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Applying the DEMATEL Method to Evaluate Social Media Criteria in Promoting Sustainable Health Behavior—A Case Study of Vegetarian Diet Promotion by a Non-Profit Organization

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Abstract: The purpose of this study was to identify and analyze the determinants of the success of social media health promotion by non-profit organizations. Based on a literature review, fourteen criteria were considered in the study. A questionnaire was administered to seventeen respondents working with a non-profit organization involved in healthcare services in Taiwan. The decision-making trial and evaluation laboratory (DEMATEL) method was used to evaluate the causal relationships among the proposed factors. The results indicated that user-friendliness, word of mouth, and security mechanisms are some of the key causal factors. In addition, cultural consideration, emotional connection, using the same language and tone, and mobilization are among the key effect factors. The findings provide non-profit healthcare organizations with insights about how they can better implement health promotion on social media. The study also provides an original contribution by examining the success criteria of social media health promotion using the DEMATEL method.

Keywords: social media; health promotion; vegetarian diet; Tzu Chi Foundation; decision-making trial and evaluation laboratory analysis



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1. Introduction

The rapid evolution of internet networking has seen a rise in the dissemination of health information on social media. Web-based social media sites such as YouTube, Facebook, Twitter, and Instagram ease communications among people who are in physically distant locations. The health sector and non-profit organizations take advantage of the ease of communication brought about by social media to communicate health promotion messages to the public [1]. In Taiwan, there are over 21 million social media users, representing 89.4% of the country's total population [2]. This broad social media presence of people has prompted non-profit organizations working in the health sector in Taiwan to build their presence on social media. Well-known non-profit organizations such as Taiwan Root Medical Peace Corps, Mental Health Association in Taiwan, Taiwan Youth Climate Coalition, and the Tzu Chi Foundation have a strong social media presence. These organizations use their social media accounts for their health promotion initiatives. For instance, the Taiwan Youth Climate Coalition uses its social media pages to promote environmental protection and climate change, and the Tzu Chi Foundation uses its social media presence to promote its missions of humanitarian relief, charity, and environmental protection.

Although social media is a powerful tool for health communication, some empirical evidence has demonstrated that in some cases, social media health communication fails to motivate the target audience's engagement in the health issue at hand [3,4]. This is due to several factors, such as users' skepticism about the accuracy of the information, cultural factors, privacy concerns, and users' preoccupation with other issues [5–8]. Consequently, the healthcare organization misses out on the chance to bring positive social change in the societies it serves. On the other hand, the target audience misses out on the chance for better health. Although extant research has examined the factors that inhibit the success

of health promotion on social media and people's attitudes towards social media health promotion [3,5,8], not much has been done to examine the key determinants of social media health promotion success. Given the stakes (to the organization and to the target audience) involved in social media health promotion, it is important to have a systematic understanding of the factors that determine the success of healthcare promotion on social media. As such, the main objective of this study is to develop an understanding of the factors that lead to the success of health promotion on social media, particularly within the context of vegetarian diet promotion.

Health promotion is designed to provide access to knowledge that promotes sustainable health-related behavior change. Sustainable behavior change refers to the process by which one acquires new behaviors and sustains them over time [9]. Health researchers argue that although there are many approaches to bringing about change, the means for ensuring that the change is permanent are sometimes lacking [10]. For behavioral change to be sustained, it needs to be well internalized and integrated into the person's self [9]. For internalization and integration to occur, the dissemination of health-related information needs to be carried out systematically [11]. One of the beneficial health behaviors being advanced by healthcare organizations worldwide is vegetarian dieting. Many studies have proved that vegetarian dieting has psychological, health, and ethical benefits [12–15]. Despite the apparent benefits of vegetarian dieting, some empirical studies demonstrate that some individuals shun information that promotes vegetarianism on social media, such that it does not bring any lasting change in them [16]. The resistance is partly due to the lack of adequate appeal in the messages [17]. This study, therefore, proposes some of the means through which social media health communication can elicit sustainable behavior change, particularly within the context of vegetarian dieting.

Applying the DEMATEL, this study addresses the following specific research questions: (1) What factors affect the success of health promotion on social media? (2) What are the interrelationships among the social-media-based health promotion success factors? With data collected from volunteers working in the promotion of vegetarian dieting from the Tzu Chi Foundation in Taiwan, the study offers valuable insight into how to maximize the benefits of social media for health-promoting behaviors. The study addresses the increasing pressure on healthcare communication practitioners to adjust their approaches to communicating and interacting with target audiences through social media [5,6]. The rest of the paper is organized as follows: the introduction is followed by a review of the existing literature and a discussion of the proposed success criteria that are tested by the study. Thereafter, the methodology is presented. Following this section, the DEMATEL, which is used in this study, is presented. The fourth section presents the study's findings and discussion. The paper ends with the conclusions and research and practical implications.

2. Literature Review

2.1. Social Media

Social media refers to the means of interaction through web-based technology in which people create and exchange information, ideas, and opinions in simulated communities and networks [18]. Social media interaction encompasses all two-way conversations that occur between a sender of information and the target audience [19]. Social media allows for the immediate and borderless exchange of information among users. As such, messages communicated through social media are spread and re-transmitted faster and to broader audiences than is possible through other communication tools [20]. Social media is a powerful tool that can create relationships between a target audience and the practitioner [21]. Thus, social media is currently an important driver for obtaining and spreading information in different contexts, such as business [22–24], government [25], healthcare [26], wildlife recreation [27], and social marketing [28,29].

Prior research suggests that various factors play a role in shaping the success of social media communications. Security, information content, communication, reputation, and the character of the message sender are powerful criteria that shape the success of

social media communications [30]. Information seeking, social activity, the attractiveness of content, collective intelligence, and network externality are also stimulators of users' continuous intention towards engagement with the government on social media [25]. Furthermore, successful social media efforts consist of five dimensions: entertainment, interaction, trendiness, customization, and word of mouth [31]. Another study also found that satisfaction, enjoyment, perceived usefulness, social influence, and perceived ease of use are facilitating conditions for social media usage habit formation [32]. Social influence metrics, influence maximization, mobilization, word of mouth, and online reputation management are also important dynamics in social media that may have a bearing on the success of social media communications [33]. In accordance with the above-stated studies, the author formulated 14 factors to be examined by the study as possible determinants of social media health promotion. These factors are discussed below.

2.1.1. Personalization of Content

The personalization of content refers to the incorporation of recognizable aspects of a person in the content information [34]. Personalization means that the communicators create content whilst considering factors such as who the audience is, how and when the audience reads the content, and the devices used to read the content. On top of that, personalized content has a positive influence on mobile convenience and loyalty [35]. Against this backdrop, this study proposes that the personalization of content is a success criterion for effective social media health promotion.

2.1.2. Emotional Connection

Emotional connection is when a recipient of a message feels a bond with or experiences strong feelings towards the sender of the message [36]. Because it allows for frequent interaction, social media can help develop emotional connections between the message sender and the recipient of the message [37]. These emotional connections help break down barriers between the sender and the receiver and can help bring about desired behavioral changes among receivers [36,38]. As such, this study proposes emotional connection as one of the determinants of social media health communication success.

2.1.3. Audience Participation

Audience participation refers to the active participation of the target audience in the entire communication process [39]. The notion of audience participation is based on the idea that the best way to increase social interaction and spread messages on social media platforms is to engage with the target audience. Audience participation helps achieve social media promotion goals because it empowers the target audience and builds the interest of the target audience [40]. As such, this study proposes audience participation as a success criterion for social media health promotion.

2.1.4. Cultural Consideration

Differences in cultures entail that the same social media messages can be interpreted differently by people of different cultures [41]. As such, entities that use social media for communication should consider the culture of the target audience. If promotion initiatives do not consider the culture of the target audience, the audience may interpret the message differently or lose interest in the content of the promotion [42].

2.1.5. Social Influence

Social influence involves accepting information or advice from a person who may or may not have previously been known as an acquaintance [43]. Social influence is an important determinant of the positive impact of social media communications on the public [33,43]. This is because people tend to follow the opinions of others to gain their approval and to make correct decisions under uncertainty [33].

2.1.6. Interaction

Interaction is defined as a consumer's proactive engagement with the communicator of health information on social media platforms such as following, replying, tweeting, sharing, and liking [44]. Users tend to be more engaged and attached to brands when interaction with the brand on social media occurs regularly [45]. Ultimately, interaction helps bring about needed behaviors among message recipients, such that it has a positive effect on marketing outcomes [44,46].

2.1.7. Word of Mouth (WOM) Communication

WOM is defined as any positive or negative statement made by a non-commercial individual about a social media site, which is made available to other people and institutions using the internet [47]. WOM is a powerful force in shaping the attitudes and behaviors of a target audience towards a social media site because it is perceived as information from an unbiased source about the quality of a social media site. Thus, in this study, word of mouth is examined as a success criterion for social media health marketing.

2.1.8. Mobilization

Mobilization refers to the coming together of allies to raise awareness of a particular program [48]. Social mobilization helps ensure collective efficacy in health communications [49], which in turn helps ensure effectiveness in the process of educating and influencing people to agree with the organization's position on a specific issue [50]. If a non-profit organization comes together with other organizations to promote health communication on social media, their health marketing initiatives would be more effective. The study, therefore, proposes mobilization as a determinant of social media health communication.

2.1.9. User-Generated Content

Social network site users are no longer just viewers, but co-producers and co-suppliers of web content [44]. Social media provides users with an opportunity to co-create, share, discuss, and modify content [51]. User participation in content generation leads to greater engagement, and engagement makes it likely that the desired sustainable behavioral change will occur [46].

2.1.10. Security Mechanisms

Website security is one of the most important considerations in current social media dynamics [52]. This is because web usage poses security threats to customers, such as the public exposure of their private information. Security mechanisms are technical tools and techniques that are used to implement security services. These mechanisms are designed to detect, prevent, or facilitate recovery from a security attack. Most users are unwilling to engage on social media if such engagement poses threats to their security [53]. Therefore, the availability of tools for detecting, preventing, or recovering from security breaches on social media sites would help ensure the success of social media health marketing communications. Thus, the security mechanisms of the network should be clearly stated for the user to know the level of security of the platform.

2.1.11. Information Sharing

Information sharing refers to users' distribution of information to others. Shared information is a powerful tool in social media communication because it drives the engagement of the sharers and receivers of the information [54]. Information sharing influences other people's individual attitudes and behavioral intentions [55]. Thus, the information-sharing tendencies of the target audience would ensure successful health communication.

2.1.12. Same Language and Tone

It is important for practitioners to retain consistency in their communications on social networks. Practitioners need to ensure that the voice, tone, and language of their social

media communications match up with the image of the organization they represent [56]. The lack of synchronization between social media communication and organizational image may lead the target audience to perceive the organization as inconsistent, and they would therefore resist its messages [57].

2.1.13. Privacy Policy

Privacy in social media is highly valued by social networking site users [58]. The availability of a privacy policy on a social networking site demonstrates the site's commitment to upholding the security of the personal information of users. If users believe that a site has no commitment to upholding their security, they become less willing to use that site [59]. This means all health communications made on that site would not reach users in the first place, rendering the communication efforts futile.

2.1.14. User-Friendliness

User-friendliness refers to the level at which a social media site is easy to operate, comprehend, and access [60]. Audiences prefer to expend less effort when using social media platforms [61]. Hard-to-use sites cause user flight rather than user attraction [62]. Therefore, messages delivered through an easy-to-use social media site would reach wider audiences than messages delivered through hard-to-use sites.

2.2. Health Promotion

Medical models that relied on the treatment of diseases in the past are no longer enough to solely counter today's health challenges. More innovative approaches such as health promotion are being utilized to improve health. Health promotion refers to the activities that move towards increasing health levels and fulfilling the health potential of individuals, families, communities, and societies [63]. Given that prevention is better than a cure [64], the purpose of health promotion is to lessen the possibility of illness and to increase the quality of life by changing or establishing health-related behaviors and lifestyles. Individuals need to be aware of good health practices before they can execute them, and healthcare promotion is one way of building health awareness.

The concept of health promotion has taken precedence over the concept of disease prevention, as there is currently a strong emphasis on the idea that everyone must take greater responsibility for their own health [15]. Health promotion enables people to improve their own health by giving them more knowledge and more control over their own health and the health of others [65]. It also triggers the adoption of progressive behaviors that advance disease prevention and enhance general health [66]. Health promotion also entails the continuous improvement of a person's health-related lifestyle because most health problems are caused by human lifestyles and behaviors [67]. Lifestyle changes emanate from improvements in people's health awareness, health dynamics in their environments, and behavioral changes. People who are empowered with knowledge about health are able to demand better conditions from responsible authorities such as governments when they perceive a difference between current conditions and desired conditions [65]. This ultimately helps ensure that the good health of the general populace is maintained.

Vegetarian dieting is one of the health behaviors that are being promoted by contemporary healthcare organizations [68]. Vegetarian dieting is said to benefit not only the vegetarian but also the environment at large. For the individual, vegetarianism leads to reduced blood cholesterol, less possibility of heart disease, lower blood pressure, and reduced hypertension and metabolic syndrome risks [69,70]. The cause for vegetarian dieting is also aided by beliefs that meat consumption causes health-related problems [71]. Furthermore, vegetarianism has implications for environmental sustainability. Vegetarianism contributes to reductions in carbon dioxide emissions, climate change, and ecological imbalances [72,73]. Since vegetarianism has sustainability implications for the individual and the environment at large, it is crucial to understand how it can be effectively promoted on social media.

2.3. Social Media and Health Promotion

Social media is being used by many people to access and share information. As such, organizations in the health sector are increasingly investing in social media to disseminate health-related knowledge. Social media allows for the widespread dissemination of information to diverse audiences at a low cost [74]. Therefore, social media helps to deal with the issue of the high costs associated with traditional marketing. In addition, social media allows for prompt interaction between the sender of the message and its recipient [20]. This makes it easier for practitioners to promptly comprehend the target audience's understanding of the issue at hand and to quickly work towards improving the audience's understanding of the issue at hand. Thus, social media are effective platforms for enhancing the success of health promotion campaigns.

Several studies have demonstrated how social media is an effective tool for addressing health issues among particular audiences. One study found that social media literacy interventions help develop positive attitudes towards tanning in relation to skin cancer [75]. Another study established that social media is an effective means of networking and mentorship for women in cardiothoracic surgery [76]. Furthermore, the authors argued that social media is an important tool for spreading clinical and research innovations and for enhancing collaboration among healthcare organizations and practitioners [76]. Social media health communication not only involves interactions between the organization and the target individuals but also among individuals in the target audience [77]. Because it enables interactions among individuals, social media health promotion is said to provide social support, which is necessary for behavioral change. The regular sharing of information and the asking and answering of questions improve self-efficacy, perceptions of social capital, and shared social norms [78]. Consequently, individuals feel a sense of belonging and are able to change their behavior because such behavioral changes make them identify more with the group that supports the behavioral change within their social network [78].

3. Materials and Methods

3.1. DEMATEL

The DEMATEL was developed by the Banelle Institute of Geneva between 1972 and 1976 for the Science and Human Affairs Program. It was developed as a tool for solving complex tangled problems and decision lab methods. It can enhance the understanding of specific problems and groups of tangled problems and provide identifiable workable solutions through hierarchical structures [79]. The most important feature of the DEMATEL is that it describes the interrelations between faces or clusters and arrives at effective core criteria for representing elements/components. The DEMATEL has been successfully applied in a number of contexts such as marketing strategy, social marketing, control systems, security, management development, and group decision-making [15,80–84]. This study applied the DEMATEL method following the procedures discussed below [79]:

Step 1: Generation of the direct-relation matrix.

In order to measure the relationship between criteria, this research designed a comparison scale comprising five levels: 0 (no influence), 1 (low influence), 2 (medium influence), 3 (high influence), and 4 (very high influence). The respondents of the study made sets of pair-wise comparisons in terms of the degree and direction of influence between every pair of criteria using the five-point integer scale. In the DEMATEL method, for every respondent, an $n \times n$ non-negative matrix $A^m = a_{ij}^m$ is developed, in which n is the number of criteria, m is the number of the respondent ($1 \leq m \leq P$), and a_{ij}^m is the degree to which the m th respondent rates the effect of criterion i on criterion j . Thus, for P respondents, the matrices $A^1, A^2, A^3, \dots, A^P$ are obtained. To combine the opinions of P respondents, the initial direct-relation matrix $A = [a_{ij}]$ is developed as follows:

$$A = a_{ij} = \frac{1}{P} \sum_{m=1}^P a_{ij}^m \quad (1)$$

Step 2: Normalization of the direct-relation matrix.

Based on the direct-relation matrix A , the normalized direct-relation matrix Z can be obtained as follows:

$$Z = \frac{1}{k} \cdot A \quad (2)$$

$$k = \max \left(\max_j \sum_{i=1}^n a_{ij}, \max_i \sum_{j=1}^n a_{ij} \right)$$

Step 3: Computation of the total-relation matrix.

The total-relation matrix T can be derived using Formula (3), in which I is the identity matrix. The elements of the total-relation matrix T are denoted as $[t_{ij}]_{n \times n}$. The sums of the rows and columns, denoted by vectors D and R respectively, are obtained from the total-relation matrix T . The vectors D and R are obtained using the following formulas:

$$T = Z(I - Z)^{-1} \quad (3)$$

$$D = \left[\sum_{j=1}^n t_{ij} \right]_{n \times 1} = [d_i]_{n \times 1} \quad (4)$$

$$R = \left[\sum_{j=1}^n t_{ij} \right]_{1 \times n} = [r_j]_{n \times 1} \quad (5)$$

Using the values of D and R , the values of $D + R$ and $D - R$ are calculated. $D + R$ indicates the degree of influence of factor i in the whole system, whereas $D - R$ shows the net effect of factor j in the system. When $D - R$ is positive, the factor is a causal variable. On the other hand, a negative value of $D - R$ means the criterion is a net receiver of effects from other factors. When the value of $D - R$ is higher, the degree by which the factor affects other factors is also greater. If the value of $D - R$ is lower, the degree by which the factor is affected by other factors is also lower.

Based on the coordinate locations of the vectors $D + R$ and $D - R$, factors can be divided into four categories. When the value of $D + R$ is high and $D - R$ is positive, the factor's degree of importance is high, and the degree to which this factor influences the other factors is also high. When the value of $D + R$ is low and $D - R$ is positive, the degree of the factor's influence on other factors is high, but the degree of total impact is low. When the value of $D + R$ is high and $D - R$ is negative, the degree of influence by other factors is high and the degree of influence on other factors is low. When the value of $D + R$ is low and $D - R$ is negative, the degree of influence by other factors is high, but the degree of total influence on other factors is low.

Step 4: Setting up a threshold value and producing the causal diagram.

To explain the relationships among the factors while reducing the complexity of the system, it is necessary to set a threshold value to filter out insignificant effects in the total relation (T) matrix. Only those factors whose effects in the matrix T are greater than the threshold value should be selected and shown in the causal diagram. The threshold value can be obtained by calculating the average of all elements in the T matrix.

3.2. Procedure

In this study, 17 volunteer experts from the Tzu Chi Foundation were invited to provide their personal opinions on the use of social media for the promotion of a vegetarian diet by filling out a questionnaire. It is recommended that the respondents in studies utilizing the DEMATEL method be experts in the issue at hand [85]. To ensure that the participants had expert knowledge on the issue, only those volunteers who had worked with the organization in promoting vegetarianism on social media for at least fifteen years were included. In addition, the respondents were required to have a managerial position in the organization's social media health promotion for at least five years. Out of these 17, 14 valid questionnaires were collected, representing an 82.35 return rate. Before filling

out the questionnaire, each participant was briefed about the aims of the research and was familiarized with the questionnaire-filling procedures. The responses of each expert were collected individually.

4. Results

The initial direct-relation matrix in Table 1 was developed using Equation (1). Thereafter, the direct-relation matrix was normalized using Equation (2) to come up with the normalized direct-relation matrix (see Table 2). After normalizing the direct-relation matrix, Equation (3) was used to obtain the total-relation matrix (Table 3). Thereafter, the prominence and cause and effect relations, shown in Table 4, were obtained using Equations (4) and (5). The cause and effect relationship diagram (Figure 1) was developed using the prominence cause and effect relations indicated in Table 4.

Table 1. The initial direct-relation matrix.

Criteria	SM1	SM2	SM3	SM4	SM5	SM6	SM7	SM8	SM9	SM10	SM11	SM12	SM13	SM14
SM1	0.000	3.000	2.786	2.357	2.714	2.786	2.643	2.643	3.000	2.357	2.357	2.571	2.000	2.786
SM2	2.786	0.000	2.786	2.286	2.429	2.714	2.429	2.429	2.714	2.429	2.500	2.857	2.357	2.929
SM3	2.786	2.786	0.000	2.500	2.857	2.786	2.571	2.643	3.071	2.857	2.929	2.786	2.429	2.786
SM4	2.500	2.357	2.643	0.000	2.429	2.500	2.286	2.143	2.357	2.214	2.571	2.571	2.143	2.500
SM5	2.500	2.714	2.714	2.786	0.000	2.357	2.143	2.214	2.714	2.643	2.214	2.786	2.143	2.429
SM6	2.857	3.000	2.714	3.000	2.929	0.000	2.429	2.143	2.286	2.714	2.857	2.571	2.714	2.500
SM7	2.357	2.643	2.857	2.643	2.786	2.786	0.000	2.357	2.571	2.500	2.857	3.071	2.500	2.857
SM8	2.429	2.857	2.714	2.786	2.214	2.643	2.429	0.000	2.786	2.214	2.643	2.714	2.143	2.643
SM9	3.071	3.000	3.000	2.714	2.571	2.571	2.500	2.714	0.000	2.357	2.286	2.786	2.286	2.714
SM10	2.857	2.429	2.571	2.929	2.786	2.786	2.357	2.214	2.500	0.000	2.214	2.786	2.429	2.286
SM11	2.214	2.500	2.714	2.357	2.429	2.786	3.000	2.214	2.357	2.357	0.000	2.429	2.071	2.643
SM12	2.500	2.786	2.857	2.500	2.071	2.429	2.643	2.500	3.071	2.643	2.214	0.000	2.286	2.857
SM13	2.286	2.214	2.429	2.643	2.429	2.857	2.429	2.071	2.143	2.286	1.857	2.357	0.000	2.071
SM14	2.643	2.857	2.786	2.500	2.429	2.357	2.643	2.500	2.786	2.000	2.357	2.571	2.214	0.000

The relative importance of the fourteen criteria is prioritized according to the $D_i + R_i$ values. Based on their relative importance, the criteria can be arranged as SM3 > SM9 > SM6 > SM2 > SM12 > SM1 > SM7 > SM14 > SM5 > SM10 > SM4 > SM8 > SM11 > SM13. Furthermore, the criteria are categorized into cause and effect groups depending on whether the values of $D_i - R_i$ are positive or negative. Based on these criteria, SM8, SM7, SM10, SM13, SM6, SM1, SM11, SM3, and SM9 were categorized as causative factors. On the other hand, SM4, SM2, SM12, SM14, and SM5 were categorized into the effect group.

Among the causative criteria, user-friendliness (SM8) has the highest $D_i - R_i$ value at 0.9036. However, its $D_i + R_i$ value is low-to-moderate (25.7902). This implies that while this factor is a dispatcher of influence on other factors and a key determinant of social media health promotion success, its degree of importance is relatively moderate. Word of mouth (SM7) has the second highest $D_i - R_i$, which is 0.8568. The factor also has a moderate $D_i + R_i$ value of 26.9863. Thus, this factor exerts a high influence on other factors, with a considerable degree of importance.

Security concerns (SM10) rank third among the causative factors, with its $D_i - R_i$ value being 0.5725, whereas its $D_i + R_i$ value is 26.0376, which is relatively moderate. This is followed by privacy policy (SM13), whose $D_i - R_i$ value is 0.1352. This factor has the lowest importance as it has the lowest $D_i + R_i$ (24.1710) among all the factors. The fifth-highest dispatcher of influence on other factors is interaction (SM6), with a $D_i - R_i$ value of 0.1311 and a high $D_i + R_i$ value of 27.6167. Thus, this factor is an important determinant

of social-media-based health promotion, and its degree of importance is very high. This factor is followed by personal content (SM1), which has a $D_i - R_i$ value of 0.0825 and a $D_i + R_i$ value of 27.2384. This means that this criterion exerts considerable influence on other factors, and its degree of importance is high. Information sharing (SM11) ranks next, with a $D_i - R_i$ value of 0.0825 and a $D_i + R_i$ value of 25.7772. This factor is, therefore, a dispatcher of influence on other factors, though with a low degree of importance. Audience participation (SM3) and user-generated content (SM9) rank eighth and ninth, respectively, with respective $D_i - R_i$ values of 0.0750 and 0.0692. These two factors have the highest $D_i + R_i$ values of 28.5300 and 28.6550, respectively. Thus, these factors are causative factors with a very high degree of importance.

Table 2. The normalized direct-relation matrix.

Criteria	SM1	SM2	SM3	SM4	SM5	SM6	SM7	SM8	SM9	SM10	SM11	SM12	SM13	SM14
SM1	-	0.084	0.078	0.066	0.076	0.078	0.074	0.074	0.084	0.066	0.066	0.072	0.056	0.078
SM2	0.078	-	0.078	0.064	0.068	0.076	0.068	0.068	0.076	0.068	0.070	0.080	0.066	0.082
SM3	0.078	0.078	-	0.070	0.080	0.078	0.072	0.074	0.086	0.080	0.082	0.078	0.068	0.078
SM4	0.070	0.066	0.074	-	0.068	0.070	0.064	0.060	0.066	0.062	0.072	0.072	0.060	0.070
SM5	0.070	0.076	0.076	0.078	-	0.066	0.060	0.062	0.076	0.074	0.062	0.078	0.060	0.068
SM6	0.080	0.084	0.076	0.084	0.082	-	0.068	0.060	0.064	0.076	0.080	0.072	0.076	0.070
SM7	0.066	0.074	0.080	0.074	0.078	0.078	-	0.066	0.072	0.070	0.080	0.086	0.070	0.080
SM8	0.068	0.080	0.076	0.078	0.062	0.074	0.068	-	0.078	0.062	0.074	0.076	0.060	0.074
SM9	0.086	0.084	0.084	0.076	0.072	0.072	0.070	0.076	-	0.066	0.064	0.078	0.064	0.076
SM10	0.080	0.068	0.072	0.082	0.078	0.078	0.066	0.062	0.070	-	0.062	0.078	0.068	0.064
SM11	0.062	0.070	0.076	0.066	0.068	0.078	0.084	0.062	0.066	0.066	-	0.068	0.058	0.074
SM12	0.070	0.078	0.080	0.070	0.058	0.068	0.074	0.070	0.086	0.074	0.062	-	0.064	0.080
SM13	0.064	0.062	0.068	0.074	0.068	0.080	0.068	0.058	0.060	0.064	0.052	0.066	-	0.058
SM14	0.074	0.080	0.078	0.070	0.068	0.066	0.074	0.070	0.078	0.056	0.066	0.072	0.062	-

Table 3. The total-relation matrix.

Total	SM1	SM2	SM3	SM4	SM5	SM6	SM7	SM8	SM9	SM10	SM11	SM12	SM13	SM14
SM1	0.928	1.040	1.044	0.991	0.978	1.011	0.961	0.919	1.020	0.932	0.940	1.021	0.874	1.006
SM2	0.989	0.951	1.033	0.979	0.961	0.999	0.946	0.904	1.003	0.924	0.933	1.017	0.874	0.999
SM3	1.043	1.079	1.017	1.038	1.024	1.055	1.001	0.959	1.066	0.984	0.994	1.070	0.923	1.049
SM4	0.920	0.948	0.964	0.856	0.900	0.930	0.882	0.840	0.930	0.860	0.876	0.945	0.813	0.925
SM5	0.949	0.987	0.997	0.958	0.865	0.956	0.907	0.868	0.969	0.898	0.895	0.981	0.839	0.953
SM6	1.016	1.054	1.057	1.021	0.997	0.953	0.970	0.920	1.017	0.954	0.965	1.035	0.904	1.013
SM7	1.007	1.049	1.064	1.016	0.997	1.029	0.909	0.928	1.027	0.952	0.968	1.050	0.902	1.025
SM8	0.970	1.014	1.020	0.980	0.945	0.986	0.935	0.830	0.993	0.908	0.926	1.002	0.858	0.981
SM9	1.020	1.054	1.064	1.013	0.988	1.019	0.971	0.933	0.956	0.944	0.951	1.040	0.893	1.017
SM10	0.977	1.000	1.013	0.981	0.956	0.986	0.931	0.886	0.983	0.847	0.913	1.001	0.863	0.969
SM11	0.936	0.976	0.990	0.942	0.923	0.961	0.922	0.863	0.953	0.885	0.831	0.966	0.832	0.952
SM12	0.976	1.017	1.028	0.978	0.946	0.985	0.945	0.900	1.004	0.923	0.920	0.936	0.866	0.990
SM13	0.885	0.914	0.928	0.896	0.871	0.909	0.857	0.811	0.894	0.834	0.830	0.910	0.730	0.885
SM14	0.961	0.999	1.007	0.959	0.936	0.965	0.927	0.883	0.979	0.890	0.906	0.984	0.848	0.898

Table 4. The prominence and relation for cause and effect.

	D	R	D + R	D – R	
SM1	13.6629	13.5754	27.2384	0.0875	Personal content
SM2	13.5121	14.0805	27.5926	−0.5684	Emotional connection
SM3	14.3025	14.2275	28.5300	0.0750	Audience participation
SM4	12.5893	13.6084	26.1977	−1.0192	Cultural consideration
SM5	13.0195	13.2850	26.3045	−0.2655	Social influence
SM6	13.8739	13.7428	27.6167	0.1311	Interaction
SM7	13.9216	13.0647	26.9863	0.8568	Word of mouth (WOM)
SM8	13.3469	12.4433	25.7902	0.9036	User-friendly
SM9	13.8621	13.7929	27.6550	0.0692	User-generated content
SM10	13.3050	12.7325	26.0376	0.5725	Security mechanisms
SM11	12.9298	12.8473	25.7772	0.0825	Information sharing
SM12	13.4135	13.9557	27.3692	−0.5423	Same language and tone
SM13	12.1531	12.0179	24.1710	0.1352	Privacy policy
SM14	13.1410	13.6592	26.8002	−0.5182	Mobilization

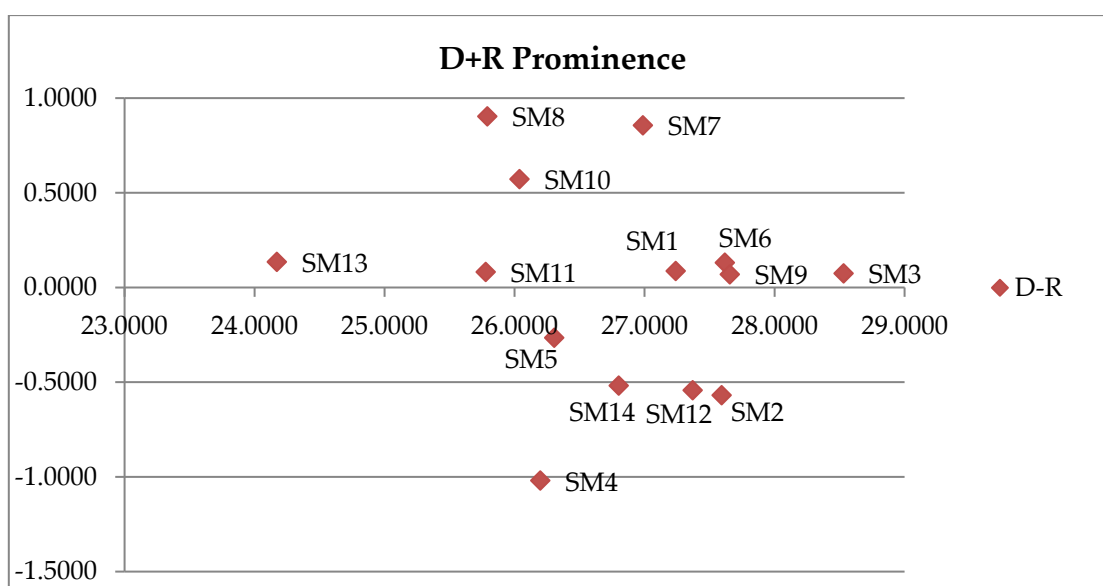


Figure 1. Cause and effect relationship diagram.

Among the effect factors, cultural consideration (SM4) ranks first, with a $D_i - R_i$ value of -1.0192 and a $D_i + R_i$ value of 26.1977 . Thus, this factor is subject to the influence of other factors, but with a relatively moderate degree of importance. Emotional connection (SM2) has a $D_i - R_i$ value of -0.5684 and a relatively $D_i + R_i$ value of 27.5926 . Therefore, this factor is influenced by the causative factors, and it has a high degree of importance. Same language and tone (SM12) has a $D_i - R_i$ of -0.5423 and a $D_i + R_i$ of 27.3692 . These results indicate that this factor is influenced by other factors, and it has a high degree of importance. Mobilization (SM14) has a $D_i - R_i$ value of -0.5182 and a $D_i + R_i$ of 26.8002 . This factor, therefore, is subject to the influence of other factors and has a moderate level of importance. Finally, social influence has a $D_i - R_i$ value of -0.2655 and a $D_i + R_i$ value of 26.3045 , making it an effect factor with a moderate degree of importance.

5. Discussion

5.1. General Discussion

5.1.1. Causal Group Factors

Based on the values of $D_i - R_i$, the results show the following order for the nine causal factors: SM8 > SM7 > SM10 > SM13 > SM6 > SM1 > SM11 > SM3 > SM9. The success factor “user-friendliness (SM8)” has the highest causal value. This implies that it is important that the social networking site on which non-profit organizations spread health communications are easy to use for the audience. According to the technology acceptance model [86], technologies that are perceived as hard to use are perceived to not be very useful, and users tend to shun them. Thus, all communications made through such sites may not reach the intended audiences. On the other hand, technologies that are perceived as easy to use are used more intensely by audiences, and communications made through such sites can easily reach their target audiences. The Tzu Chi Foundation and its subsidiaries are present on all popular social media sites that are perceived as user-friendly and used by many people in Taiwan. These include Facebook, Line, Youtube, Twitter, and Instagram [2]. The foundation’s messages promoting health behaviors such as vegetarianism are promoted through these social media sites, hence the respondents’ opinion that the ease of use of social media sites is an important determinant of social media health promotion success.

The second-highest success factor is word of mouth. It is important for non-profit organizations to ensure that the social media sites on which health communications are carried out are supported by the recommendation of others. Word of mouth presents unbiased evidence and opinions about the quality of a site. In situations where individuals are unsure about whether to use a social networking site, they would make use of information from word of mouth before making the decision to use the social media site or to believe information from the site. The word of mouth communications could be about various features of the sites. These may include the safety of the sites in terms of upholding users’ private information and the ease of use of the sites. This finding suggests that conducting health promotion through social media sites that are spoken well of increases the likelihood of social media health communication success.

The next most important causal factors are security mechanisms and privacy policy. These results indicate that for social media health promotion to be successful, it needs to be conducted on social media sites that provide an assurance of the security of the users and which have privacy policies to demonstrate the commitment of the sites to uphold the privacy of users’ personal data. Such means increase the users’ perception that the usage of the social media site will not bring harm to them and that the social media company is committed to ensuring that the users are kept free from harm. The Tzu Chi Foundation aims to create a pure and clear world with integrity and honesty, in which no human being is harmed in any way [87]. These principles imply that the Tzu Chi Foundation is bound to work in such a manner that does not cause harm to any person it serves. This also includes sending out messages through social media sites that are generally regarded as safe and which have commitments to ensuring that the safety of their users is upheld.

Interaction is the fifth most important success factor. It is important for organizations that implement social media health promotion to ensure that they engage in two-way reciprocal exchanges with their target audiences for their health promotion efforts to be successful. Interaction helps the recipients of the health promotion messages to seek and obtain clarifications on the message being put forward. The Tzu Chi Foundation engages its target audiences as it conducts health promotion on social media. Its health promotion videos on YouTube, for instance, attract comments from its audiences, and in some cases, such comments are questions from viewers about the viewed content. The comments are addressed directly in the comment section or through future videos. Such organization–user interactions boost the user’s perception of belonging and closeness to the organization [88]. Such positive attitudes towards the organization lead to trust and positive perceptions of relationship equity [31,88]. Users who trust the healthcare organization are likely to

accept the healthcare promotion of the firm and act upon it [31]. In addition, through replying, sharing, and liking social media health promotion messages, users spread the organization's message to others in their circles [44], broadening the reach of the messages. As such, it is important to ensure that such interactions are not only frequent but also that they are meaningful to users [45].

Personalized content, audience participation, and user-generated content were also established as key success factors. Although their $D_i - R_i$ values were relatively small, their degree of influence, as evidenced by the $D_i + R_i$ values, were relatively large. Personalized content helps ensure that the users identify with the information they are presented with. Effective personalization can involve matching the message to the receiver's self, the receiver's personality, and the receiver's cognitive processing styles. It is important, therefore, for healthcare organizations to know their audiences well along these three dimensions because the organization cannot personalize messages for its audience if it is not familiar with its audience. The Tzu Chi Foundation also ensures the personalization of content for users by ensuring that the content that is sent out to target audiences is suitable for the target audiences. For instance, messages meant for children are framed differently and mostly communicated by other children, whereas messages meant for adults are framed to suit adults as well. Because social media, by its very nature, implies the participation of audiences, audience participation and the user generation of content are also important considerations for non-profit organizations in ensuring the success of social media health promotion. The participation of the audience and the audience's generation of content enables the audience to be more engaged and to own the content, such that the health communication brings the desired behavioral change in the audience. By engaging with users through the comments and considering the questions of users in its content, the Tzu Chi foundation ensures the participation of its audience and gives room for users to take part in the generation of content.

Finally, although information sharing was found to be a causative success factor, its degree of importance is relatively low. While information sent out by users to other users may be useful in shaping the attitudes and resultant behaviors of the target audience in response to health communication, it may not work out in some cases. The users may not have the technical knowledge or expertise on the subject about which they are sending out the information. As such, the information may be filled with falsehoods and may not be believed by the target audience [89], hence its low degree of importance and low causation on other factors.

5.1.2. Effect Group Success Factors

The factors in the effect group were sorted according to the negative values of $D_i - R_i$ as plotted in Figure 1. According to the results, the effect factors are in the following order: SM4 > SM2 > SM12 > SM14 > SM5. Cultural consideration (SM4) is the most influenced among all the effect factors. Furthermore, based on its $D_i + R_i$ value, culture is a relatively important factor in social media health promotion. This is in line with findings by a previous study that culture is an important consideration in the success of social media marketing [90]. This implies that if healthcare organizations address the success factors, the target audience will be less likely to perceive any incongruence between the organization and/or the message it promotes and their culture. Thus, the target audience is likely to feel that the social media health promotion messages are suited to their cultural beliefs if, for instance, the promotion process is reinforced by the word of mouth of fellow social media users, if their security and privacy concerns are well addressed, and if the health promotion process is perceived as being interactive. The embedding of healthcare messages in the culture of the target audiences is an important consideration for the Tzu Chi Foundation. Despite having its own cultural identity as a Buddhist organization, taking into account the culture of the target audience is an important consideration for the organization. The empirical results demonstrate that the Tzu Chi Foundation achieves cultural embeddedness

in its healthcare communication by paying attention to such factors as the user-friendliness of social media sites, word of mouth, and security mechanisms.

The results also demonstrate that emotional connection (SM2) is the second-most influenced success factor. Emotional attachment is an indication of committed, satisfied, and lasting relationships between partners in a relationship. Prior research has also indicated that emotional connections between target audiences and message-senders on social media are important in the formation of sender-desired behaviors from the target audience [36,91]. The results of this study indicate that if the causal factors are addressed, the target audience will become emotionally connected to the healthcare organization, and as a result, the organization's healthcare communication will be successful.

Same language and tone (SM12) and mobilization (SM14) are two other success factors that are influenced by the causal group factors. It is important to ensure that non-profit organizations' health communications are congruent with the image of the organization [57]. Failure to maintain consistency between health communication and organizational image may cause negative reactions to the health communication by the target audience [92]. Furthermore, mobilization is an important factor in health communication as it helps secure support from specific communities, groups, and individuals [48]. If the major cause factors are addressed, the challenges of consistency in social media communication and mobilization will be overcome, and as such, social media health communication will be a success.

The study also established that social influence is a success factor influenced by the causal group factors. Social influence is a known determinant of information acceptance by social media users [33]. The results indicate that if the causal factors are addressed, social influence will also be achieved, and this would ultimately ensure that the social communication is effective.

5.2. Theoretical Implications

This study's findings have several theoretical implications. First, the study provides a holistic understanding of the determinants of social media health promotion. Whereas prior studies examined the factors that hinder the success of social media health promotion [3,5,8], not much had been done to empirically examine the determinants of social media health promotion in terms of bringing about sustainable behavioral change. Although this study was conducted within the context of vegetarianism promotion, its findings may also apply to other forms of health promotion. Generally, this study has indicated that considering the features of the social media sites on which the health promotion is conducted and considering the characteristics of the target audience may help ensure successful social media health promotion. In addition, leveraging mobilization with other organizations or groups interested in the promotion of the same healthcare issue may help enhance the success of healthcare promotion.

Secondly, prior to this study, few studies had used the DEMATEL method to examine the success factors of social media health promotion. The DEMATEL method allows for the examination of network structure among factors. Unlike other approaches, which assume that the predictor variables that shape outcome variables in causal relationships are independent, the DEMATEL method also allows for the examination of causal relations among criteria [93]. This study demonstrates that capitalizing on causal criteria such as user-friendliness, word of mouth, and the personalization of content leads to health promotion success. In addition, it also leads to the achievement of important effect factors such as cultural consideration and emotional connection.

5.3. Managerial Implications

The findings of this study have several implications for non-profit organizations engaging in health promotion. In many cases, non-profit organizations are faced with resource constraints, particularly for social campaigns [15]. This brings challenges related to the prioritization of interventions in social marketing programs to guide resource allocation.

By showing the relative importance of success factors for social media health promotion, this study provides insights into how managers can deal with the resource allocation problem in social media health promotion. It also demonstrates the areas where managers can direct organizational effort and attention to health promotion. Priority needs to be given to the most influential causal factors in order to ensure the success of social media health promotion.

More specifically, the findings of this study indicate that managers need to pay attention to the features of the social media sites on which they conduct health promotion. Specifically, there is a need to ensure that health communication is performed on sites that are user-friendly, and which assure users of their security through the availability of security mechanisms and privacy policies. User-friendly social media sites enable users to navigate the sites with ease, and consequently, they achieve their usage goals such as access to health-related information with greater ease [94]. Social media users are very concerned about their privacy and how their private information is handled. Upholding their privacy and ensuring their security would make them feel secure about using social media sites, and they would not avoid using the sites [53]. The users' presence on social media sites is important in ensuring that health promotion is successful.

Finally, the study also demonstrates the importance of conducting health promotion on social media sites that enjoy positive word of mouth among users. Word of mouth presents experiential, personal, and unbiased support for the social media site on which the health communication is conducted. Users tend to use social media sites that are recommended by others based on their experiences of using those social media sites. It is important, therefore, that organizations reach out to target audiences through social media sites that enjoy positive word of mouth in specific contexts.

6. Conclusions

The incidence of disease has always been a critical concern in societies all over the world. Non-profit organizations play a key role in controlling disease incidence through support in the prevention of diseases. Apart from religious purposes, the Tzu Chi Foundation has for four decades encouraged and promoted vegetarianism as one way of achieving good health. The experiences of the Tzu Chi Foundation, as discussed in this paper, demonstrate some of the key factors that healthcare organizations need to consider as they conduct health communications on social media to deliver preventive medicine. Although these experiences are specific to the Tzu Chi Foundation, they may be applicable to other non-governmental organizations in related contexts.

Although this study provides useful insights on how to design successful social media health promotion, it is limited by some inadequacies that could be addressed in future studies. First, the data were collected cross-sectionally. However, social media is dynamic and continuously evolving, such that key success factors may differ over time. Longitudinal studies of determinants of social media health marketing success would provide insights into how success factors evolve over time. Another limitation is that data were collected from volunteers working with one organization. This could limit the generalizability of the findings in other contexts. Future studies could utilize data from several organizations to ensure greater generalizability of the findings. In addition, the model used data collected from experts. Future studies could triangulate data sources by also collecting data from social media users who are in the target audiences of the health communications to improve the accuracy of the results. Lastly, the data were collected only from individuals promoting a vegetarian diet. However, vegetarianism is not the only cause for which health promotion is conducted. The differences among the health issues could limit the generalizability of the findings of this study, whose data and results are drawn from a sample of volunteers participating in vegan diet promotion. Future studies could therefore examine the determinants of social media health promotion success in the context of other health issues. This could help provide insights into the similarities and differences in health promotion dynamics across different health contexts.

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