

Using Big Data to Analyze Impact of Visual Design on Social Networking [†]

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Abstract: How to use social media to publicize policies is one of the most critical topics for local governments to operate social networking. Thus, this study is carried out to analyze the relationship between post-presenting and visual design taking the Facebook fan page of the Construction Office of Taitung County Government as an example and using big data technology. The results show that the promotion effect of images and text is higher than that of videos, reposted news, and shared posts. Moreover, the type of image and text is more attention with the position with more than 100 words, and there is no significant difference in the promotion effect of text layout, hashtags, and image forms (graphics or photos). The results of this study provide a reference for future government management of social media, reducing the waste of human resources and ineffective costs.

Keywords: policy promotion; social media; communication; visual design; big data; social networking

1. Introduction

The government has gradually changed from sovereignty to interactivity in its policy promotion. Social media is an excellent communication network between the government and the public. Facebook is still the most widely used social platform in Taiwan in 2022, and its market share is still as high as 60% [1]. Through its algorithm and big data design, it is easier to induce users to participate in communication between social networks. The use of interactive functions can strengthen public participation in policy communication and improve the mechanism of citizen participation [2]. For the government, using social media to improve policy recognition is essential [3]. The primary purpose of this study is to enable the government to effectively promote policies on social networks and make their audiences receive information more effectively. In the past, researchers mainly summarized and analyzed the content of posts on Facebook fan pages. According to the user experience theory, visual perception during the process is found to affect their experience [4]. With the development of information technology (ICT), social media has become the most popular communication channel and formed a unique communication logic different from traditional media. Social media is challenging to define media ecology. In particular, the increasing diversity of built-in social media services makes social media ecology research pertinent. Thus, research on the social ecology of social media has received more attention. Therefore, we selected the “Taitung Construction” Facebook fan page operated by the Taitung County Government in 2015 as the research target of this study.



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2. Literature Review

2.1. Digitalization of Government Information

The government has undergone a digital transformation in response to the advent of the information age. Through the effective management of social media, the government can improve the transparency of government implementation of government affairs, and the open online world can make people more willing to express their opinions [5,6]. At the same time, it also breaks the traditional limitations of space and time and promotes the public's enthusiasm to attend to civic issues [2]. Social media is a type of self-media that allows the government to publish information without considering the political stance of other media. The public can directly and openly express their opinions to the government, forming a more effective two-way communication [7]. In recent years, the government has gradually achieved results in the operation of social media. At the same time, they also face the following problems: they do not understand the audience's preferences, resulting in the low promotion of information, spending much money to hire Internet celebrities to promote policies, but they cannot effectively increase the public's recognition of the policy [8], with a lack of human resources to maintain social media, resulting in information omission or multiple people operating social media, making the overall message-style different [9]. These need to be overcome in future policy promotion.

2.2. Related Research on Facebook Fan Pages

Since Facebook opened the fan page function, research exploring its interaction mode has been presented one after another. In the early days of little advertising and few fake accounts, the posting location of the message and the comment's content greatly impacted the post impressions [10]. According to research results in recent years, the content, time, and medium of posts of several types of Facebook fan pages affect post impressions. On Facebook fan pages with English teaching, the pictures in warm colors and the posts posted on working days have higher promotion benefits [11]. Facebook fan pages on commercial brands show that the text content of posts (incentive marketing, brand characteristics, and message vividness) significantly affect the user's interactive behavior. At the same time, the posting time and the post impressions have no significant impact on the interactive behavior [12]. For Facebook fan pages run by the government, the posts' image quality, clarity, and entertainment can significantly affect the degree of policy recognition and support [3]. According to the post's content, entertainment messages and clarification messages have a significant positive impact on fan interaction. Livelihood messages have a significant positive impact on the number of likes and shares, and overall, the post's content trumps the medium [13].

2.3. Research on Visual Design and User Experience

Through the above analysis, the user's feelings are the main factors affecting the interaction of fans. Cognition and emotion have an impact on human thinking. Aesthetic and pleasant things improve efficiency [4]. The typesetting of design posts is used to provide users with aesthetic needs and satisfy their visceral level. Then, the designer needs to consider the behavioral level of the user's operational experience and allow users to enter a reflective level [14], thereby increasing the user engagement of Facebook fan pages. User experience is a perceptual process that results from repeated tests and adds rational information to emotional appeals [15]. Increasing cognitive ease of use, emotional interest, and emotional attachment can enhance the user's sense of identity [16]. Therefore, Facebook fan pages operated by the government must not divide information types by business but consider audience types, use information visualization to enhance user's memory, and effectively link policy issues to make two-way communication more complete [17].

3. Research I: Post-Presenting and Promotion Effect

We take the "Taitung Construction" Facebook fan page operated by the Taitung County Government as the research object. It is explored whether different post-presentation

methods affect the effect of policy promotion. The number of Facebook fan page fans was about 7400. About 42.4% of fans set their residence as Taitung County; male users accounted for 51.3%; female users accounted for 48.7%; the majority of users were age 35 to 44 years old, and this fan page did not purchase advertisements.

3.1. Research Methods

We set the research period from January to September 2022. It published 163 posts, an average of 18 posts per month, including 97 policy advocacy posts, 40 policy achievements, 18 related announcements, and 8 relay messages. Posts on the fan page were grouped into five types: video, image and text, reposted Facebook posts, reposted news, and reposted YouTube news according to the presentation. Among them, the number of “repost YouTube news” accounted for 58.9% of all posts. However, its promotion data were relatively low compared to other types. This implied that the policy promotion effect of the fan page was not satisfactory. Therefore, we set the post-presentation as an independent variable, set the promotion data of the backend system of the meta business suite as a dependent variable, and conducted an Analysis of Variance by SPSS.

3.2. Research Results

3.2.1. Descriptive Statistics

According to the descriptive statistics (Table 1), the fan page released 7 videos, 22 images and text, 8 reposted Facebook posts, 30 reposted news, and 96 reposted YouTube news. The presentation of “image and text” obtained the highest promotion benefits [11], followed by “reposted Facebook posts.” There was little difference in the post impressions for videos, reposted news, and YouTube news.

Table 1. Descriptive statistics of Research 1.

Post-Presenting	Post Impressions		
	Mean	N	Std. Deviation
Image and text	1945.32	22	1707.784
Videos	592.71	7	181.767
Repost news	581.20	30	290.102
Repost Facebook posts	1056.25	8	528.603
Repost YouTube news	616.61	96	282.803
Total	809.98	163	815.637

3.2.2. Research Analysis and Results

The hypothesis of this study is “post-presenting affects the post impressions on the fan page,” and the results of the Analysis of Variance are shown in Table 2. The research results show significant differences in the influence of post-presentation methods on the post impressions, $F(4,158) = 18.47$, $p < 0.001$. Further analysis showed that the post impressions of “image and text” ($M = 1945.32$, $SD = 1707.784$) were higher than “repost Facebook posts” ($M = 1056.25$, $SD = 528.603$), “repost YouTube news” ($M = 616.61$, $SD = 282.803$), “videos” ($M = 592.71$, $SD = 181.767$), and “repost news” ($M = 581.20$, $SD = 290.102$), so overall, the hypothesis is supported.

Table 2. ANOVA result of Research 1.

Post-Presenting	ANOVA				
	Sum of Squares	Do	Mean Square	F	Sig.
Between Groups	34,333,129.704	4	8,583,282.426	18.466	<0.01
Within Groups	73,439,689.241	158	464,808.160		
Total	107,772,818.945	162			

3.2.3. Other Research Findings

According to the presentation method of posts stipulated by Facebook, “image and text” and “repost Facebook posts” are text on top of multiple pictures, and “videos” are played in real time. The layout of “reposted news” and “reposted YouTube news” is presented in a single full-page static image. The interactive interface affects the user’s preference [4], so we analyze the impact of visual design on the promotion effect for highly interactive posts.

4. Research II: Visual Design on Promotion Effect

The focus of this study is to summarize the post-editing model with a high promotion effect and low cost for the government. Since the “Taitung Construction” fan page does not have a single administrator, the editing habits are also different.

4.1. Research Methods

In this study, from the original 163 posts, excluding the posts with low interaction, 37 posts were screened out. The factors affecting the user’s visual design were used as independent variables, and the promotion data of the backend system of the meta business suite were used as a dependent variable. The independent variables were divided into four categories: number of words (less than 100 words, more than 100 words), typesetting (one line per sentence, no line break), #Hashtag (used, not used), and central visual design (photos, post-production images), and an Independent Sample *t*-test by SPSS was conducted.

4.2. Research Results

4.2.1. Descriptive Statistics

According to the descriptive statistics (Table 3), the fan page had no apparent preference and unique style in the number of posted characters, typesetting, #Hashtag, and the central visual design, verifying that the fan page mentioned in the preceding paragraph is not a single administrator. According to the average post impressions, the post impressions with more than 100 words, no line breaks, the use of #Hashtag, and photos are better than the average. To check whether the above operating factors significantly impact the post impressions, an Independent Sample *t*-test was performed.

Table 3. Descriptive Statistics of Research II.

Independent Variables	Operating Factors	Number of Psst	Average Post Impressions	Std. Deviation
Number of words	Less than 100 words	10	752.40	359.37
	More than 100 words	27	1773.04	1597.32
Typesetting	One line per sentence	23	1391.87	1230.95
	No line break	14	1670.21	1777.89
#Hashtag	Used	13	1746.77	1449.30
	Not used	24	1362.00	1454.36
Central visual design	Photos	18	1869.89	1570.82
	Post-production images	19	1144.11	1253.55
Total		37	1497.19	

4.2.2. Research Analysis and Results

There are four research hypotheses in this study. Hypothesis 1: “The number of words posted will affect the promotion effect, and the post impressions with more than 100 words is higher than the other”; Hypothesis 2: “The type of typesetting will affect the promotion effect, and the post impressions without line breaks is higher than the other”; Hypothesis 3: “#Hashtag will affect the promotion effect, and the post impressions with using #Hashtag is

higher than the other”; Hypothesis 4: “The central visual design will affect the promotion effect, and the post impressions presented by photos is higher than the other.”

The independent sample *t*-test results are shown in Table 4. The research results show that the number of posted words significantly differs in the post impressions, $F = 4.402$, $p = 0.043$, $t = -3.114$, $df = 31.873$, $p\text{-value} = 0.004$. Further analysis shows that the number of words is more than 100 words ($M = 1773.04$, $SD = 1597.321$), and the post impressions are higher than 100 words or less ($M = 752.40$, $SD = 359.371$), so Hypothesis 1 is supported. The research results of Hypothesis 2 ($t = -0.515$, $p\text{-value} = 0.612$), Hypothesis 3 ($t = 0.769$, $p\text{-value} = 0.447$), and Hypothesis 4 ($t = 1.558$, $p\text{-value} = 0.128$) show that they cannot reject the null hypothesis. #Hashtag, typesetting, and central visual design have no significant difference in the impact of the post impressions.

Table 4. *T*-Test results of Hypothesis 1–4.

Post-Presenting	Post Impressions		T-Test for Equality of Means		
	F	Sig.	T	Df	Sig. (2-Tailed)
Hypothesis 1					
Equal variances assumed	4.402	0.043 *	−1.985	35	0.055
Equal variances not assumed			−3.114	31.873	0.004
Hypothesis 2					
Equal variances assumed	0.044	0.836	−0.563	35	0.577
Equal variances not assumed			−0.515	20.654	0.612
Hypothesis 3					
Equal variances assumed	0.680	0.415	0.769	35	0.447
Equal variances not assumed			0.770	24.810	0.449
Hypothesis 4					
Equal variances assumed	0.297	0.589	1.558	35	0.128
Equal variances not assumed			1.548	32.521	0.131

4.3. Other Research Findings

A hashtag is a function similar to tag sharing. In addition to turning the text blue, it increases the attention between the posts. Generally speaking, proper use can increase post impressions, and it has always been a function advocated by marketing units. It is found in this study that using this function has no significant effect on promoting the “Taitung Construction” Facebook Fan Page. It is speculated that the hashtag used on the fan page is of low generality or the hashtag is only used to distinguish between fonts and colors, which makes it impossible to link to popular keywords, so it cannot significantly increase the post impressions.

5. Conclusions

This study aims to explore the impact of visual design on community interaction and to analyze whether the different post-presenting significantly differ in their promotion effect. In the past, most research focused on the cognitive division of the post’s content but did not discuss it according to the type of posting. Therefore, with post-presentation for statistical analysis, we verified that posts with images and texts are more likely to arouse users’ interest.

Usually, the government does not have enough professional human resources to operate fan pages. It is common for different business units to operate a fan page jointly. According to the business distribution of the government, if there are projects beyond professional such as producing films, posters, and dummies, extra expenses are usually entrusted to external agencies for execution. However, through this research, we found that

the way of video and post-graphics does not have a significant impact on users. Instead, the number of texts in the post positively impacts the policy promotion effect.

To save the cost and time of the government, the study result needs to be used as a reference. For the content of future policy promotion posts, clearer texts must be used to inform the public of relevant information, and it does not require gorgeous typesetting and design. Clear information text with photos is the best business strategy for this research subject.

The limitation of this study is that the research object is the construction unit of the local government agency, and the hypotheses are only four. After statistical analysis, only the first hypothesis is supported. The preliminary inference is that the user group of the fan page is primarily middle-aged. Therefore, it belongs to the online communication mode that young people are used to including the typesetting method of one sentence per line, the use of #Hashtag, and the presentation method of memes which have no significant impact on the audience of the fan page. By summarizing the above factors of visual design and policy promotion, it is possible to establish a standard post-editing process for the government to operate the fan profession to avoid problems such as information gaps during the subsequent handover of business personnel.

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