

Article

#ProtectNature—How Characteristics of Nature Conservation Posts Impact User Engagement on Facebook and Twitter

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Abstract: Social networks expand the communication tools of nature conservation. Nonetheless, to date there is hardly any scientific literature on nature conservation communication in social networks. For this reason, this paper examines 600 Facebook and Twitter posts of three German nature conservation organizations: Federal Agency for the Conservation of Nature (Bundesamt für Naturschutz, BfN), Naturschutzbund Deutschland e. V. (NABU), and World Wide Fund for Nature (WWF) Germany. Using the Mann–Whitney U method and Spearman’s rank correlation analysis, it reveals how post design affects communication success and provides respective recommendations for German conservation organizations. Communication success was divided into four indicators: reactions, comments, shares, and overall engagement as a synthesis of the three. On Facebook, the use of hashtags, images, and many characters (up to 1500) leads to higher success, whereas emojis and videos can reduce it. On Twitter, links, images, and longer posts promote user interactions. Emojis have a positive influence on comments and overall engagement, but a negative influence on reactions and shares. In addition, hashtags reduce overall engagement on Twitter. These results are discussed with reference to similar studies from other political fields in order to provide recommendations for conservation organizations. A validation and expansion of the presented results is recommended due to the growing relevance of digital nature conservation communication.

Keywords: nature conservation; social media; social networks; conservation communication; user engagement; Facebook; Twitter



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1. Introduction

It is only through communication that nature conservation issues gain social relevance and acceptance. Accordingly, communication processes play a crucial role in nature conservation [1–3]. Since the beginning of the 1990s, the World Wide Web has supplemented the written communication tools of society and thus of nature conservation. As it offers a wide range of new opportunities for obtaining information, participating, interacting, and forming opinions, it quickly developed into a catalyst for a change in the way society communicates—including nature and environmental conservation actors [4,5]. A few years later, Facebook (2004) and Twitter (2006) followed. Nowadays, many nature conservation organizations around the world use social networks for their public relations work.

While various definitions for “social networks” can be found in scientific literature, we use the term as follows:

Social networks refer to Internet-based services that allow users to create a personal profile and define a list of other users with whom they share a connection. This may be based on existing social contacts or on other commonalities such as interests, views, or goals. Various functions are used to share information and media content and otherwise interact among users of the network (cf. [6,7]).

The terms “social media” and “social networks” are often used synonymously in public discourse. Yet their meanings differ, with social media being a blanket term for

social networks, blogs, wikis, photo and video platforms, and many other Internet-based services that allow the creation and exchange of user-generated content [8].

Organizations active in environmental, nature, and climate protection (due to the focus of this paper, hereafter collectively and somewhat oversimplified referred to as conservation organizations) can use social networks to, among other things, initiate and lead interactive conservation debates [5], inform the public [9], recruit members [10,11], raise public awareness [12], or communicate research findings [13]. Consequently, almost all conservation organizations are now active on social networks and thereby offer interactive opportunities for communication and engagement [5,14]. Well-known examples include the #LastSelfie species conservation campaign [15] and the #EndangeredEmoji campaign of the World Wide Fund for Nature (WWF) [16].

This brief introduction clearly shows why nature conservation organizations (should) increasingly concern themselves with elevating their digital media competence. Already in 2005, Kolf et al. [17] named communication via the Internet as a standard component of good nature and environmental protection practice. Various publications show the range of ways social media can be used for conservation communication and as a data source (e.g., [18,19]) and discuss their influence on society's understanding of nature and the commercialization of the natural environment (e.g., [5,20]).

A look beyond nature conservation shows that the marketing industry has also been concerned with successful communication in social networks for some time now; social media marketing has developed into an independent and recognized marketing discipline ([21]). In this context, special methods and instruments are needed to assess communication success [22]. For this reason, so-called social media analytics are increasingly used in business circles to collect and analyze data from social media [23,24]. The aim of these procedures is to gain insights into user behavior and preferences, the course of interactions, contact networks, and above all one's own communication success (cf. [22]). Social media analytics are primarily used to analyze the design of corporate posts, as this is one of the key success factors in social media marketing [21,22].

However, these methods have yet to be fully harnessed for nature conservation communication, as the lack of research and literature on the effective design of conservation posts in social networks shows [12]. The intent of this article is therefore to provide explorative insights into how the design of nature conservation posts on Facebook and Twitter influences their communication success. In this context, we aim to confirm or reject the following hypothesis:

Communication success on Facebook and Twitter is influenced by the utilization of design characteristics commonly found in posts, such as hashtags, links, emojis, images, videos, interaction prompts, and post length.

2. Materials and Methods

During the sampling process, conservation organizations were selected based on the following criteria:

- They are associated with nature conservation by the German public.
- They are based in Germany.
- They have Facebook and Twitter profiles with at least 3000 followers.
- They predominantly communicate in German on social networks.
- Their organizational and thematic diversity ensure that the study is relevant for different types of nature conservation organizations.

Based on these criteria, the German Federal Agency for Nature Conservation (Bundesamt für Naturschutz, BfN), Naturschutzbund Deutschland e. V. (NABU, one of the biggest conservation NGOs in Germany), and World Wide Fund for Nature Germany (WWF) were chosen for our study. Table 1 shows some of their characteristics and differences.

Table 1. Overview: BfN, NABU, and WWF Germany database: [25–34].

Property	BfN	NABU	WWF Germany
Legal status	German government's scientific authority	State-recognized environmental and nature conservation organization	Non-profit foundation
Decision-making structure	Top-down	Primarily B=bottom-up	Top-down
Main sources of funding	Public funding	Membership fees, donations, public subsidies	Membership fees, donations, public subsidies, business cooperations
Employees	390	244	338
Facebook followers (July 2020)	6013	138,600	403,161
Twitter followers (July 2020)	3697	136,800	483,100

The social networks Facebook and Twitter were selected because they are the most widely used social networks in Germany with a focus on text-based communication. Facebook is used by over 258 million users per week in Germany, and Twitter by 33 million (as of 2019, [35]).

We examined 100 posts from each organization on Facebook and Twitter, resulting in a total sample of 600 posts (see Supplementary A). Only posts that were originally created by the conservation organizations (i.e., not posts shared by them) were taken into account. Additionally, sponsored posts were excluded. The data collection took place from 31 July to 7 August 2020. The last 100 posts by each organization on Facebook and Twitter from before 30 June 2020 were examined. Thus, posts from July 2020 were ignored, as the likelihood of higher attention and dissemination through likes, shares, etc. of older posts rises with their longer display time on the users' wall (Facebook) or timeline (Twitter). By analyzing posts that were at least one month old, we minimized such effects and could assume that the number of reactions, comments, and shares were (approximately) the final values (cf. [36,37]).

The posts were analyzed with respect to seven independent variables (see Table 2). Their selection was based on existing studies on post design in social networks (cf. [6,12,22,38–41]).

Table 2. Independent variables used to examine posts.

Independent Variable	Scaling	Remarks
Hashtag	Categorical (yes/no)	–
Link	Categorical (yes/no)	Both platform-internal and external links
Emoji	Categorical (yes/no)	–
Image	Categorical (yes/no)	–
Video	Categorical (yes/no)	Only directly playable videos or GIFs counted
Interaction prompt	Categorical (yes/no)	Questions for users in post text or video and explicit invitations to comment; no rhetorical questions
Character count	Metric	Characters in images and videos as well as emojis and links were not counted.

Various dependent variables are used to evaluate communication success. We consider posts to be successful if they advance the following communication goals on social networks: sensitization, information, and motivation of users [42]. However, the sensitization, information uptake, and motivation gains that conservation posts actually achieve and other potentially desirable effects like increased donations could not be sufficiently determined within the scope of this study. Therefore, indicators for the (potential) communication success were developed for the three communication goals.

The basic prerequisite for achieving the aforementioned goals is to reach the addressees with the respective message and to encourage them to actively engage with the content of the post [6]. However, it should be noted that we do not know how many users actually saw a post. We can only count their interactions with it. These desirable interactions of the users with a post we refer to as “user engagement” (in a deviation from the everyday understanding of the word) [22].

Based on Ahrholdt et al. (2019) [22], engagement is measured through four indicators, with the fourth serving as an overarching, summarizing indicator in case reactions, comments and shares are of equal interest to a conservation actor:

- Reactions—users perceive the post and acknowledge it with an emoji reaction (Facebook) or a Like (Twitter).
- Comments—the post incites users to comment.
- Shares—users disseminate the post further.
- Overall Engagement—the post is acknowledged, inspires comments, and is further distributed.

When evaluating the communication success of BfN, NABU, and WWF Germany, it had to be considered that their profile pages had different numbers of followers (see Table 1). As a result, the posts by WWF Germany were displayed to significantly more users, which presumably resulted in more overall interactions (cf. [22]). Since the posts of the three organizations were analyzed together and the sample was only subdivided according to the social networks, this would have distorted the statistical results. To avoid this, for each individual post the number of interactions was therefore set in relation to the number of followers of the respective organization (cf. [22,41,43]).

According to Ahrholdt et al. (2019) [22], this results in the following formulas for calculating the success indicators for every post:

$$\text{Reactions (\%)} = (\# \text{ Reactions}) / (\# \text{ Followers}) \times 100 \quad (1)$$

$$\text{Comments (\%)} = (\# \text{ Comments}) / (\# \text{ Followers}) \times 100 \quad (2)$$

$$\text{Shares (\%)} = (\# \text{ Shares}) / (\# \text{ Followers}) \times 100 \quad (3)$$

$$\text{Overall Engagement (\%)} = (\# \text{ Reactions} + \# \text{ Comments} + \# \text{ Shares}) / (\# \text{ Followers}) \times 100 \quad (4)$$

To assess the influence of the post design on the communication success, two methods of inductive statistics were applied using the program R (see Supplementary B):

(1) The Mann–Whitney U test can be used to test whether categorical independent variables with two factor levels (yes/no) have a significant impact on a metric dependent variable [44]. Accordingly, the Mann–Whitney U test was used for the independent variables hashtag, link, emoji, image, video, and interaction.

(2) The influence of the metric independent variable of character count on communication success was tested using Spearman’s rank correlation analysis (cf. [12]). It is used to test the linear relationship between two metric variables. We interpreted the resulting Rho values in terms of effect strength according to Cohen (1992) [45] as follows:

- Absolute value of Rho ≥ 0.10 —weak effect
- Absolute value of Rho ≥ 0.30 —medium effect
- Absolute value of Rho ≥ 0.50 —strong effect

Throughout the following sections, in order to place our results in a larger context, we refer to existing findings on success factors of posts on social media in areas other than conservation, since our survey is the first so far to focus on conservation. Therefore, similarities between the results can not be expected per se, nor can direct comparisons be drawn. Nevertheless, it rounds off the picture with previous findings on the subject and at the same time shows that there is a need for further research to gain more representative knowledge.

3. Results

3.1. Descriptive Results

What follows is a descriptive insight into the collected data, i.e., the design of the conservation posts and the user engagement achieved. The results of the descriptive statistical analysis (see Table 3) show, above all, that the Facebook posts achieved higher mean values in all four success indicators than the Twitter posts. On both platforms, the average reaction values were higher than the comment and share values obtained. In addition, users preferred to share posts rather than comment on them. Table 3 also shows how often the conservation organizations used the examined design elements (hashtags, links, etc.) in their posts on Facebook and Twitter. It is noticeable that many posts contained links (91%), emojis (52%), and images (78%). Hashtags were also used frequently on Twitter—but less so on Facebook. Both videos and interaction prompts were present in less than 15% of posts. On Facebook, the conservation organizations published posts with an average length of around 385 characters. The shortest posts contained no text at all, only images or videos. The longest post was over 2000 characters. However, this was an outlier; the second longest post had just about 1500 characters. Consequently, all of the following statistical results and recommendations for action regarding post length on Facebook only apply to the actual character span of 1500 characters that was examined. Posts by conservation organizations on Twitter were much shorter than on Facebook, averaging around 196 out of 280 possible characters. The shortest Twitter post contained 16 characters, the longest 251, with more than half of the posts being published between 12 and 5 p.m. on both platforms. There were no posts before 7:30 a.m. on either Facebook or Twitter, and only rarely after 8 p.m.

Table 3. Descriptive results for all independent and dependent variables.

Platform	Variable	Mean Value	Standard Deviation	Min.	Max.
Facebook (<i>n</i> = 300)	Hashtag	0.28	0.45	0	1
	Link	0.88	0.326	0	1
	Emoji	0.6	0.491	0	1
	Image	0.85	0.358	0	1
	Video	0.147	0.354	0	1
	Interaction prompt	0.07	0.256	0	1
	Character count	384.8	296.1	0	2012
	Reactions	0.417	0.479	0.005	4.424
	Comments	0.069	0.342	0.000	5.605
	Shares	0.151	0.399	0.000	5.240
	Overall Engagement	0.638	1.106	0.006	15.670
Twitter (<i>n</i> = 300)	Hashtag	0.747	0.436	0	1
	Link	0.937	0.244	0	1
	Emoji	0.443	0.498	0	1
	Image	0.71	0.455	0	1
	Video	0.043	0.204	0	1
	Interaction prompt	0.013	0.115	0	1
	Character count	195.9	37.97	16	251
	Reactions	0.139	0.263	0.001	1.975
	Comments	0.005	0.014	0.000	0.135
	Shares	0.071	0.141	0.000	0.893
	Overall Engagement	0.025	0.036	0.000	0.317

3.2. Influence of the Post Design on the Communication Success

On Facebook, hashtags, images, and the use of many characters positively influenced communication success (see Table 4). On Twitter, links, images, and longer posts led to more user interactions. Moreover, emojis had a positive influence on commenting and overall engagement on Twitter. Conversely, emojis and videos had a negative statistical impact on several success indicators on Facebook. Emojis also had a negative impact on Twitter reactions and shares. Additionally, hashtags reduced overall engagement on Twitter.

Table 4. Post characteristics with positive (blue) or negative (red) impact on user interactions (results for empty cells are non-significant, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, see Supplementary C for detailed analysis results). FB = Facebook; Tw = Twitter.

	Reactions		Comments		Shares		Overall Engagement	
	FB	Tw	FB	Tw	FB	Tw	FB	Tw
Hashtag	*				*			***
Link		***				***		
Emoji	***	*		*		*	***	***
Image	*	***	**	***		***	*	*
Video	*		**				*	
Interaction prompt								
High character count	*** ¹	*** ¹	** ²		*** ¹	*** ¹	*** ¹	*** ¹

¹ Medium effect (absolute value of Rho ≥ 0.30) according to Cohen (1992) [45]; ² weak effect (absolute value of Rho ≥ 0.10) according to Cohen (1992) [45].

4. Discussion

In the following, we discuss—separately for the four engagement indicators—the results as well as the possible reasons for them in more detail. We also place them in the context of already existing research. Finally, we derive design recommendations for conservation posts on Facebook and Twitter (see Section 4.5) and discuss methodology and future research needs (see Section 4.6). In each subsection, we address the seven independent variables in the same order as in Tables 2 and 4: hashtag, link, emoji, image, video, interaction prompt, and high character count.

4.1. Reactions

(a) Hashtags: On Facebook, conservation posts generated more reactions if they contained at least one hashtag, a result that has also been found for posts by local governments in Greece [39]. This is presumably because hashtags put posts in a broader thematic context (cf. [22]). This allows users to find relevant posts on a certain subject via the search function—even if the posts were not displayed on their own wall or timeline. On Twitter, hashtags had no impact on the reaction count.

(b) Links: While links on Facebook did not have an impact on reactions, they led to more likes on Twitter. We cannot explain this difference, especially since Pianosi's (2017) [6] study showed that conservation posts from De Montfort University received more likes when they did not contain a link. Conservation posts with links may have gotten more likes on Twitter because links make posts more memorable and can trigger emotions (cf. [46]). To verify this assumption and especially the differences shown, future studies could investigate what content the conservation organizations link to in their posts and whether the sentiment of user responses and comments are related to it. We hypothesize that culture-related issues or different target groups might play a role.

(c) Emojis had a negative influence on the reaction rate of conservation posts on both Facebook and Twitter. In contrast to this finding, diabetes-related Facebook posts with emojis achieved more reactions [47], as well as Twitter posts from airlines and car manufacturers [37]. We assume that these disparate results are due to the different topics and therefore target groups, although it is left to future studies to find the reasons for this by examining the relationship between emojis and user reactions in more detail.

(d) Images: On both platforms, images had a positive influence on reactions. Other studies came to the same conclusion (e.g., [12,41]).

(e) Videos: Posts with videos achieved fewer reactions on Facebook and had no impact on Twitter. The negative influence on Facebook could be due to the length of the videos and accordingly long loading times (cf. [48]). This may have led users not to view posts with videos at all and consequently not to react to them (ibid.). In contrast to our results, other studies on Greek local governments [39] and large companies [49] have shown a positive impact of videos on reactions.

(f) Interaction prompts: These had no influence on reactions on Facebook and Twitter. This could be because they were infrequent and their influence was therefore not statistically significant; only 7% of the examined Facebook posts and 1% of Twitter posts addressed questions to users or invited them directly to react, comment, or share.

(g) High character count: A higher character count positively influenced the reactions on both platforms, which was confirmed by a study by Gligorić et al. (2018) [50] for Twitter posts. A possible reason could be a preference of subscribers for detailed, informative posts.

4.2. Comments

(a) Hashtags and (b) links: Neither affected the number of comments a conservation post received on Facebook or Twitter.

(c) Emojis: While no such effect was visible on Facebook, conservation posts on Twitter generated more comments if they contained at least one emoji. This could be due to the fact that emojis can be used to communicate complex content in a lively way without taking up much space (cf. [51]). This is especially important on Twitter, due to its post length limitation of 280 characters, which does not exist on Facebook. Another reason might be that emojis can convey emotions, which entice users to comment more than neutrally minded posts (cf. [22]). However, we cannot explain why this applied neither to Facebook posts nor to reactions on Twitter and Facebook (see Section 4.1)—an issue for further research.

(d) Images: On both platforms, nature conservation posts with an image were commented on more often than posts without one. This is consistent with results of studies on corporate posts [41] and university Facebook posts in England [6]. On the other hand, university Facebook posts in Mexico received more comments when they contained only text [43]. In line with that, Löffler (2014) [52] recommends not using images when seeking comments. These different results, despite having a similar study focus, could indicate that the influence of images on the comments is dependent on other variables—for example, the post's content, cultural factors, or target groups/followers. This could, however, not be investigated further in our study.

(e) Videos: On Twitter, videos had no influence on the number of comments, whereas they had a negative effect on Facebook. As with the reactions (see Section 4.1), two other studies found an opposite, positive effect of videos [39,49]. Since there are no other studies to date that show a negative effect or no effect of videos on the number of comments, definite conclusions require further research.

(f) Interaction prompts had no impact on the number of comments received on either platform. As mentioned for reactions, the reason might be missing statistical significance. The same could also apply to the following indicators: shares (see Section 4.3) and overall engagement (see Section 4.4).

(g) High character count: Whereas character count had no influence on the number of comments on Twitter (where the number of characters is limited), it increased them on Facebook. This could be because longer posts offer more ground for comments in the form of questions, amendments, approval, or disagreement. However, the finding was statistically weak, so it should not dictate post design.

4.3. Shares

(a) Hashtags: On Facebook, hashtags led to more shares of conservation posts, presumably because hashtags situate the post within a larger topic area and are therefore shared more often by users with an interest in it. This complies with results of the already mentioned study on posts by Greek local governments [39] and is underlined by Ahrholdt et al. (2019) [22], who stated that hashtags can increase the reach of marketing posts. The Twitter posts by the three conservation organizations studied here did not obtain more shares when they contained hashtags—an issue for future research, as the reasons remain unclear.

(b) Links did not lead to more or fewer shares on Facebook. On Twitter, they had a positive influence presumably because linked content increases the informative value of posts, making users more willing to share them. In addition, links to images or videos can also contribute to increased shares, as Bruni et al. (2012) [48] showed for tourism posts.

(c) Emojis: While emojis had no impact on shares on Facebook, they decreased sharing of conservation posts on Twitter, which was also the case for Twitter posts by airlines and car manufacturers [38]. In contrast to that, Twitter posts about diabetes achieved significantly more shares with than without emojis [48]. These differences could have been caused by the respective post topic. Possibly, many subscribers to conservation organizations are strongly concerned about the matter and do not want to share posts that may, due to emojis, not be perceived as serious. However, emojis are an inherent component of communication on social networks [48] and increase the number of comments on conservation posts on Twitter (see Section 4.2). Emojis should therefore not be completely eliminated from them.

(d) Images: Facebook posts with images did not yield a change in shares, whereas Twitter posts were shared more often. The latter could be because users are more likely to share posts if they are interesting and attractive to their own followers. The difference between Facebook and Twitter could be due to the fact that many Twitter posts do not contain an image and Twitter users accordingly particularly value images and share them more often [38], whereas the use of images is more common and therefore nothing special on Facebook.

(e) Videos and (f) interaction prompts: Neither had an influence on shares on Facebook or Twitter.

(g) High character count: On both platforms, conservation posts were shared more often the longer they were, although this influence was weak on Facebook. An explanation for this effect could be that subscribers to the nature conservation organizations tend to pass on posts with a high information value to their own contacts. Löffler (2014) [52] also recommended that organizations from the marketing sector publish longer Facebook posts for more shares. According to Vries et al. (2012), the same applies to Twitter, regardless of topic and user [50].

4.4. Overall Engagement

(a) Hashtags: On Facebook, hashtags had no influence on overall engagement, whereas they reduced it on Twitter. This is surprising, as hashtags are an important part of information management on Twitter and none of the other three success indicators on Twitter was influenced positively or negatively by hashtags. Possible causes could be an excessive number of hashtags and a lack of fit with the post content. Too many hashtags might interfere with the reading flow and inappropriate hashtags might hinder the integration into an overarching topic cluster. Given the character limit on Twitter, too many hashtags could also take up valuable characters and thus reduce the meaningfulness of the post. Existing studies on the effective use of hashtags (e.g., [13,53]) have emphasized that fewer and more suitable hashtags are more useful than many generic hashtags.

(b) Links did not play a role in overall engagement on either platform. This is surprising, since they had a positive influence on reactions and shares on Twitter and should therefore be further investigated. A possible cause for the lack of statistical significance

could be the low frequency of links in Twitter posts (<10%) combined with the strictness of the Mann–Whitney U test (see Section 4.6).

(c) Emojis: Emojis led to less overall engagement for conservation posts on Facebook. This is presumably because emojis reduce the number of reactions but have no influence on the other success indicators. However, there are no studies on the effect of emojis on overall engagement that demonstrate a similar negative effect. It is only known that emojis are used to increase the vividness and engagement of a post [51]. Indeed, on Twitter, emojis increased the overall engagement of conservation posts. This is somewhat surprising, as emojis had a negative impact on reactions and shares there, whereas they increased the number of comments. This positive effect dominated the calculation of overall engagement.

(d) Images: Overall engagement on Facebook and Twitter was higher for conservation posts that included an image. This finding is confirmed by other studies on marketing in social networks (e.g., [22,49]) as well as on environmental protection posts [6] and on posts of nonprofit youth organizations on Facebook [40].

(e) Videos led to less overall engagement on Facebook—certainly because they also had the same effect on reactions and comments. However, to date there are no studies that have come to similar conclusions—they show rather the opposite (cf. [39,49]). Therefore, it should be investigated whether there are specific factors of conservation posts that contribute to lower overall engagement, such as mood, style, or information content of the videos. The length of a video can also negatively influence its appeal [54]. On Twitter, videos had no influence on overall engagement.

(f) Interaction prompts did not influence overall engagement, neither on Facebook nor on Twitter.

(g) High character count: In line with the other indicators, overall engagement with nature conservation posts also increased with the character count on Facebook. This complies with Carboni and Maxwell's (2015) [40] findings on Facebook posts by nonprofit youth organizations, which were up to 4780 characters long. The authors suggested that longer posts are more substantial, making users more likely to identify with and respond to them (ibid.). However, for conservation posts on Twitter, our results show that more characters led to less overall engagement. Although this correlation is extremely weak, this is surprising, as shares and reactions correlated positively with character count. There are also no other scientific studies that confirm this, leaving it up to future studies to shed more light on this question.

4.5. Recommendations for Conservation Posts on Facebook and Twitter

Summarizing the findings presented in Sections 4.1–4.4, we now give recommendations to increase the success of German conservation posts. In any case, it should be noted that we cannot give one-size-fits-all, prescription-like recommendations since results differ between Facebook and Twitter as well as between the four success indicators used. Beyond that, our study was only based on 300 posts and tweets by three conservation organizations and studies from other fields only partly confirm our results. Consequently, the respective conservation actors should accompany their social network activities with thorough observations of their results in order to adapt their posts to the lessons learned.

Again, our recommendations follow the different design elements.

(a) Hashtags should be used in posts since they led to a higher number of reactions and shares on Facebook, without having negative effects on other success factors. The only exception is overall engagement on Twitter, which decreased for posts with hashtags. Although this effect cannot be explained beyond doubt, it can be seen as a hint to not use too many hashtags in one post, but rather to deliberately choose a few—especially to put the post in a larger thematic context and to allow for an easy search. In addition, organizations could also develop their own hashtags and actively circulate them to promote their brand identity [13,53] or topics important to them. A good example is WWF's #LastSelfie campaign [15].

(b) Links should especially be used on Twitter, as they had a positive influence on reactions and shares there, but no negative influence on any other indicator, including Facebook.

(c) Emojis should be used carefully, as they seemed to have a much more negative than positive impact on the success of posts, although they increased the number of comments and overall engagement on Twitter. Nonetheless, as they are essential elements of communication on social networks, they should not be completely excluded from posts, but rather used in particular cases only—e.g., to emphasize the intended mood of the post or to avoid misunderstandings due to ironic statements. Beyond that, conservation organizations should carefully observe the influence of emojis on the success of their own posts and apply their learnings to future posts.

(d) Images can and should be used whenever it seems to be suitable and the image fits the topic since they had a positive influence on almost all indicators on both Facebook and Twitter, but no negative one.

(e) Videos decreased the number of reactions and comments as well as overall engagement on Facebook and had no effect in any other case. Consequently, they should be used consciously and in exceptional cases only. We assume that longer videos might make a post less attractive due to different reasons and therefore suggest using short videos. Still, this is a hypothesis to be tested, particularly by conservation actors using videos.

(f) Interaction prompts did not influence any indicator of success, implying they can be used or not. However, this result is based upon a very small number of posts that actually made use of interaction prompts and therefore has to be taken cautiously.

(g) High character count was more important on Facebook than on Twitter, where only 280 characters are allowed. However, it also had an influence on Twitter, where a higher number of characters led to more reactions and shares (but also to lower overall engagement—although with very weak statistical significance). For Facebook, we suggest using longer posts (up to 1500 characters), as they were more successful than shorter ones.

4.6. Discussion of Methodology and Future Research

Some limitations of this study should be considered in future research endeavors. In this paper, Facebook and Twitter were examined. An investigation of additional social networks, such as Instagram or TikTok, could provide valuable information for the deliberate selection of social networks for specific conservation communication goals (cf. [55]).

Although the three organizations studied were deliberately chosen to have very different characteristics, they are not necessarily representative of nature conservation as a whole—not even in Germany. Future studies could therefore include even more (also international) nature conservation organizations and increase the sample size to verify whether the conclusions and recommendations for post design presented here can be applied on a broader base. In-depth studies should also be conducted for specific recommendations for individual organizations or areas of nature conservation action, as differences could also arise between them.

Moreover, it is unclear how many bots interact with the accounts of BfN, NABU, and WWF Germany, as their number and activities can only be determined through complex analytical procedures (cf. [56]). Accordingly, future studies should consider bot activities in the calculation of success metrics—for example, by mathematically adjusting the values.

Furthermore, although the Mann–Whitney U test and Spearman’s rank correlation analysis impose only low requirements on the data used, they are statistically very strict, i.e., they reject results as non-significant more readily. Moreover, they cannot be used to investigate complex interactions between more than two variables, and they do not always allow for the depiction of real causality. Future studies should therefore use more extensive parametric analyses and models to test the causality of the statistical relationships identified here—for example, a multivariate analysis of variance (MANOVA), which could not be done for this paper since the data collected did not meet the necessary requirements, esp. concerning normal distribution and homogeneity of covariances.

In addition, future studies could examine how the timing, subject matter and sentiment (cf. [22]), communication intent (cf. [6,57]), and complexity and readability (cf. [58]) of a post affect its success. They could also use a variety of other dependent variables. If possible, they should match the communication goals of the conservation actors studied. The following variables could be used to complement the success indicators examined in this paper:

- Overall engagement with weighted sub-indicators (cf. [22]);
- Cost-effectiveness, i.e., the ratio of resources used to publish posts to the level of engagement achieved (cf. [22]);
- Influence on political decision-making processes (cf. [2]);
- Increases in the volume of donations (cf. [2]); or
- An increase in subscriber numbers and overall reach (cf. [6,22]).

In any case, a validation and supplementation of the presented findings is a worthwhile task for future research due to the growing relevance of digital conservation communication.

5. Conclusions

The analysis revealed that the influence of post design on communication success varies greatly depending on the social network and the success indicator under consideration. Therefore, we can only partially confirm our hypothesis that communication success on Facebook and Twitter is influenced by the utilization of design characteristics commonly found in posts. Specifically, some of the design features examined had a positive effect on one success indicator but reduced the values of another one or had no statistically significant influence at all. The strong variation depending on the platform and success indicator primarily concerned hashtags and emojis. Only a higher character count and the use of image elements had a predominantly positive influence on communication success. In addition, links on Twitter had a positive influence on reactions and shares. Conversely, videos on Facebook led to lower values in all success indicators except shares. There were no statistically significant results at all for the interaction prompt variable. The above results show many similarities with other study findings, but also some differences. This fact was taken into account when developing clear and easy-to-implement design recommendations for the four success indicators.

Through the effective and deliberate use of social networks, nature conservation can connect to a society undergoing digitalization and contribute to the sustainable shaping of this development. Communication can help reduce the gap between nature conservation and the public and bring people together to tackle the problem of the degradation of the natural environment. In this respect, new media such as social networks offer nature conservation the potential for unprecedented reach and mobilization of societal support.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/su132212768/s1>. Supplementary A: Miller_Heiland_data.txt contains the data collected for the statistical analysis. Supplementary B: Miller_Heiland_script. Rmd was the R script utilized for statistical analysis. Supplementary C: Miller_Heiland_statistical_results contains detailed statistical results.

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