysis to tweets with technical communication content. The final sample for this study included 1,604 technical communication tweets. We used the companies' tweets in the corporate and marketing communication domains (N = 3,623) as a benchmark in some of the analyses. Table 1 provides descriptions and examples of the three overall content categories. A sample of all tweets was coded by two independent coders. A Cohen's kappa of .95 indicated a very good inter-coder reliability.

For the analyses regarding message elements and online engagement, we had to limit our sample to original tweets. Twitter does not allow users to add new message elements to retweets and only displays engagement indicators for original tweets. For these analyses, the sample consisted of 1,354 (84%) original technical communication tweets and 2,714 (75%) original corporate and marketing communication tweets.

Coding Scheme

Our coding scheme consisted of three categories—content, message elements, and communication

Table 1. Identification of the Three Overall Content Categories

Content Category	Examples of Tweets
Technical Communication Tweets fostering the acceptance and successful usage of current and future technologies in society	• 9 great articles you might have missed about data management • Easy steps to change Microsoft Edge home page: http://msft. social/C6Od2n
Corporate Communication Tweets building or maintaining relationships with different stakeholders and providing information about the company	• We're honored to be recognized on @Forbes' list of World's Most Reputable Companies for the 10th year running. We dedicate ourselves to that same commitment to excellence for the next 10! • From energy and water conservation to waste reduction and environmental design, #Intel is reducing our footprint to protect the planet we call home. #EarthDay https://intel.ly/2F1mid8
Marketing Communication Tweets promoting or selling products or services	• Try #IBM #MaaS360 free for 30 days and breed customer confidence in your #security offering. Exploit the cognitive power of #Watson to prevent attacks on your clients' devices before they can have an effect. http://bit.ly/2sJfH6v" • Check out these 5 new product launches from @HP!http://hp.tl/6015DwunL#KeepReinventing

strategies—and was largely based on Zhang et al.'s (2020) study. Each tweet was analyzed according to all three categories.

Regarding content, we used Zhang et al.'s (2020) three main technical communication codes as a starting point: (1) information on specialized topics, (2) user instructions, and (3) updates and feedback. Using an open coding process, we inductively developed new subcodes emerging from the tweets.

Regarding message elements, we coded all elements that deviated from plain text, including: hyperlinks, hashtags (#), mentions (@), visuals (e.g., photos and infographics), videos, and emojis.

Regarding communication strategies, we took Lovejoy and Saxton's (2012) framework—distinguishing information, community, and action—as the starting point. This framework had been used by several earlier studies to understand companies' level of interaction and engagement with stakeholders (Saxton & Waters, 2014; Wu et al., 2019; Zhang et al., 2020). We used the framework's main codes and inductively created subcodes when needed.

Finally, we recorded users' online engagement with the tweets. Twitter provides three indicators of online engagement with tweets: likes, retweets, and replies. For all tweets, all three metrics were recorded approximately one week after they were posted.

Intercoder Reliability

Two independent coders analyzed a random sample of 150 tweets. Cohen's kappas were calculated as measures of inter-coder reliability. After two rounds of coding, the intercoder reliability was .80 for main content categories, 0.76 for subcategories, 0.92 for message elements, and 0.87 for communication strategies. All Cohen's kappas indicate sufficient levels of inter-coder reliability.

Data Analysis

The analyses for the first research question were largely descriptive. We merely report and illustrate how the IT companies used Twitter, focusing on content, message elements, and communication strategies. However, for message elements and communication strategies, we compared the frequencies in the IT companies' technical communication tweets with their tweets in the other two domains (corporate and marketing communication), using chi-square tests to analyze the significance of the differences.

The analyses for the second research question involved correlations between the independent variables (the message characteristics) and dependent variables (the online engagement indicators). All three dependent variables (likes, retweets, and replies) were count variables with a Poisson distribution. Poisson and negative binomial regression analyses are commonly used to model such data. In our study, the variance of the three dependent variables appeared to be

Table 2. Descriptive Statistics for the Three Dependent Variables

Dependent Variable	Mean	Variance	Range (Min – Max)
Like	18.02	1143.64	0–387
Reply	.41	1.82	0–16
Retweet	10.59	275.02	0–160

Note: Only original tweets (n = 1,354) were analyzed for online engagement.

considerably higher than the means (Table 2). Taking this overdispersion of all dependent variables into account, we used negative binomial regression analyses (Cameron & Trivedi, 1998). For the analyses regarding content and communication strategies, we had to choose one of the categories as a baseline to compare the other categories with. For the analysis regarding message elements, we could analyze differences between tweets with and without each element.

RESULTS

The research aimed at answering two research questions. The first question involved the characteristics of the companies' tweets, specifically focusing on content, message elements, and communication strategies. Below, we will present the results regarding these three characteristics first, in separate subsections. The last subsection presents the results of the second research question, focusing on the relationship between tweet characteristics and users' online engagement (likes, retweets, and replies).

Content of Tweets

Table 3 gives an overview of the main categories and subcategories of message content that emerged from our analysis. A majority of the technical communication tweets involved *information on specialized topics* (60%). Tweets within this main category drew attention to technological developments, tried to sketch the bigger technological picture, or raised awareness for technological possibilities. The second main category involved *user instructions*. Tweets within this category provided people with instructions to actually use technology and are therefore most closely connected to the traditional technical communication themes of manuals, online help, user forums, and helpdesks. The last main category involved *updates and feedback* (10%). Tweets within this category used the platform's affordances to directly connect with users. For all main categories we distinguished subcategories, which will be described in more detail below.

Table 3. Content of the Technical Communication Tweets

Main Category	Subcategory	Description	Example	Frequency (%)
Information on specialized topics (N = 962, 60%)	Specialized topics for professionals	The tweet provides specialized information to developers or IT professionals (e.g., programming concepts, software development knowledge).	5 things you didn't know about Java 10	346 (22%)
	Product features	The tweet describes, explains, or demonstrates the functionality of specific products or services (e.g., a demo introducing what a software is capable of doing).	Check out this short introduction of the #IBMCloudPrivate platform, and discover how it could work for your customers: http://bit.ly/2zYKJJX	340 (21%)

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Main Category	Subcategory	Description	Example	Frequency (%)
Information on specialized topics (N = 962, 60%)	Specialized topics for users	The tweet introduces or explains technical products, concepts, trends, applications, or expectations.	Dance your way to a better understanding of collaborative robots, aka #cobots: http://msft.social/zgRmEj	245 (15%)
	Tips and tricks	The tweet provides information aimed to optimize user experience (e.g., the optimal use of a device).	Customizing the appearance of your Chromebook is half the fun! Check out these cool tips: http://hp.care/2zI7vD2	31 (2%)
User instructions (N = 478, 30%)	Instructions for professionals	The tweet provides developers with tutorials, manuals, or instructions for building apps or designing software	Developers, this new code pattern shows you how to use visualizations and analytics in your apps http://ow.ly/qoGD30jB3nN #Angular #NodeJS #IBMCode	390 (24%)
	Instructions for users	The tweet provides users with procedural information about how to use a product or how to perform a task	Do you know how to replace the ink in your Deskjet, Officejet, or HP Envy All-in-One printer? Check out these videos and steps: http://hp.care/2juCpLP	72 (4%)
	Troubleshooting	The tweet provides a guide to help users to detect, diagnose, and correct problems in emergent and ill-defined situations	Video driver error message? Check out this guided troubleshooter for some answers: https://hp.care/2j565cD	16 (1%)
Updates and feedback (N = 164, 10%)	Updates information	The tweet informs about software updates, new features added, and bugs fixed	Preview build 17074 is available to insiders, with lots of new features in Edge: * Variable fonts * Notifications API for extensions * Vertical docking for DevTools * Push notification fixes * Credit card autofill * Extensions InPrivate * PDF/EPUB improvements And lots more!	149 (9%)
	Feedback solicitation	The tweet seeks input or feedback in product development and information design processes	What do you look for in docs? What's missing? What's good? The @docsmsft team is listening and wants your feedback. https://docs.microsoft.com/en-us/teamblog/help-make-docs-microsoft-com-better … cc // @erinrifkin"	12 (1%)
	Warnings and alerts	The tweet informs about product-related security vulnerability, safety recalls, or potential risks.	IBM Security Bulletin: API Connect Developer Portal is affected by Drupal vulnerability (CVE-2018-7600) https://ibm.biz/BdZgiF #askIBMStorage @IBMStorageSupt	3 (0%)

Information on Specialized Topics

Four subcategories were distinguished within the information on specialized topics. Two of the subcategories involved information provision on specialized topics. Raising awareness for technological developments and sketching the bigger picture of technological developments appeared to be important goals of such tweets. We distinguished between *specialized topics for professionals* (22%) and *specialized topics for users* (15%), with tweets addressing professionals (e.g., software engineers or product experts) outnumbering those aimed at normal users. The content of tweets aimed at professionals was clearly beyond the knowledge scope of ordinary users, with topics such as Python, Java 10, future trends of programming language, and artificial intelligence (AI). Most of these tweets explicitly used words like "developer," "programmer," or "builder." The specialized topics for users focused on the impact of technology on daily life. Examples of such topics were the history and future of mobile technology, the impact of AI on agriculture and manufacturing, the impact of 5G on our daily lives, or forecasts of what life will be like five years from now. Trendy topics like self-driving cars, smart cities, AR/VR applications, IoT, and 5G were often addressed.

The two other subcategories drew attention to possible benefits of technology. The first, *product features* (21%), were close to technical marketing. Tweets in this subcategory described available functionalities, configurations, or capabilities of products or services. Tweets demonstrated the advantages and characteristics of products and services without explicitly trying to persuade people to buy them. The second, *tips and tricks* (2%), bordered user support. Tweets in this category provided directions for using technology more efficiently (e.g., the keyboard shortcut of Windows 10 to hide or display the desktop, the recovery of files from the recycling bin, or the customization of the browser appearance).

User instructions

Three subcategories emerged regarding user instructions. Two of them involved how-to information: *instructions for professionals* (24%) and *instructions for users* (4%). Again, the tweets for professionals clearly outnumbered those for users. The instructions for professionals involved specialized tasks such as building an app or chatbot or designing a cloud-powered AI platform. Instructions for users provided step-by-step information about how to use a product or perform certain tasks, focusing on more or less regular tasks with the products (e.g., how to use cloud storage to store, share, and access documents securely or how to change a product's settings). The last subcategory was *troubleshooting* (1%). Tweets in this subcategory provided stepwise technical support to help users solve ill-defined or emergent technical problems (e.g., how to cope with video driver error messages or how to solve the problems with scanning). These tweets might be generic responses to frequent user problems companies became aware of.

Updates and Feedback

Three subcategories were distinguished within updates and feedback, all benefitting from the direct connections facilitated by Twitter. Two subcategories focused on real-time dissemination of important information. The first was *updates information* (9%), drawing attention to software updates, the release of new versions, or improved or new features of software. The second was *warnings and alerts* (0%, only 3 out of 1,604 tweets) and focused on risks that companies became aware of (e.g., a safety recall of PC batteries, or a security breach of software). The third subcategory used the interactive features of Twitter: Under *feedback solicitation* (1%), companies, for instance, explored users' satisfaction with and points of improvement for products or sent out surveys.

Message Elements

Table 4 gives an overview of the message elements included in the companies' technical communication tweets. We only analyzed original tweets, as companies cannot add new message elements in their retweets. Most tweets contained hyperlinks (96%), hashtags (81%), and visuals (79%); mentions (21%) were less frequently used and emojis (5%) were rarely used. Among the various types of visuals, infographics and photos were most popular, while other sorts of visual elements were seldom used. In general, the results suggest that plain-text tweets are exceptional.

A comparison of the companies' technical communication tweets with their tweets in the domains of corporate and marketing communication revealed various significant differences. The technical

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Table 4. Message Elements in Technical Communication Versus Corporate and Marketing Communication Tweets

Message Element	Frequency Technical Communication Tweets (%)	Frequency Marketing and Corporate Tweets (%)	Chi-Square Test
Hyperlinks	1,303 (96%)	2,297 (85%)	x^2 (1) = 119.4, p < .001
Hashtags (#)	1,100 (81%)	2,430 (90%)	x^2 (1) = 54.2, p < .001
Visuals	974 (72%)	2,138 (79%)	x^2 (1) =23.5, p < .001
Infographics	472 (35%)	1,017 (37%)	x^2 (1) = 2.7, p = .10
Photos	252 (19%)	823 (30%)	x^2 (1) = 63.7, p < .001
Graphics	116 (9%)	169 (6%)	x^2 (1) = 7.6, p < .01
Screenshots	80 (6%)	5 (0%)	x^2 (1) = 144.7, p < .001
GIFs	52 (4%)	121 (4%)	x^2 (1) = 0.8, p = .36
Memes	2 (0%)	3 (0%)	x^2 (1) = 0.1, p = .75
Video	97 (7%)	200 (7%)	x^2 (1) = 0.1, p =.81
Mentions (@)	281 (21%)	762 (28%)	x^2 (1) = 25.4, p < .001
Emojis	63 (5%)	290 (11%)	x^2 (1) = 41.5, p < .001
Total	1,354	2,714	

Note: Only original tweets of the companies are included in the analysis.

communication tweets used significantly more hyperlinks, graphics, screenshots, and videos than the corporate and marketing communication tweets, which might underline an inherently more complex nature of the information conveyed in the tweets. Their more limited use of several other message elements illustrated two other underlying differences: (1) The use of fewer hashtags and mentions showed that the technical communication tweets were less frequently connected to broader discussions and other actors on Twitter, and (2) the use of fewer visuals (particularly photos) and emojis showed that vividness and attractiveness might be valued less in the technical communication domain than in corporate and marketing communication.

Communication Strategies

Table 5 gives an overview of the communication strategies found in the companies' tweets. In addition to the three main strategies (communication, community, and action), four action strategies emerged from our data. We found that tweets aiming at action are dominant in technical communication tweets, followed by tweets aiming at providing information. Tweets focusing on community building were entirely missing in our sample. Of the four action strategies, providing instructions was the most prevalent, followed by promoting events and offering downloads or updates; calling for feedback only happened sporadically.

A comparison with the communication strategies used in the domains of corporate and marketing communication showed that the strategies used in the technical communication domain differ significantly in the other domains (x^2 (2) = 5,623.6, p < .001). Compared to the technical communication tweets, the tweets in the other two domains focused more on information and community, and less on action.

Relation Between Message Characteristics and Online Engagement

To explore the relation between message characteristics and the dependent variables (likes, retweets, and replies), we conducted three negative binomial regression analyses, one for each dependent variable. The results of these analyses are summarized in Table 6. Regarding content, the analyses showed that tweets involving *user support* and *updates and feedback* led to more online engagement than tweets involving *information on specialized topics* did. Tweets in the category of *user support* resulted in more likes and retweets, but not replies. The latter might be related to the nature of these tweets: Expressions of gratitude and feedback on instructions might be expected, but

Table 5. Communication Strategies in Technical Communication Versus Corporate and Marketing Communication Tweets

Communication Strategy	Technical Communication Example	Frequency Technical Communication Tweets (%)	Frequency Marketing and Corporate Tweets (%)
Information	With 3D printed parts, @NASA could significantly lower the cost of building rockets. http://hp.tl/6015DKEx3 #3Dprinting"	624 (39%)	2,168 (60%)
Community	[No example available]	0 (0%)	392 (11%)
Action		980 (61%)	1,113 (31%)
• Providing instructions	Learn how to utilize #ElasticDatabase client library to create and manage scaled-out databases:	478 (30%)	31 (1%)
• Promoting events	Developers, architects, middleware administrators, IT managers. You are invited to the upcoming, complimentary WebSphere Liberty V18.0.0.1 Virtual Proof of Technology (vPOT) session scheduled on April 23rd from 9 am to 11 am ET. http://spr.ly/6016DwjZr	341 (22%)	427 (12%)
• Offering downloads or updates	#MicrosoftEdge improvements, Quiet Hours, Improved Storage Settings, and more. Check it out. #Windows10 #WindowsInsiders	149 (9%)	0 (0%)
• Calling for feedback	Are you a #WatsonCommerce user? We'd love to hear your experience with our solutions. Please leave a review on @G2Crowd - http://ibm.co/2HFm2n1 #WatsonCommerce"	12 (1%)	0 (0%)
Total		1,604	3,623

vivid discussions are less likely. Tweets in the category of *updates and feedback* did better on all three dependent variables.

Regarding message elements, the analyses showed that particularly elements that make tweets more lively, entertaining, or playful resulted in online engagement. Tweets with visuals and videos did better on all three dependent variables than tweets without these elements. Even the use of emojis had a positive effect on the numbers of likes and retweets. The two elements that can be used for connecting tweets to other contributions on Twitter—hashtags and mentions—only had a positive effect on the numbers of retweets. However, hashtags led to fewer replies, possibly due to a reluctance to take part in larger discussions on Twitter. Hyperlinks had negative effects on the numbers of likes and retweets, not on the numbers of replies. In the literature, an increased cognitive load has been suggested as an explanation for lower engagement in the case of hyperlinks. An alternative explanation would be that hyperlinks lead users away from tweets, which reduces the tweets' role to merely being the entrance to the message behind the link, which might make users less inclined to express engagement with the tweets themselves.

Regarding communication strategies, our analyses showed that the information strategy led to more online engagement than the action strategy for two of the three dependent variables (likes and retweets). This might reflect the fact that the action-oriented tweets actually

Table 6. Results of Negative Binomial Regression Analyses

	Likes		Retweets		Replies	
Content	B (SE)	Exp (B)	B (SE)	Exp (B)	B (SE)	Exp (B)
User instructions	(base category)		(base category)		(base category)	
Information on specialized topics	-.42 (.27)	.65***	-.44 (.11)	.65***	.31 (.24)	1.36
Updates and feedback	.87 (.12)	2.39***	.65 (.13)	1.92***	1.54 (.27)	4.66***
Message Elements						
Hyperlinks	-.57 (.22)	.57**	-.15 (.20)	.86	-.82 (.39)	.44*
Hashtags (#)	.02 (.11)	1.02	.18 (.09)	1.19*	-.50 (.20)	.61*
Visuals	.41 (.10)	1.51***	.35 (.09)	1.43***	.69 (.22)	2.01**
Video	.80 (.17)	2.23***	.67 (.16)	1.96***	.94 (.33)	2.58**
Mentions (@)	.06 (.10)	1.06	.16 (.09)	1.18*	.17 (.19)	1.18
Emojis	.39 (.20)	1.48*	.30 (.17)	1.35*	.54 (.35)	1.72
Communication Strategy						
Information	(base category)		(base category)		(base category)	
Action	-.42 (.11)	.67***	-.50 (.10)	.61***	-.17 (.22)	.84

Note: *** p < .001, ** p < .01, * p < .05.

call for entirely different types of user engagement: using instructions, registering for events, downloading software, and, only in very few cases, providing feedback or other input.

DISCUSSION

Main Findings and Implications

This study investigated large IT companies' use of Twitter for technical communication purposes, focusing on current practices and their relation to online engagement (likes, retweets, and replies). Several insights emerged from our data. The first is that technical communication is an important domain in the Twitter activities of technology companies. Almost one third of all tweets posted by the IT companies had technical communication content. This finding suggests that SNSs have become an important element in the technical communication practice of companies and therefore should be an important theme in technical communication research and education.

Closely related to the first observation, it also became clear that the companies' use of Twitter further expands the field of technical communication. Even though supporting users remains a central and much appreciated content element, our results showed that such content is complemented with several other types of communication facilitating relationships between people and technology (e.g., bolstering the company's image and reputation; telling the bigger story of technological developments; immediately alerting users of updates, bugs, or risks; bridging gaps between product functionality and practical use; raising people's interest in current and future technological products; and maintaining lasting relationships with relevant stakeholders). This broadening of content reflects the platform's possibilities discussed in earlier studies, such as providing timely information (Bowdon, 2014; Katajisto, 2010; Potts, 2013), interacting and collaborating with users (Andersen, 2014; Swarts, 2018), and, to a lesser extent, promoting user engagement and building and maintaining relationships with stakeholders (Saffer et al., 2013; Zhang et al., 2022). Twitter also is used as a niche platform to communicate with professionals: Within the main categories of *information about specialized topics* and *user instructions*, tweets aimed at professionals outnumbered those aimed at regular users. In all, the content of technical communication on Twitter is broad and multifaceted.

A third observation involves the message elements included in tweets. Within the technical

communication domain, the usage of message elements appeared to primarily support the explanation of complex subject-matter (with hyperlinks, graphics, screenshots, and videos), focusing less strongly on enhancing the vividness and attractiveness of tweets. This observation is based on a comparison with tweets of the same four companies in the corporate and marketing communication domains. It is imaginable that the differences will even be larger with tweets of non-technological firms. As vividness and attractiveness appeared to be important features for generating online user engagement, it might be worthwhile to explore options of adding more of these message elements in technical communication tweets. This seems to be in line with the general development in the field from usability engineering to UX (Haaksma et al., 2018; Hassenzahl & Tractinsky, 2006).

A fourth insight involves the use of communication strategies. The technical communication tweets differed considerably from the tweets in the corporate and marketing communication domains: Action was the dominant strategy and none of the technical communication tweets aimed at community building. It could be interesting to explore possibilities and effects of community-building tweets within technical communication. One can think of communities of practice, among regular users and particularly among professionals. Building communities could enhance the effectiveness of many communication activities: Alerting users, raising their awareness of and interest in new products, optimizing their use of products, and maintaining a favorable company reputation will be easier in a lively community. Of course, the viability of communities depends on many factors and success is not guaranteed, but our findings suggest that the companies did not even try to work toward such communities.

Our last observation involves the online engagement indicators that we used. Just like other studies into the effects of organizations' SNSs on people, we used the readily available numbers of likes, retweets, and replies as indicators of users' engagement. Considering some of our surprising findings, we have to relativize the importance of these indicators. The first finding is that action tweets generate less online engagement than tweets merely broadcasting information. This is a puzzling result—although corroborated by some earlier studies (Saxton & Waters, 2014; Wu et al., 2019; Zhang et al., 2022)—as most literature suggested the opposite (Culnan et al., 2010; Li et al., 2013; Lovejoy & Saxton, 2012). However, many of the action tweets within the technical communication domain call for activities that may easily distract users' attention to the tweets themselves. If users, for instance, read a tweet about a software update, they will primarily decide whether to download the update or not. Liking the tweet may not be the first thing on their minds, even if they gratefully download the update. Retweeting does not really make sense as they may assume that all people in need of the update will be exposed to the same message. Replying is unlikely because the tweet cannot be seen as the start of a discussion. The real indicator of engagement would be how many people actually downloaded the update. The other surprising finding is that hyperlinks are negatively related to online engagement. It is imaginable that users forget all about the tweet after following the hyperlink. The real engagement indicator here is how many people actually followed the hyperlink. The online engagement indicators might be typical examples of low-hanging fruit, which could be complemented with more sophisticated and context-sensitive indicators of user engagement. Our results can be seen as a plea for a more comprehensive view on online user engagement, comprising immediately visible (likes, retweets, and replies) and less visible (downloads, followed hyperlinks) indicators of engagement and relating them to the types of appeals that are made in tweets (or, for that matter, other SNS posts).

Limitations and Suggestions for Future Research

Three limitations must be taken into consideration when interpreting our findings. A first limitation involves our sample. We included four large IT companies in this study and it remains to be seen whether our findings also apply to other types of technology companies. It is imaginable that smaller companies, companies in different technology branches, companies with different mixes of regular users and professional users, or companies that focus more strongly on brand attachment, image, and relationships with stakeholders would generate (partially) different results. Future research could further explore the applicability of our findings to different types of companies.

A second limitation involves the age of our data. We collected our data in 2018. As developments on social media go fast, we cannot exclude that some specific results may have changed over time, for instance reflecting developments in companies' communication strategies. Follow-up research, preferrably periodically mapping the development of technical communication tweets over time, would be interesting. Our research strategy and codebook can be used in such research and our findings may serve as a benchmark to compare future results with.

A third limitation is that we used likes, retweets, and replies as indicators of online engagement. These indicators are certainly meaningful: Likes give an indication of users' appreciation, retweets actually contribute to the dissemination of informations, and replies indicate actual interaction with the company. But our findings suggest that users' inclination to like, retweet, or reply may not be the entire story when it comes to online engagement. Developing other possible measures of user engagement, comparing and validating different indicators, and understanding why users decide to like, retweet, or reply would be essential steps in developing a more comprehensive overview of the way SNSs can promote online engagement.

CONCLUSION

Our research showed that Twitter is a platform on which technical communication plays a significant role. Although user support is a prominent aspect in the companies' Twitter accounts, the content of technical communication tweets represents more comprehensive perspectives on the human-technology relationship. Our findings provided two considerations that might be beneficial for technical communication tweets: more attention to message elements that enhance the attractiveness and vividness of tweets and more attention to community-building as a message strategy. Furthermore, they relativize the universal importance of online engagement indicators (likes, retweets, replies) and call for more comprehensive research on user engagement. In all, our study showed that technical communication activities of technology companies are a highly relevant study object, which may contribute to a broader conception of technical communication, stronger positions of technical communication practitioners in companies, and a stronger position of technical communication in the range of academic communication disciplines.

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