Integrated SWOT analysis with multiple preference relations

Selection of strategic factors for social media

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Abstract

Purpose – SWOT (strengths, weaknesses, opportunities, threats) analysis is a powerful approach for evaluating the strengths and weaknesses of an organization with an internal perspective. The approach also takes into account the opportunities and the threats from an external point of view. These features make SWOT a commonly used approach in strategic management. The purpose of this paper is to propose an integrated SWOT analysis with multiple preference relations technique, to show the application of the proposed methodology, to prioritize the strategic factors and to present alternative strategies for ABC, a case company, which is targeting to use social media more effectively.

Design/methodology/approach – In this study, expert opinions are used to identify SWOT factors of ABC on social media. The obtained findings are evaluated and each factor is prioritized by means of the multiple preference relations technique.

Findings – The proposed evaluation model has four main groups, namely, strengths, weaknesses, opportunities, threats, under which 17 factors are identified. As a result of the evaluations, "O2: Opportunity to contact a large number of users simultaneously at affordable cost" has the highest importance level among other factors. Alternative strategies are developed based on the obtained results.

Originality/value – Decision-makers who have different backgrounds or ideas can state their preferences in different formats. Multiple preference relations technique is used to combine different assessments. SWOT analysis with multiple preference relations technique with a group decision-making perspective is proposed. This is the first time the method is used in the social media-related literature. With this study, the most appropriate social media strategic factors are selected for ABC and alternative strategies are determined based on the results.

Keywords Social media, SWOT analysis, Group decision making, Multiple preference relations

Paper type Research paper

Nomenclature

AHP	= Analytical Hierarchy Process;
ANP	= Analytical Network Process;
COPRAS-F	= Fuzzy Complex Proportional Assessment;
DEMATEL	= Decision-Making Trial and Evaluation Laboratory;
DMs	= Decision-Makers;
GDM	= Group Decision-Making;
GI	= Group Importance;
IOWG	= Induced Order Weighted Geometric Operator;

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IMPR = Intuitionistic Multiplicative Preference Relations;
MADM = Multi-Attribute Decision-Making;
MA-OWA = Majority Additive-Ordered Weighting Averaging;
MCDM = Multi-Criteria Decision-Making;
MPDM = Multi-person Decision-Making;
OWA = Ordered Weighting Averaging;
OWG = Order Weighted Geometric
PROMETHEE = Preference Ranking Organization Method for Enrichment of Evaluations;
SAW = Simple Additive Weighting;
TOPSIS = Technique for Order Preference by Similarity to Ideal Solution;
VIKOR = Viekriterijumsko Kompromisno Rangiranje;
QFD = Quality Function Deployment;
QGID = Quantifier Guided Importance Degree Evaluations;
Pij = Preference Value;
Q = Fuzzy Quantifier;
$QGID_i^k$ = Quantifier Guided Importance Degrees; and
W = Weights Vector.

1. Introduction

Due to the increase of internet usage and emergence of social sharing sites, social media has not only become a part of people's daily lives but also emerged as an important tool for companies to stand out in the competition. Companies today can quickly observe the impact of their work on social media, which provides them with powerful capabilities for communication and interaction with their customers. Companies can directly reach out to customers to better understand their perceptions regarding their products and/or services and hence can continuously improve their business processes through this continuous feedback mechanism. Through social media, companies can also seek out new customers and increase their sales volumes, brand awareness and competitiveness at much lower costs without the need for high advertisement costs (Roblek *et al.* 2013).

To make sure of these advantages, it is important to determine the best strategies for effective social media use. Companies need to plan in advance how, and for what purpose, they will be using social media. To achieve this, companies need to evaluate the advantages and disadvantages of using social media and give importance to strategic planning processes (McCann and Barlow, 2015). In this study, strategic factors for using social media more effectively are determined using SWOT analysis. Factors are prioritized with an analytical approach and alternative strategies are developed. Following this, the analysis is applied to ABC, a case company, and the findings are elaborated on.

SWOT is a strategic planning tool used as a systematic approach to assist with decision-making processes. It is a well-known approach that is used by both researchers and practitioners. While it can help determine strategic factors for companies (Aktan, 2008), it is inadequate in finding the importance degrees of possible alternatives. Multi-criteria decision-making (MCDM) techniques can help to address this deficiency.

In decision-making problems, opinions of experts can be subjective. A group decision-making (GDM) approach can prove useful in addressing this subjectivity. In a GDM process, decision-makers (DMs) with different backgrounds, experiences and ideas determine the alternatives and provide their preferences in different formats which is associated with multiple preferences relations (Büyüközkan and Güleryüz, 2015).

The objective of this paper is to determine those factors that play an important role in best managing social media activities by applying an integrated SWOT analysis with a

GDM approach in the selected area and to develop strategies in this direction. This method involves multiple preference formats and eventually aggregates different statements into a combined group evaluation. The functionality of the method is demonstrated with the help of a case study. In addition, with this study, SWOT analysis with multiple preference relations technique is proposed for social media analysis for the first time in the literature.

This article continues with Section 2, which provides information regarding the related literature on SWOT analysis and multiple preference relations. Section 3 presents the calculation procedure of the applied methods. Section 4 demonstrates how the methodology can be applied to actual decision-making problems. Section 5 discusses the outcomes, while Section 6 elaborates on the managerial implications. Finally, Section 7 concludes the study.

2. Literature survey

2.1 Strengths, weaknesses, opportunities and threats analysis

Strengths, weaknesses, opportunities and threats (SWOT) analysis is a popular method that provides companies and practitioners with the ability to not only examine their internal strengths and weaknesses but also with the ability to determine the associated opportunities and threats via an external outlook (Kahraman *et al.* 2007). SWOT analysis helps companies clearly define their current situation, allowing them a long-term success by determining the factors that will ensure growth and eliminating the ones that will lead to failure (Aktan, 2008). The main goal of SWOT analysis is developing and selecting a strategy that takes external and internal factors into account.

Despite the simplicity and usefulness of SWOT, the method is known to be associated with certain limitations. For one, SWOT requires quantitative measurement of importance degrees of the factors in decision-making problems. To overcome this issues, MCDM techniques can be used to prioritize the SWOT analysis factors. That approach has been commonly used in the literature. In one study for instance, SWOT is used with analytical hierarchy process (AHP) technique by Kurttila *et al.* (2000) to review the strategic importance of certification of forest regions. Chang and Huang (2005) also proposed a quantified SWOT by using AHP technique. Pur and Tabriz (2012) calculated the weights of SWOT factors by using fuzzy QFD. Besides using SWOT analysis with AHP, SWOT is also integrated with fuzzy techniques in some studies. Kabak *et al.* (2016) combined fuzzy analytic network process (ANP) with SWOT to analyze the strategic energy situation of Turkey. The same combination is used by Sevkli *et al.* (2012) for the Turkish airline industry. Ramkumar *et al.* (2016) presented a fuzzy inference system by integrating SWOT with ANP and applied it on a risk assessment problem. Arabzad *et al.* (2011) used SWOT analysis with Fuzzy TOPSIS method to select suitable suppliers. The authors made use of linear programming to allocate orders. Baş (2012) proposed an integrated SWOT analysis with Fuzzy TOPSIS method that is integrated with AHP. Tavana *et al.* (2015) proposed an integrated SWOT analysis with intuitionistic fuzzy AHP methodology to evaluate outsourcing reverse logistics. Baykasoğlu and Gölcük (2016) used SWOT analysis with interval Type-2 fuzzy TOPSIS and interval Type-2 fuzzy DEMATEL methodologies on a SWOT-based strategy selection problem. More recently, Dadpour and Shakeri (2017) evaluated and selected private-public partnership projects with an integrated SWOT, Fuzzy VIKOR and PROMEEHTE method. Arsić *et al.* (2018) used an integrated SWOT-ANP analysis for evaluating alternative scenarios in ecosystem management for a national park in Serbia. Ervural *et al.* (2018) proposed an integrated methodology for analyzing energy planning of Turkey using SWOT analysis with ANP and Fuzzy TOPSIS. Khan (2018) evaluated and selected alternative strategies for compressed natural gas industry using SWOT analysis with Fuzzy Goal Programming.

This short review suggests that there are no examples in the literature of combining SWOT analysis with multiple preference relations technique in the selection of strategic factors for social media. Filling this gap, this article introduces a novel approach to determine the importance of SWOT factors using multiple preference relations technique with a GDM perspective in the selected area.

2.2 Multiple preference relations

Preference relations methods are frequently used in decision-making. They describe DMs' opinions regarding possible problem alternatives in different formats. Some of these preference formats are preference orderings (Büyüközkan and Feyzioğlu, 2005), (Büyüközkan, Feyzioğlu and Ruan, 2007), importance degree (Büyüközkan and Feyzioğlu, 2005), (Büyüközkan and Çifçi, 2013), linguistic preference relations (Büyüközkan and Çifçi, 2015), (Büyüközkan and Güleryüz, 2015), fuzzy preference relations (Dong and Zhang, 2013), multiplicative preference relations (Jiang and Xu, 2013), selected subset (Kurttila *et al.* 2000), intuitionistic multiplicative preference relations (Xia and Xu, 2013), (Jiang and Xu, 2013) and utility functions (Dong and Zhang, 2013).

This multiple preference relations approach allows experts with different qualifications and opinions to voice their preferences in a variety of ways. The approach provides flexibility to DMs by applying different forms of judgments. This approach also helps to achieve a higher contentment level in the decision-making process.

Academic studies that make use of multiple preference relations are summarized in Table I.

3. Calculation procedure of proposed methods

When the decision-making process depends on a single DM, ineffective evaluations may occur due to lack of experience or clarity when expressing opinions. Addressing these issues, the GDM approach is commonly used to avoid prejudice and to minimize the amount of partiality in the decision-making process. The GDM process consists of multiple individuals interacting to achieve a decision. However, when each DM is deemed to have different experiences, cultural and educational backgrounds, they may have different perspectives in the decision-making process. DMs can provide their evaluations numerically, by subsets, and linguistically, etc. The multiple preference relations technique is used to achieve a common outcome by combining different preference formats. As mentioned earlier in Section 2, this technique has been used in a variety of areas and has been integrated with several different techniques. However, this technique has not been used in conjunction with SWOT analysis in the selection of strategic factors for social media.

In this study, integrated SWOT analysis with multiple preference relations technique is proposed for social media strategic factor selection of ABC and alternative strategies are developed based on the selected factors. This proposed approach consists of two phases.

In the first phase, the current situation of ABC's use of social media is analyzed using SWOT analysis. Social media SWOT analysis was created via the literature review and based on the expert opinions.

In the second phase, the SWOT factors are prioritized using the GDM approach. Each determined SWOT factor has been evaluated by experts in various preference formats. In this study, five common preference formats are used, such as importance degree vector, ordering vector, linguistic importance vector, state of importance without identifying

Authors	Integrated Methodology with Multiple Preference Relations	Area	Type
Büyüközkan and Feyzioğlu (2005)	Fuzzy GDM, QFD	Word processing software development	illustrative example
Büyüközkan, Feyzioğlu, and Ruan (2007)	Fuzzy GDM, QFD	Hatch-door design for cars	illustrative example
Li, Tang, Chin, Luo, Pu and Jiang (2012)	Multi-format preference analyses in QFD	Product development of personal digital assistant in an electric corporation	real world example
Wang (2012)	QFD, Nonlinear programming	Pencil design	illustrative example
Xia and Xu (2013)	IMPR	Sharing of internet-service costs	illustrative example
Dong and Zhang (2013)	MPDM, preference orderings, utility functions, multiplicative preference relations and fuzzy preference relations	Education, causes of misbehavior of the students in the classroom	illustrative example
Xia and Xu (2013)	IMPR	Sharing of internet-service costs	illustrative example
Jiang and Xu (2013)	IMPR	–	practical example
Büyüközkan and Çifçi (2013)	QFD, incomplete preference	Turkish logistic sector	real world example
Jiang *et al.* (2014)	IMPR, incomplete IMPR	Training venue in communication drills	illustrative example
Büyüközkan and Çifçi (2015)	QFD, incomplete preference relations	Portable entertainment and game systems design	real world example
Büyüközkan and Güleryüz (2015)	QFD, incomplete preference relations	Turkish software company	real world example
Zhang, Zhu, Liu and Chen (2015)	Multi-dimensional preference relations and incomplete weight information	Air-fighter plane selection	real world example
Zhang *et al.* (2015)	MADM with multiple preference formats	Robot selection	illustrative example
Rianthong, Dumrongsiri and Kohda (2016)	MCDM with multi-dimensional preferences	Hotel booking from online travel agencies	real world example
Zhang (2016)	Interval-valued intuitionistic multiplicative preference relations	Supplier selection	real world example
Meng and Tan (2017)	Interval multiplicative preference relation, 0-1 mixed programming model	–	illustrative example
He and Xu (2017)	Hesitant multiplicative preference relation, Hesitant fuzzy preference relation	Medical institutions in China	real world example
Zhang *et al.* (2017)	GDM with multiplicative linguistic preferences	Emergency decision-making problem	real world example

Table I.
Studies using multiple preference relations

degree and subset of criteria. Using multiple preference relations techniques, evaluations in different formats were combined under a single group decision and the factor with the highest priority was determined. Subsequently, alternative strategies have been identified in line with the results obtained. The detailed description of the calculation procedure is given in Section 3.1.

3.1 Calculation procedure for multiple preference relations with strengths, weaknesses, opportunities and threats analysis

In this section, the proposed framework is illustrated in Figure 1. The calculation procedure is detailed with a step by step description of the methodology.

Step 1: Determining the factors of SWOT:

SWOT factors used for the selected area are described with the help of a literature research and expert opinions.

Step 2: Calculating the weights of SWOT groups and factors:

In this step, the relative priorities are determined by DMs for SWOT groups and factors. DMs may use different formats for their evaluations. The aim in this step is to unify DMs' evaluations.

Step 2.1: Unifying individual evaluations:

DMs may provide their preferences in different formats, as described below:

(1) DMs may present an importance degree vector $(u_1, \ldots, u_N)$, each of its N elements being between 0 and 1. Here, a value of u_i with $i = 1, \ldots, N$ that is closer to 1 means higher importance. An importance degree vector is translated into relative importance relations with the formula below:

$$z_{ij} = u_i/u_j \text{ for all } 1 \leq i \neq j \leq N \tag{1}$$

(2) DMs may provide their opinions as an ordering vector (o(1), . . ., o(N)), where o(i) is the importance ranking of SWOT factor i. Here, 1 designates the highest importance and N the lowest importance. This ordering is transformed to relative importance relations with the formula below:

$$z_{ij} = 9^{u_i - u_j} \text{ for all } 1 \leq i \neq j \leq N \tag{2}$$

Where:

$$u_i = (N - o(i))/(N - 1)$$

(3) DMs may voice their judgments linguistically with an importance vector $(s_1, \ldots, s_N)$, with elements s_i ($i = 1, \ldots, N$). These values may be any of "Not Important (NI), Some Important (SI), Moderately Important (MI), Important (I) and Very Important (VI)." If fuzzy triangular numbers are considered, its representation becomes (a_i, b_i, c_i) with b_i being the most frequent value. Then, the fuzzy membership functions of the collected linguistic values are represented as NI = (0.00, 0.00, 0.25), SI = (0.00, 0.25, 0.50), MI = (0.25, 0.50, 0.75), I = (0.50, 0.75, 1.00) and VI = (0.75, 1.00, 1.00). This linguistic judgment vector is translated to relative importance relations with the formula below:

$$z_{ij} = 9^{b_i - b_j} \quad \text{for all } 1 \leq i \neq j \leq N \tag{3}$$

(4) DMs may also describe the importance of SWOT factors with no absolute degree. This type of evaluation is formulized below:

$$\begin{aligned} &z_{ij} = 9 \quad \text{and} \quad z_{ji} = 1/9, \text{ if } i \text{ is designated as more important than } j \\ &\text{and } z_{ij} = 1, \text{ if no information is provided.} \end{aligned} \tag{4}$$

(5) DMs may only identify a subset of SWOT factors (R') that includes essential elements. The SWOT factors in R' are then equally important and have priority

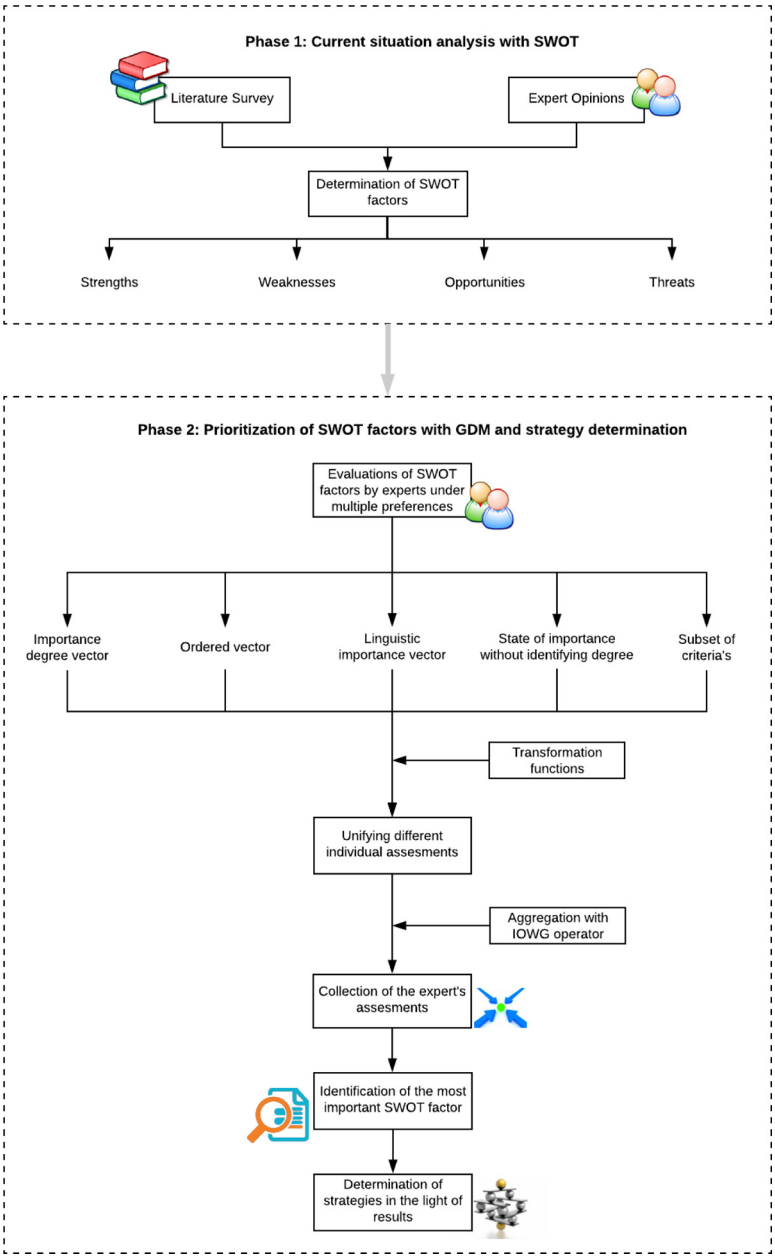

Figure 1.
Flowchart of the proposed framework

over the factors in R/R', which are equally important among themselves. Then, the preference relation is formulized as:

$$z_{ij} = \begin{cases} 9, & if\ i \in R',\ j \in R/R' \\ \frac{1}{9}, & if\ i \in \frac{R}{R'},\ j \in R' \\ 1, & if\ otherwise \end{cases} \qquad \text{for all } 1 \le i \ne j \le N \tag{5}$$

Step 2.2: Collecting the evaluations:

Each single evaluation is gathered to define an eventual group opinion. With this step, dominant opinions of DMs are reflected. Suppose that $\left(p_{ij}^{k1}, p_{ij}^{k2}, \ldots, p_{ij}^{kL_k}\right)$ is a set of values collected with $i, j \in R$ from a decision group with k evaluators, their weights being $\bar{W} = \left(\bar{w}^{kl}, \ldots, \bar{w}^{kL_k}\right)$.

The induced order weighted geometric (IOWG) operator with L_k dimensions is a function in the form of $\Phi_W^G : (RxR)^{L_k} \to R$. The weights-vector $W = (w_1, \ldots, w_{L_k})$ is linked to this function, such that $w_1 \in [0, 1]$ and $\sum_1 \mathbf{w}_1 = 1$. The two-tuples of L_k $\{(\overline{w}^{kl}, p_{ij}^{kl}), \ldots, (\overline{w}^{kL_k}, p_{ij}^{kL_k})\}$ with a positive ratio scale can be found with the formula below:

$$\phi_W^G\left\{\left(\bar{w}^{k1}, p_{ij}^{k1}\right), \ldots.\left(\bar{w}^{kL_k}, p_{ij}^{kL_k}\right)\right\} = \prod_{l=1}^{L_k}\left(p_{ij}^{k[l]}\right) \tag{6}$$

Here, $\{1, \ldots, L_k\} \to \{1, \ldots, L_k\}$ is a permutation where $\overline{w}^{k1} \ge \overline{w}^{k[1+1]}$, with $l = \{1, \ldots., L_k - 1\}$. In this step, $\{\overline{w}^{kl}, p_{ij}^{kl}\}$ is the two-tuple and $\overline{w}^{k1}$ is the first largest element in $\overline{W} = \left(\overline{w}^{kl}, \ldots, \overline{w}^{kL_k}\right)$. The IOWG vector indicates the fuzzy majority, if its weighting vector W is calculated over a fuzzy linguistic quantifier (Büyüközkan and Çifçi, 2015).

Relative quantifiers (e.g. "most", "as many as possible" etc.) can be represented by fuzzy subsets between 0 and 1. For any $t \in [0, 1]$, Q(t) stands for the degree where t is associated with the proportional quantifier it represents. For a non-decreasing proportional quantifier Q, the weights can be calculated with the formula below:

$$W_k = Q(k/K) - \left(Q(k-1)/K\right), \text{ where } k = 1, \ldots, K. \tag{7}$$

where Q(t) can be described as (Büyüközkan and Çifçi, 2015):

$$Q(t) = \begin{cases} 0, & \text{if } t < s \\ \frac{t-s}{v-s}, & \text{if } s \le t \le v \\ 1, & \text{if } t \ge v \end{cases} \tag{8}$$

The relative quantifier "most" is represented as (0.3, 0.8), "at least half" as (0, 0.5) and "as many as possible" as (0.5, 1). Then Q, a fuzzy quantifier, can be represented with Φ_Q^G for calculating the weights of IOWG operator Φ_W^G. The overall multiplicative relative importance relation can then be found as:

$$p_{ij}^{k} = \Phi_{Q}^{G}\left(p_{ij}^{k1}, p_{ij}^{k2}, \ldots, p_{ij}^{kL_k}\right), 1 \le i \ne j \le N \quad (9)$$

Step 2.3: Identifying the importance of SWOT groups and SWOT factors:

The aim here is to find the importance weights of SWOT factors. For this purpose, Equation (9) is used to find the group opinion aggregated with matrix P^k. Next, the importance of one factor against another is determined with a fuzzy majority approach, as described by Herrera, Herrera-Viedma and Chiclana:

$$QGID_i^k = 1/2\left(1 + \log_9 \phi_Q^G\left(p_{ij}^k : j = 1, \ldots, N\right)\right) \quad \text{for all } i = 1, \ldots, N \quad (10)$$

The OWG operator is essentially IOWG operator's special case. Here, the weights of aggregation elements are equal to each other (i.e. $1/|W|$). After normalization, the importance degrees are found as percentages for the group k with the help of the formula below:

$$QGID_i^k = \frac{QGID_i^k}{\sum_i QGID_i^k} \quad (11)$$

These steps have to be applied consistently for each level of the evaluation model. The global weight of each factor can be computed by multiplying its specific and the upper-level global importance values with each other. Eventually, the aggregate SWOT factors importance values are found by calculating the weighted sums of the SWOT factors group importance (GI) values.

Step 3: Determining the strategies:

Following the prioritization of the SWOT factors, alternative strategies have been identified in this step. At this point, four types of strategies can be identified as stated below:

(1) *SO* strategies that take advantage of opportunities by using strengths;

(2) *WO* strategies that take advantage of opportunities by considering weaknesses;

(3) *ST* strategies that use strengths to eliminate threats; and

(4) *WT* strategies to eliminate threats by considering weaknesses.

4. Case study

In this section, SWOT factors are determined for ABC, a company located in Turkey that aims to use its social media channels more effectively with the help of the proposed methodology and alternative strategies are determined in the light of the results.

4.1 Application area: social media strategic factor selection and strategy development for ABC

Social media is a kind of media in which information sharing can be followed simultaneously. There are many social media platforms used for various purposes such as Facebook, Twitter, Instagram, YouTube and LinkedIn. Along with the emergence of social media, marketing and promotional activities have also gained an additional outlet. Social media solutions are significantly more affordable and interactively accessible than conventional media outlets such as newspaper, radio and television. Therefore, they can be

extremely useful for marketing activities and provide great strategic advantages when managed effectively and correctly for companies (Algharabat, 2017).

There are many decision-making studies published in this area, such as the social media platform selection by using fuzzy ANP and COPRAS-G methods (Tavana, Momeni, Rezaeiniya, Mirhedayatian and Rezaeiniya, 2013), the estimation of the potential influencers in the social media by using Pugh method and TOPSIS (Gandhia and Muruganantham, 2015), the determination of most significant social media principles by using QFD and ANP approaches (Hsieh, 2016), the development of sentiment analysis model to underline the effects of social media in health-care industry by using SAW and TOPSIS methods (Abirami and Askarunisa, 2017) and the evaluation the role of social media tools in polio prevention by using Delphi and Dematel methods (Kumar, Kaviani, Bottani, Dash and Zavadskas, 2018). Our literature review suggests that an integrated SWOT analysis with multiple preference relations approach has previously not been used to select strategic factors for a company that aims at using social media more effectively. Moreover, we have not encountered the application of this selection problem using any analytical technique.

In this application, the SWOT matrix is constructed with the help of a literature search and expert opinions. Evaluations are taken from two different groups and a total of six experts. Following the creation of the SWOT matrix, factors are prioritized with multiple preference relations technique and alternative strategies have been identified based on the prioritized factors. The recommended approach is implemented for ABC. To act with the appropriate strategies in social media analysis, the decision-making process should be a team process. As the approach in this study is based on GDM, it presents more efficient results.

The steps for the evaluation procedure of the experts are given in Section 4.2.

4.2 Procedural steps of multiple preference approach

Step 1: Determining the factors of strengths, weaknesses, opportunities and threats:

First of all, a SWOT analysis is carried out for ABC, which intends to use social media in a more effective way, with the help of a literature review and expert opinions. This analysis is given in Table II.

Step 2: Calculating the weights of SWOT groups and factors:

After the SWOT factors are identified, DMs are consulted to choose the more important SWOT group and SWOT factor.

Step 2.1: Unifying different individual evaluations:

Step 2.1.1: Evaluation of SWOT groups

(1) First group:

- DM1 provides an ordering vector of {1, 3, 2, 4}. Here, 1 means that the strengths group is the most important group and 4 means that the threats group is the least important group. Opportunities group evaluated as the second important group and weaknesses group evaluated as the third important group. The ordering vector of DM1 is transformed into a relative importance relation by using Equation (2) as $u_1 = (4-1)/(4-1) = 1$ and $u_2 = (4-3)/(4-1) = 0.33$ $P_{12}^{11} = 9^{u_i - u_j} = 9^{1-0,33} = 4.33$.
- DM2 evaluates each SWOT group in linguistic terms {VI, I, SI, NI}. Here, the strengths group evaluated as Very Important, weaknesses group evaluated as Important and opportunities and threats groups are evaluated as Some Important and Not Important, respectively. The linguistic terms of DM2 is transformed into a relative importance relation using Equation (3) as $P_{12}^{12} = 9^{1-0.25} = 5.20$.

Strengths	*Weaknesses*
S1: Dominating the social media platforms	W1: Into the which business processes that social media will be integrated cannot be determined clearly
S2: It can be taken fast results with social media management	W2: The lack of company staff to support the dynamic nature of social media
S3: The formation of reportable and observable outputs	W3: The inability to assess the social media marketing opportunities for private persons
S4: Touching customers with variety of tools on social media such as videos, images, sounds	W4: The lack of the experience and the lack of lessons learned
S5: The perception of the company rises to upper levels with the attractive applications	
Opportunities	*Threats*
O1: Ability to communicate interactively at an appropriate cost with the target audience	T1: Competitor companies that are dominant in social media
O2: Opportunity to contact a large number of users simultaneously at affordable costs	T2: Failure of the image of the company reflected via social media
O3: CRM opportunity through social media	T3: Reported data are not done through metrics that make sense for the company
O4: The opportunity to get support from a large number of specialized companies on social media, located in Istanbul	T4: Social CRM applications cannot be used effectively

Table II.
SWOT Analysis of ABC

- DM3 says the strengths group is more important than the weaknesses group and the opportunities group is more important than the threats group. Using Equation (4), P_{12}^{13} is calculated as 9.

By using the transformation functions given in Section 3 (Step 2.1), importance relation matrices P^{11} to P^{13} are calculated:

$$p^{11} = \begin{bmatrix} 1.00 & 4.33 & 2.08 & 9.00 \\ 0.23 & 1.00 & 0.48 & 2.08 \\ 0.48 & 2.08 & 1.00 & 4.33 \\ 0.11 & 0.48 & 0.23 & 1.00 \end{bmatrix}$$

$$p^{12} = \begin{bmatrix} 1.00 & 5.20 & 1.73 & 9.00 \\ 0.19 & 1.00 & 0.33 & 1.73 \\ 0.58 & 3.00 & 1.00 & 5.20 \\ 0.11 & 0.58 & 0.19 & 1.00 \end{bmatrix}$$

$$p^{13} = \begin{bmatrix} 1.00 & 9.00 & 1.00 & 1.00 \\ 0.11 & 1.00 & 1.00 & 1.00 \\ 1.00 & 1.00 & 1.00 & 9.00 \\ 1.00 & 1.00 & 0.11 & 1.00 \end{bmatrix}$$

Step 2.2: Collecting the evaluations:

The matrices P^{11}-P^{13} are collected with the help of Equations (6)-(9) and the IOWG operator is applied with the fuzzy linguistic quantifier "at least half: (0, 0.5)" to find the GI relation matrix. Its weighing vector is calculated as (0.67, 0.33, 0).

Then, using Equation (6), the GI relation matrix is found to be:

$$p^1 = \begin{bmatrix} 1.00 & 4.60 & 1.96 & 9.00 \\ 0.22 & 1.00 & 0.43 & 1.96 \\ 0.51 & 2.35 & 1.00 & 4.60 \\ 0.11 & 0.51 & 0.22 & 1.00 \end{bmatrix}$$

An example for P^1_{12} is given next;

$$P^1_{12} = \prod_{l=1}^{3} \left(p_{12}^{1[l]}\right) = \Phi_Q^G\left(p_{12}^{11}, p_{12}^{12}, p_{12}^{13}\right) = 4.33^{0.67} \text{ x } 5.20^{0.33} \text{ x } 9^0 = 4.60$$

Step 2.3: Identifying the importance of SWOT groups:

For obtaining the priorities from the evaluation matrix, Equations (6)-(9) are applied again to compute the weighing vector (0.5, 0.5, 0, 0), which is associated with the fuzzy linguistic quantifier "at least half". Then, using Equations (10) and (11), the aggregated GI values of P^1 are calculated.

The associated GI values of the First Group are computed as (0.673, 0.326, 0.52, 0.173). They are then normalized as (0.397, 0.192, 0.307, 0.102).

An example for the first GI value is given next;

$$QGID_1^1 = 1/2\left(1 + \log_9 \phi_Q^G\left(p_{1j}^4 : j = 1, 2, 3, 4\right)\right)$$

$$= 1/2\left(1 + \log_9 (1^{0.5} \text{ x } 4.60^{0.5} \text{ x } 1.96^0 \text{x } 9^0\right) = 0.673$$

(2) Second group:

- DM1 gives an importance degree vector {0.8, 0.6, 0.6, 0.5}. Here, the strengths group is evaluated as the most important group with the importance degree of 0.8 which is closer to 1, and the threats group is evaluated as the least important group with the importance degree of 0.5. The importance degree vector of DM1 is transformed into a relative importance relation using Equation (1) as $P_{12}^{21} = 0.8/0.6 = 1.33$.
- DM2 gives an ordered importance vector {1, 2, 3, 4}. Here, 1 means that the strengths group is the most important group and 4 means that the threats group is the least important group. Weaknesses group evaluated as the second important group and opportunities group evaluated as the third important group. The ordering vector of DM2 is transformed into a relative importance relation by using Equation (2) as $u_1 = (4\text{-}1)/(4\text{-}1) = 1$ and $u_2 = (4\text{-}2)/(4\text{-}1) = 0{,}67$ $P_{12}^{22} = 9^{u_i - u_j} = 9^{1-0,67} = 2.08$
- DM3 provides a subset of SWOT groups {S} that are found to be important. For P_{12}^{23}, where i = 1 and j = 2, i ∈ R', j ∈ R/R' notation is provided for the subset which member chose. Using Equation (5), P_{12}^{23} is computed as 9.

Matrices P^{21}-P^{23} are calculated as follows:

$$p^{21} = \begin{bmatrix} 1.00 & 1.33 & 1.33 & 1.60 \\ 0.75 & 1.00 & 1.00 & 1.20 \\ 0.75 & 1.00 & 1.00 & 1.20 \\ 0.75 & 0.83 & 0.83 & 1.00 \end{bmatrix}$$

$$p^{22} = \begin{bmatrix} 1.00 & 2.08 & 4.33 & 9.00 \\ 0.48 & 1.00 & 2.08 & 4.33 \\ 0.23 & 0.48 & 1.00 & 2.08 \\ 0.11 & 0.23 & 0.48 & 1.00 \end{bmatrix}$$

$$p^{23} = \begin{bmatrix} 1.00 & 9.00 & 9.00 & 9.00 \\ 0.11 & 1.00 & 1.00 & 1.00 \\ 0.11 & 1.00 & 1.00 & 1.00 \\ 0.11 & 1.00 & 1.00 & 1.00 \end{bmatrix}$$

Step 2.2: Collecting the evaluations:

The matrices P^{21}-P^{23} are collected with the help of Equations (6)-(9) and the IOWG operator is used with the fuzzy linguistic quantifier "at least half – (0, 0.5)" for identifying the GI relation matrix. Its weighing vector is calculated as (0.67, 0.33, 0). Using Equation (6), the GI relation matrix is found as:

$$p^{2} = \begin{bmatrix} 1.00 & 1.54 & 1.97 & 2.83 \\ 0.65 & 1.00 & 1.27 & 1.83 \\ 0.51 & 0.79 & 1.00 & 1.44 \\ 0.40 & 0.55 & 0.69 & 1.00 \end{bmatrix}$$

Step 2.3: Identifying the importance of SWOT groups:

For obtaining priorities from the evaluation matrix, Equations (6)-(9) are applied once more to compute the weighing vector (0.5, 0.5, 0, 0) linked to the fuzzy linguistic quantifier "at least half". Thereafter, using Equation (10) and (11), the aggregated GI values of P^2 are calculated.

The associated GI values of the Second Group are computed as (0.549, 0.450, 0.395, 0.326). Then, they are normalized as (0.319, 0.261, 0.229, 0.189).

Step 2.1.2: Evaluation of SWOT factors of the Strengths group:

(1) First Group:

- DM1 expresses an importance degree vector {0.6, 0.5, 0.5, 0.7, 0.6}.
- DM2 expresses an ordered importance vector {5, 4, 3, 1, 2}.
- DM3 expresses a subset of Strengths factors {S3, S4}, which is found important.

Step 2.2: Collecting the evaluations:

The matrices P^{11}-P^{13} are collected with the help of Equations (6)-(9) and the IOWG operator is used with the fuzzy linguistic quantifier "at least half – (0, 0.5)" for determining the GI relation matrix. Its weighing vector is calculated as (0.67, 0.33, 0).

Then using Equation (6), GI relation matrix can be found as below:

$$p^1 = \begin{bmatrix} 1.00 & 0.94 & 0.79 & 0.44 & 0.58 \\ 1.06 & 1.00 & 0.83 & 0.46 & 0.62 \\ 1.27 & 1.20 & 1.00 & 0.56 & 0.74 \\ 2.29 & 2.16 & 1.80 & 1.00 & 1.33 \\ 1.72 & 1.62 & 1.35 & 0.75 & 1.00 \end{bmatrix}$$

Step 2.3: Identifying the importance of Strengths factors for 1st Group:

For obtaining the priorities from the evaluation matrix, Equations (6)-(9) are applied to compute the weighing vector (0.4, 0.4, 0.2, 0, 0) linked to the fuzzy linguistic quantifier "at least half". After, using Equations (10) and (11), aggregated GI values of P^1 are calculated.

The associated GI values of the First Group are computed as (0.483, 0.497, 0.538, 0.672, 0.607), which are then normalized as (0.172, 0.177, 0.192, 0.240, 0.217).

(2) Second Group:

- DM1 evaluates each SWOT factor of the Strengths group with the help of linguistic parameters {I, I, MI, I, VI}.
- DM2 gives a subset of the Strengths factors {S1, S2} that is found important.
- DM3 indicates that S1 important than S3, S4 important than S2 and S5 important than S3.

Step 2.2: Collecting the evaluations:

The matrices P^{21}-P^{23} are collected with the help of Equation (6)-(9) and the IOWG operator is applied with the fuzzy linguistic quantifier "at least half – (0, 0.5)" for determining the GI relation matrix. Its weighing vector is calculated as (0.67, 0.33, 0).

Then, using Equation (6), the GI relation matrix is found as:

$$p^2 = \begin{bmatrix} 1.00 & 1.00 & 2.98 & 2.06 & 1.43 \\ 1.00 & 1.00 & 2.98 & 2.06 & 1.43 \\ 0.34 & 0.34 & 1.00 & 0.69 & 0.48 \\ 0.48 & 0.48 & 1.44 & 1.00 & 0.69 \\ 0.70 & 0.70 & 2.09 & 1.44 & 1.00 \end{bmatrix}$$

Step 2.3: Identifying the importance of Strengths factors for Second Group:

For obtaining the priorities from the evaluation matrix, Equations (6)-(9) are applied once again to compute the weighing vector (0.4, 0.4, 0.2, 0, 0) that is linked to the fuzzy linguistic quantifier "at least half". Next, using Equations (10) and (11), the aggregated GI values of P^2 are calculated.

The associated GI values of the Second Group computed as (0.549, 0.549, 0.300, 0.384, 0.468). Then, they are normalized as (0.244, 0.244, 0.133, 0.170, 0.208).

Using the same logic above, all factors of the SWOT groups are assessed and priorities are determined. The final evaluations of the SWOT groups and SWOT factors are provided in Table III. In this table, SWOT group weight scores are calculated by getting the average of the two DM groups' evaluations. When calculating the overall weights of the SWOT factors, the average of DMs' evaluations is computed. Each overall weight score is then multiplied with its corresponding group weight.

Step 3: Determining the strategies:

SWOT group	Group weight score	SWOT factors	Local weight score DM 1	Local weight score DM 2	Overall weight score
Strengths	0.358	S1	0.172	0.244	0.074
		S2	0.177	0.244	0.075
		S3	0.192	0.133	0.058
		S4	0.240	0.170	0.073
		S5	0.217	0.208	*0.076*
Weaknesses	0.227	W1	0.293	0.210	0.057
		W2	0.235	0.244	0.054
		W3	0.162	0.230	0.044
		W4	0.308	0.315	*0.071*
Opportunities	0.268	O1	0.256	0.205	0.062
		O2	0.205	0.402	*0.082*
		O3	0.384	0.199	0.078
		O4	0.153	0.192	0.046
Threats	0.145	T1	0.162	0.235	0.029
		T2	0.336	0.235	*0.042*
		T3	0.252	0.264	0.037
		T4	0.248	0.264	0.037

Table III.
Final evaluations of SWOT groups and SWOT factors

Alternative strategies can be set out based on the results of the SWOT analysis. Strategies that take advantage of "O2: Opportunity to contact a large number of users simultaneously at affordable costs" and "S5: The perception of the company rises to upper levels with the attractive applications" factors can be produced to eliminate the "W4: The lack of the experience and the lack of lessons learned" and "T2: Failure of the image of the company reflected via social media" factors. In this direction, eight alternative strategies are developed as following (Deloitte Consulting, 2009; Hassan *et al.* 2015; Loddon Shire Council, 2017; Murphy, 2016):

(1) *SO1*: Appropriate social media tool/tools should be identified and social media policies and procedures including account management, content management, monitoring and measurement processes should be established (S1, S2 - O2).

(2) *SO2*: The target audience to be reached should be identified and the characteristics and the use of social media of the selected target audience should be researched and analyzed (S3 - O1,O2).

(3) *WO1*: Training should be organized for employees and a strong social media management team should be established (W2, W3, W4 - O3, O4).

(4) *WO2*: A content schedule should be created to plan in which context content should be created and shared (W1, W4 - O3).

(5) *ST1*: Qualified employees should be assigned to respond to questions, criticisms and complaints coming from social media channels (S1 - T2).

(6) *ST2*: Interaction should be increased with likes, comments and sharing's of users by using attractive contents, videos or images (S4, S5 - T1).

(7) *WT1*: To improve social media performance, a system should be established to monitor, learn and analyze the movements in social media (W4 - T2, T4).

(8) *WT2*: Measurement metrics should be used to monitor progress in sales and marketing activities and record participation in social media channels (W1 - T2, T3).

5. Results and discussion

In this study, a strategic analysis was conducted to make more efficient use of social media for ABC. In this direction, the company's current situation was analyzed and important strategic factors were determined and alternative strategies were developed. Strategic factors assessed by SWOT analysis were prioritized by DM groups in various formats, with multiple preference relations techniques. Table III gives the final results of the SWOT group and factors prioritization.

As shown in Table III, priority values between SWOT groups appear as strengths (0.358), opportunities (0.268), weaknesses (0.227) and threats (0.145). When the weights of the SWOT factors are examined, it can be observed that the threats group is at a lower importance level than the other groups while the strengths group is at a higher importance level than the remaining groups.

Considering the overall weight scores of the SWOT factors, "O2: Opportunity to contact a large number of users simultaneously at affordable costs" has the highest importance within the SWOT factors. ABC should construct its strategy around this factor. It will be of great importance to evaluate the SO1 and SO2 strategies in this direction.

The second most important factor is "S5: The perception of the company rises to upper levels with the attractive applications". Change in ABC's perception in the positive direction with effective social media activities can enable ABC to move forward one step ahead of its competitors in competitive markets. It would be beneficial for ABC to evaluate the ST2 strategy in this direction.

The third most important factor to evaluate is "W4: The lack of the experience and the lack of lessons learned". ABC should take these weaknessess into consideration in strategic planning process. WO1 and WO2 strategies can be evaluated to deal with this weak point.

The fourth most important factor is "T2: Failure of the image of the company reflected via social media" from threats group. While creating strategies, ABC should focus on eliminating threats arising from the external environment. ABC should take the necessary steps to evaluate ST1, WT1 and WT2 strategies.

6. Managerial implications

As today's technology evolves, there is increasing interest in digital platforms. Companies have begun to use social media more frequently as digital platforms appeal to a wider audience helping the companies gain advantage in a highly competitive market. Companies can organize their advertising campaigns through social media, reduce their advertising costs and ensure that target groups are aware of the recent innovations. In this study, strategic factors of ABC are evaluated to effectively use social media. The results indicate that while ABC is creating a strategy to use social media effectively, it should firstly consider the factor of "Opportunity to contact a large number of users simultaneously at affordable costs" as the highest importance within the SWOT factors. The proposed approach allows practitioners to decide on those factors that should be prioritized when determining social media strategies. In addition, the study presents alternative strategies in the direction of the findings. This study is helpful for strategic social media planning processes of businesses.

For managerial practices, this study suggests the following:

- SWOT analysis is a strategic planning tool that provides the basis for companies' strategic decision-making processes. Through SWOT analysis, uncertainties are better evaluated to obtain superior results. The analysis conducted in this study helps companies to determine and prioritize strategic factors for social media. The results obtained are beneficial for managers in

charge of decision-making processes, due to the analytical nature of the approach proposed in this study.

- While the methodology applied in the study is extensive and detailed, calculations in the application phase are straightforward and can be made easily via Excel spreadsheets. ABC's managers pointed out that this methodology was easy to understand and apply. They furthermore noted that the methodology applied in the study is useful in analyzing the current situation, identifying the weakest points and understanding the aspects that need to be focused on when taking corrective actions for social media use.
- Alternative strategies were presented to ABC based on the results obtained by quantitative methods. The company authorities were satisfied with the results and strongly supported the proposed approach. Recommended changed were adopted via the proposed strategies more rapidly.
- Managers must understand the advantages and disadvantages of social media to use social media more effectively in their company. Using appropriate strategies would significantly speed up this process, ensuring its success.
- The opportunities that social media present should be used to the best extent possible. Providing entertainment- and service-oriented content to customers through social media can change the points of view of customers toward the company providing competitive advantage.

7. Conclusions and future research directions

Social media is an important tool for companies and if used correctly, companies can provide great added value, but a wrong brand strategy can have a negative impact on customers. For this reason, it will be important to act with the right strategies. This study determined strategic factors for effective usage of social media for ABC company by using SWOT analysis and identified most important factor by using multiple preference relations approach. Subsequently, in the light of the assessments, alternative strategies were determined.

SWOT analysis is a popular and well-known method for organizations to develop strategies by investigating internal and external environment. The importance degrees of SWOT factors can be calculated with MCDM techniques. GDM approach can be effective in MCDM to achieve more objective results. In GDM, group members may provide their assessments in different ways. Multiple preference relations help to consolidate different assessments. When the literature is examined, it is observed that many studies apply multiple preference relations. However, there are no studies which use SWOT analysis together with this technique in the selection of strategic factors for social media. The scientific value of this study can be summarized as follows:

- This study presents an approach that enables to combine linguistic and numerical information of different individual assessments for the evaluation of SWOT analysis and determined the SWOT factors importance values based on the fuzzy majority concept.
- For the first time in literature, social media was assessed strategically by using SWOT analysis and multiple preference relations techniques with a GDM perspective.
- This study provides a road map that enables managers to use social media more effectively in the light of the results of the proposed methodology.

This study can be extended with additional studies, in particular by using SWOT analysis with multiple preference relations in other areas. With the determination of factor weights, different alternative strategies can be defined and compared for strategy selection purposes in the future. Another research direction could be the development of a computer-based application tool to speed up the calculations. Furthermore, incomplete preference relations can be used with SWOT and multiple preference relations techniques to reduce the uncertain nature of GDM. The proposed methodology can be extended by applying different aggregation operators for aggregating assessments, such as ordered weighted averaging (OWA), majority additive OWA (MA-OWA) or ordered weighted geometric (OWG) operators.

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