Dematel-Topsis-AHP for Online Marketing in Furniture Industry

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Abstract
This study aimed to create an online marketing model for the identified furniture industries in metro Cebu as inputs to trends and innovation. Ten (10) furniture industry experts and ten (10) customers who have purchased online were asked for their opinions and preferences in selecting an online marketing strategy. To treat the data for online marketing selection decision-making, an integrated DEMATEL-TOPSIS-AHP approach was used. DEMATEL provided interrelationships and the weight of each criterion, whereas Technique for Order Performance by Similarity to Ideal Solution provided weights and ranking of the initial alternatives. Furthermore, the Analytic Hierarchy Process (AHP) was used to compute the final alternative weights. The global weight was computed for the definitive ranking of alternatives after obtaining weights of all levels in the hierarchy. The proposed MCDM model was used in the Philippines furniture manufacturing industry, with a concentration in Cebu City. A priority map for small and medium-sized businesses in selecting an online marketing strategy that considers both business and customer perspectives has been proposed. This is advantageous because it keeps SMEs competitive in the market. The proposed map will allow decision-makers to choose an online marketing strategy from two distinct perspectives, giving them greater flexibility in selecting the right strategy. More research in various industries is needed to help with the decision-making process for online marketing strategy. Although technology is considered dynamic, the benefits of this proposed model are expected to last for a longer time.

Key-words: Furniture Industry, Technology, Manufacturing, Marketing Strategy.

1. Introduction

The practice of promoting and advertising products and services over the internet is known as online marketing. According to Sultan and Rohm (2004), the internet has caused a significant shift in the competitive landscape; thus, online marketing has become the primary marketing channel and has become critical to a company's success or failure. Consumer-to-consumer conversations are amplified by online marketing strategies, which marketing managers rarely control (Mangold & Faulds, 2009). However, while marketing managers can rarely control some information disseminated through online marketing, ignoring the realities of the positive impact on consumer behavior of the information that is supposed to be transmitted to the marketplace, such as increased purchasing intentions, means ignoring the realities of the positive impact on consumer behavior of the information that is supposed to be transmitted to the marketplace. As a result, management must adopt a strategic online marketing strategy that can shape consumer discussions to be consistent with its objectives. In the Philippines, online marketing is seen as a powerful tool for small and medium businesses (SMEs) to stay competitive in the market (Agabin, 2015).

A successful online marketing strategy allows SMEs to tap into a large and growing market, leading to new opportunities for growth. Large corporations have the financial resources to invest in online marketing; however, SMEs are known for having limitations and acceptance barriers to adopting new technology. The internet and communication channels have changed the way people do business today (Dahnil et al. 2014). Furthermore, SMEs do not always fully utilize their innovative and creative potential because many of these businesses are unfamiliar with today's technology tools, let alone the benefits of social media (Vasquez et al., 2014). The Philippines has over 33 million internet users, ranking second in Southeast Asia and sixth in Asia, with more than 34 percent of Filipino online users visiting the internet every day and more than 45 percent going online at least once a week (ADMA, 2013). The average Filipino spends up to 21.5 hours per week online when they use the internet.

Furthermore, according to Internet World Statistics, the number of Filipinos who subscribe to broadband services is expected to grow at an annual rate of 11.3 percent until 2016, when it is expected that more than 59 percent of Filipinos will be online. This creates an opportunity for SMEs to enter the online marketing market. This means that the Philippines has the infrastructure and resources necessary for SMEs to use online marketing to promote their goods and services. This also establishes a foundation for how critical it is for SMEs to engage in online marketing in order to develop marketing strategies that increase market participation. Several online marketing strategies or

forms were presented in recent literature, and marketing practitioners must evaluate and select these strategies based on a number of complex factors. As a result, deciding on a marketing strategy is classified as a multi-criteria decision-making (MCDM) problem. The MCDM model addresses the complexities of real-world decision-making caused by a number of potentially conflicting criteria and alternatives and the subjectivity of these criteria with limited measurement systems. For marketing practitioners in SMEs, this complexity creates an ill-structured problem, which may not imply a straightforward selection decision. In this problem domain, current literature only offers a limited solution. Rzemieniak (2015), for example, was tasked with finding the most effective online advertisement but failed to employ MCDM techniques.

Despite the fact that the problem appears to be important for both theory and practice, it has not been addressed in the current literature. As a result, this study sought to fill a gap in the existing literature by proposing a method for SMEs to choose an online marketing strategy. Applying a hybrid decision-making model approach and integrating businesses' and customers' perspectives in the online marketing strategy selection decision are the work's main contributions. This is significant because it emphasizes the importance of promoting online marketing for SMEs to keep them competitive. This study uses the proposed approach to allow marketing practitioners to choose an online marketing strategy from two different perspectives, giving them more flexibility in their decision. In this paper, an integrated DEMATEL-TOPSIS-AHP approach is proposed. The DEMATEL (Decision Making Trial and Evaluation Laboratory) assigns weight to criteria. The weights of the initial alternatives are provided by Technique for Order Performance by Similarity to Ideal Solution (TOPSIS), and the weights of the final alternatives are computed by Analytic Hierarchy Process (AHP). To demonstrate the proposed approach, a case study in the furniture manufacturing industry was used. This research contributes to creating a flexible online marketing strategy selection decision for marketing practitioners that considers both business and customer needs.

2. Review of Related Literature

As members of a competitive market, all businesses strive to outperform their competitors. Businesses need creative and innovative knowledge in designing management strategies to achieve or maintain such a reputation in the industry. One of these strategies is marketing (Aghazadeh, 2015). Several types of research consistently found that strategic marketing has a strong positive correlation with a company's success. Anderson, Fornell, and Mazvancheryl (2004) discovered that customer

satisfaction positively impacts shareholder value. Because of the rapid changes brought about by technological advancements, businesses are increasingly relying on internet technology to pursue international marketing opportunities. (Bianchi & Andrews, 2015; Bianchi & Andrews, 2015; Bianchi & Andrews, 2015 Companies use this portal to provide quality communication to their customers as technology dominates in the modern era. Internet usage is becoming an increasingly important source of competitive advantage on a global scale (Leeflang et al. 2014). As a result, businesses have taken advantage of the internet's global access to companies and individuals by connecting customers to companies more efficiently and cost-effectively than traditional services (Angelides,1997). Compared to traditional marketing, online marketing can efficiently disseminate vast amounts of information to a much larger customer base. This translates to increased interaction, improved customer service, and faster responses. Because the internet is available 24 hours a day, Kiang and Chi (2001) emphasized the ability of the internet to provide timely information to customers. Even though online marketing is now commonplace for businesses, Leeflang et al. (2014) identified several challenges, including the digital revolution, customer insights, breakthroughs, social media, online opportunity, price transparency, automated interactions, metrics, talent gap, and organization. These issues make it difficult for businesses to use online marketing effectively. Despite the obstacles mentioned above, businesses continue to engage in a new and diverse electronic marketing and advertising (Angelides, 1997). The majority of business firms commonly use different online marketing strategies. Social media marketing (Dahnil et al., 2014), search engine marketing (Skiera et al., 2010), e-mail marketing (Chadwick & Doherty, 2012), corporate websites (Hwang, McMillan & Lee, 2003), and content marketing are examples of these marketing strategies. Social media marketing (SMM), according to Dahnil et al. (2014), is a business practice in which goods, services, information, and ideas are promoted through online social media. It is a powerful tool for disseminating brand advocates by sharing with large groups of people; however, it can negatively affect publicity (Oztamur & Karakadilar, 2014). On Facebook, Twitter, Instagram, Flickr, Youtube, and other social media platforms, company pages, tagged-based, and referral marketing are examples.

Advertisers can use Google and Yahoo for search engine marketing (SEM), which allows them to place ads when a keyword is typed into a search engine (Skiera et al., 2010). Advertisements are ranked according to bids and paid per click (PPC), or unsponsored ads are promoted to higher positions using optimization techniques (search engine optimization). Because the search engine is the primary tool for finding information, SEM is the most popular form of online marketing (Skiera et al., 2010). However, because companies strive for the highest ranking in SEM, they will always be in a constant battle with other businesses (Xiang, Law & Fesenmaier, 2011).

E-mail marketing is a type of online marketing in which promotional messages are sent via e-mail (Chadwick & Doherty, 2012). Customers give their explicit consent to receive direct e-mails. E-mail marketing, according to Pavlov, Melville, and Plice (2007), provides twice the return on investment (ROI) as other online marketing strategies. However, because e-mail marketing is less expensive, customer complaints about unsolicited e-mails or spam are already common. Gmail, Yahoo Mail, and company e-mails are examples of e-mail sites. The corporate website is a type of corporate advertisement in which customers are provided with either comprehensive or concise information about the company via a website (Hwang, McMillan & Lee, 2003). When you click on a link from a search engine, you'll be taken to this website (Skiera et al., 2010). Customers' perceptions of a brand can be influenced by their knowledge of the company's website (Hwang, McMillan & Lee, 2003). Content marketing aims to educate customers by providing valuable information that builds brand loyalty. It attracts customers to purchase, according to Mandloys Digital Agency, identifying the benefits of content marketing: building credibility and value, building relationships, and versatility to business marketing strategy. The researchers define content marketing as blogs, online news articles, and commerce communities (e.g., Lazada, eBay, and Amazon).

3. Two Perspectives of Online Marketing

Customers' needs should always take precedence when choosing an online marketing strategy; however, businesses have their own set of requirements for selecting an online marketing strategy. As a result, relevant literature from these two domains can be used to create a research framework for this study.

The Perspective of Customers

According to various studies, companies with a strong customer focus have high levels of customer satisfaction and have well-established institutionalized processes for understanding and meeting their needs. It also aids in the marketing process, including product research and development and promotional communication. In recent years, there has been a greater emphasis on customer-centric marketing strategies. According to Gretzel, Yuan, and Fesenmaier (2006), one of the success factors for web marketing is engaging users' interest and participation through customized interactions. Customers should be considered in terms of online marketing by businesses to meet their needs. Several studies on the qualities of online marketing websites focused on the needs of the customers.

The Perspective of Businesses

While customers have their own set of requirements, businesses have their own set of requirements that may differ from those of the customers'. The primary goal of a business is to maximize profits for its owners and stakeholders (Murillo & Martinek, 2009). In order to achieve their objectives, several other businesses' needs should be considered. Cost, coverage, communication, and convenience are also online marketing concepts that should be considered from a business standpoint. The cost of developing, implementing, and maintaining an online marketing strategy refers to the monetary value that the company will incur. Typically, businesses would prefer lower development, implementation, and maintenance costs. Coverage is a quantitative measure of a company's communication with its customers. It refers to the total number of users reached by the company via online marketing, regardless of their feedback or insights. Technically, greater coverage is preferable because it gets a larger number of customers. Meanwhile, communication aims to build a meaningful relationship and interaction with the customer by focusing on their requirements. Customers will be able to provide constant feedback if you use interactive advertising. As a result, businesses would be able to improve and stay ahead of the competition. While market coverage refers to the quantity of the market, communication refers to the quality of the market. The ease with which an online marketing strategy can be designed and maintained is referred to as convenience.

Small and Medium Enterprises

The internet has provided opportunities to businesses, especially for small and medium enterprises. Comprising almost 98% of US companies (International Trade Administration, 2012), small and medium enterprises (SME) can expand their customer base, enter new product markets, and rationalize their businesses through online marketing (Organization for Economic Co-operation and Development, 2000). According to the World Bank Review on Small Businesses Activities, small and medium enterprise (SME) was committed to the World Bank Group as a core element in its strategy to foster economic growth, employment, and poverty alleviation. They are non-subsidiary, independent firms that more frequently employ fewer than 250 employees, in which 25% of these are now internationally competitive and must have an annual turnover of EUR 40 million or less in the European Union (Organisation for Economic Co-operation and Development, 2000). In the Philippines, 940,886 small and medium enterprises in operation contributed 35.7% of the value-added (DTI, 2012). SMEs must have less than 200 employees with at most P15-P100 million of assets. They

account for 99.6 percent of total registered enterprises in the country. Policymakers lauded SMEs as the real backbone of our economy, contributing to 32 percent of the country's GDP. This explains how SMEs play an important role in the national economy. Although large corporations have sufficient resources to invest in online marketing, SMEs are well known to have limitations and acceptance barriers in adopting new technology, especially in business today (Dahnil et al., 2014). Business owners who rarely know today's tool of technology may lose the opportunities of online marketing. With the emergence of SMEs' implementation of online marketing, a few studies are conducted to evaluate its effectiveness.

For instance, the Greek food exporting SMEs use online marketing strategies and the websites' features to establish a strong brand identity in the global market. Peer review of existing website evaluation frameworks in the literature and input from web style guides is used to identify what specific strategies most SMEs practice. Percentages of specific online marketing strategies under each category are derived from the firms' responses.

On the other hand, Rzemieniak (2015) researched the effectiveness of online advertising. Entrepreneurs are asked to select what they consider the most effective online advertising through a questionnaire. Results showed that most respondents chose search engine advertisement as the most effective location of online advertising.

In selecting the best alternative, multi-criteria decision-making (MCDM) is the most preferred and well-known approach of decision-making (Triantaphyllou, et al. 1998). It is a useful tool in many economic, manufacturing, material selection, military, constructional, etc. problems, specifically on investment decision, project evaluation, financial benefit evaluation and so on (Gavade, 2014). MCDM structures complex problems (Aruldoss et al., 2012) with multiple conflicting criteria that often form a hierarchy (Xu & Yang, 2001). Experts are given discretion in scoring importance weights to various criteria regarding the goal (Stanujkic, Dordevic B. & Dordevic M., 2013).

Few studies on marketing have applied MCDM approaches for decision-making. For example, Lee et al. (2010) modeled a marketing strategy decision-making problem and provided a five-step decision framework to carefully assess traditional marketing strategies using ANP, VIKOR, and DEMATEL. Meanwhile, Chuo, Leu & Tsai (2011) used DEMATEL, ANP, and VIKOR in proposing an integrated model for evaluating airlines' websites' effectiveness.

Both studies placed more emphasis on business' perspective rather than the customers' perspective. There is a synergistic effect between the business and customer perspectives, in which strengthening the business leads to stronger customer relationships and vice versa, feeding a positive,

virtuous cycle (Mittal and Sawhney 2001). Business or customer alone is not as successful as a focus on both perspectives. One perspective without the other is not that effective, and the combination will be greater than either alone (Ambler et al., 2002). For instance, a company will gain lesser revenue as it only focuses on lowering the cost in advertising but did not consider its effect on the customers. Emphasizing both perspectives will lower the cost of advertising and raise the revenue by giving quality marketing to the customers.

Due to the complexity of the decision process in selecting the best online marketing strategy, an integrated framework that corporate business and customer needs is proposed. The proposed framework attempts to develop a map that provides decision-makers a platform to choose an online marketing strategy in the context of business and customer needs.

Multi-criteria Decision-making (MCDM) Approaches

Multi-criteria Decision Making (MCDM) is a decision-making tool that structures the problem clearly and systematically (Lee et al., 2010). These problems are such complex decision situations in which several, often contradictory, points of view must be considered. Several studies made use of MCDM approaches, such as supplier selection (Bruno et al., 2012), truck selection (Baykasoglu et al., 2013), performance evaluation (Sun, 2010), information systems selection, industrial engineering sector choosing, the election of deputy candidates for nomination, and fire site selection (Chaudhary et al., 2015) to name a few. Generally, these problems are characterized by many criteria and alternatives structured either in a hierarchy or a network. In the proposed framework of this study, DEMATEL, TOPSIS, and AHP were used.

DEMATEL Method

The DEMATEL method was developed by the Science and Human Affairs Program of the Battle Memorial Institute of Geneva between 1972 and 1976. They converted the mutual relationship between the criteria's causes and effects into an intelligible structural model for the system (Tzeng et al., 2007). Several applications have been conducted in numerous studies, such as I.T. projects outsourcing strategy mix decision, evaluation, and selection of outsourcing provider for a telecommunication company (Kacamak, Kahraman & Uygun, 2015), truck selection (Baykasoglu, et al. 2013), sustainable management (Sai & Chou, 2009), and evaluation model for the web-based marketing of the airline industry (Chou et al., 2011). This methodology can confirm interdependence

among variables/criteria and restrict the relations that reflect characteristics within an important systemic and developmental trend. The following describes the process of DEMATEL Generate the direct-relation matrix. A group of experts is asked to perform pairwise comparisons of influence between criteria. An evaluation scale of 0,1,2,3, and 4 are used for comparison, representing "no influence", "low influence", "medium influence", "high influence", and "very high influence," respectively. These evaluations form initial direct-relation matrices of size n x n matrix where each expert is denoted as k, where $k=1, 2,…,$ experts, where z_{ii} is denoted as the degree to which the ith criterion affects the jth criterion. The following represents Z^k

$$Z^k = \begin{bmatrix} z_{11}^m & \cdots & z_{1j}^m & \cdots & z_{1n}^m \\ \vdots & & \vdots & & \vdots \\ z_{i1}^m & \cdots & z_{ij}^m & \cdots & z_{in}^m \\ \vdots & & \vdots & & \vdots \\ z_{n1}^m & \cdots & z_{nj}^m & \cdots & z_{nn}^m \end{bmatrix}, k = 1, 2, ..., m \quad (1)$$

Aggregating direct-relation matrices using equation (2) where $\beta_k \rightarrow [0,1]$ is the importance weight of the kth decision-maker and $\sum_{k=1}^{m} \beta_k = 1$

$$\overline{Z} = \beta_1 Z^1 + \beta_2 Z^2 + ... + \beta_m Z^m \quad (2)$$

Normalizing the direct-relation matrix. The normalized direct-relation matrix can be derived through formulas (3)-(5), where all principal diagonal elements are equal to zero.

$$Y = \frac{\overline{Z}}{g} \quad (3)$$

$$g = \max \left(\max_{1 \leq i \leq n} \sum_{j=1}^{n} |z_{ij}|, \max_{1 \leq j \leq n} \sum_{i=1}^{n} |z_{ij}| \right), i, j \in \{1, 2, 3, ..., n\}, (4)$$

$$\lim_{i \rightarrow \infty} Y^i = [0]_{n \times n} \text{ where } Y = [Y_{ij}]_{n \times n}, 0 \leq y_{ij} < 1. \quad (5)$$

Obtaining the total relation matrix. Once the normalized direct-relation matrix Y has been obtained, a continuous decrease in problems' indirect effects along with the powers of the matrix Y, e.g. $Y^1, Y^2, …, Y^\infty$ guarantees convergent solutions to the matrix inversion. The total-relation matrix T can be derived using formula (6), denoted as the identity matrix.

$$T = Y + Y^2 + Y^3 + ... = \sum_{i=1}^{\infty} Y^i = Y (I - Y)^{-1} \quad (6)$$

Computing the values of influence and relation. Using the values of $D-R$ and $D+R$, where D is the sum of columns and R the sum of rows in the matrix , levels of influence on others and relationships with others are defined as shown in formulas (7)–(9). Some criteria have positive values of $D-R$ and thus greatly influence other criteria. These criteria are called dispatchers; others have a negative value of $D-R$ and thus are greatly influenced by other criteria. These are called receivers. The value of $D+R$ indicates the degree of relationship between each criterion with other criteria. Criteria having greater values have stronger relationships with other criteria, while those having smaller values $D+R$ have less of a relationship with others.

$$T = \left[t_{ij} \right]_{n \times n} \quad i, j \in \{1, 2, 3, ..., n\}, \qquad (7)$$

$$D = \left[\sum_{j=1}^{n} t_{ij} \right]_{n \times 1} = \left[t_i \right]_{n \times 1} \qquad (8)$$

$$R = \left[\sum_{i=1}^{n} t_{ij} \right]_{1 \times n}^{t} = \left[t_j \right]_{n \times 1} \qquad (9)$$

Setting a threshold value to obtain the influence-relation-map. To obtain an appropriate influence-relation-map, the decision maker must set a threshold value for the influence level. Only some elements whose influence level in the matrix T is greater than the threshold value can be chosen and converted into the influence-relation-map. The threshold value is computed through equation (10) (Yang et al., 2008). The influence-relation-map is acquired by mapping the dataset of $(D+R, D-R)$ where the horizontal axis is $D+R$, and the vertical axis is $D-R$.

$$\alpha = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} \left[t_{ij} \right]}{N} \qquad (10)$$

Where N is the number of elements in matrix T.

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

This method is proposed by Chen and Hwang (1992). The basic principle of TOPSIS is that the chosen alternative should have the shortest distance from the ideal solution that maximizes the benefit and minimizes the total cost. The farthest distance from the negative ideal solution that minimizes the benefit also maximizes the total cost. It defines an index called similarity to the positive ideal solution and the remoteness from the negative ideal solution (Sun, 2010). Furthermore, the steps in implementing the TOPSIS method are the following:

Construct a decision matrix $X^k = \left[X_{ij}^k \right]_{m \times n}$ that denotes the performance of ith alternative to the jth criteria perceived by the kth decision-maker by a defined rating structure.

Table 1 - 10- Point Scale

Criteria	Rating Scale
Customer needs	
Reliability (CC1)	10 (Very good) – 1 (Very poor)
Responsiveness (CC2)	10 (Very good) – 1 (Very poor)
Credibility (CC3)	10 (Very good) – 1 (Very poor)
Convenience (CC4)	10 (Very good) – 1 (Very poor)
Business needs	
Cost (BC1)	10 (Very low) – 1 (Very high)
Coverage (BC2)	10 (Very high) – 1 (Very low)
Communication (BC3)	10 (Very good) – 1 (Very poor)
Convenience (BC4)	10 (Very good) – 1 (Very poor)

Aggregate decision matrices X^k using equation (11) where $\beta_k \to [0,1]$ is the weight of the kth decision-maker and $\sum_{k=1}^{l} \beta_k = 1$

$$\overline{X} = \left[\overline{X}_{ij} \right]_{m \times n} = \sum_{k=1}^{l} \beta_k X^k \qquad (11)$$

Calculate the normalized decision matrix. The normalized value r_{ij} is calculated as follows where i=1, 2, ..., m and j = 1, 2, ..., n.:

$$r_{ij} = \left. x_{ij} \middle/ \sqrt{\sum_{i=1}^{m} x_{ij}^2} \right. \qquad (12)$$

Calculate the weighted normalized decision matrix. The weighted normalized value v_{ij} is calculated as follows:

$$v_{ij} = r_{ij} \times w_j \qquad (13)$$

Where W_j is the weight of the jth criterion or attribute and $\sum_{j=1}^{n} w_j = 1$.

Determine the ideal (A^+) and negative ideal (A^-) solutions.

$$A^+ = \left\{ \left(\max_i v_{ij} \mid j \in C_b \right), \left(\min_i v_{ij} \mid j \in C_c \right) \right\} = \left\{ v_j^+ \mid j = 1, 2, ..., m \right\} \ (14)$$

$$A^- = \left\{ \left(\min_i v_{ij} \mid j \in C_b \right), \left(\max_i v_{ij} \mid j \in C_c \right) \right\} = \left\{ v_j^- \mid j = 1, 2, ..., m \right\} \quad (15)$$

Calculate the separation measures using the m-dimensional Euclidean distance. The separation measures of each alternative from the positive ideal solution and the negative ideal solution, respectively, are as follows:

$$S_i^+ = \sqrt{\sum_{j=1}^m \left(v_{ij} - v_j^+ \right)^2}, \; j = 1, 2, ..., m \quad (16)$$

$$S_i^- = \sqrt{\sum_{j=1}^m \left(v_{ij} - v_j^- \right)^2}, \; j = 1, 2, ..., m \quad (17)$$

Calculate the relative closeness to the ideal solution. The relative closeness of the alternative A_i with respect to A^+ is defined as follows:

$$RC_i^+ = \frac{S_i^-}{S_i^+ + S_i^-}, \; i = 1, 2, ..., m \quad (18)$$

Rank the preference order.

Analytic Hierarchy Process (AHP) method

The AHP method is a multi-criteria method of analysis based on an additive weighting process, in which several relevant attributes are represented through their relative importance. (Saaty, 1980). Through AHP, the importance of several features is obtained from pairwise comparison, in which the relevance of the attributes or categories of drivers of intangible assets are matched two-on-two in a hierarchic structure (Sun 2010). The following describes the processes of AHP:

Construct pairwise comparison matrices among all the elements/criteria in the dimensions of the hierarchy system using a scale given by Saaty (1980). Value 1, from that scale, is used when both criteria have the same priority. Assuming n criteria, the pairwise comparison of criterion i with criterion j gives a square matrix $A_{n \times n}^m$ where a_{ij}^m represents the relative importance of criterion i over the criterion j. In the matrix, $a_{ij}^m = 1$ when $i = j$ and $a_{ij}^m = \frac{1}{a_{ij}^m}$.

Aggregate individual judgements. Let a_{ij}^k be the influence of criterion j to criterion jj perceived by the kth decision-maker. To compute for the aggregated judgement $a_{ij} \in A_{n \times n}$

$$a_{ij} = \prod_{k=1}^{m} \left(a_{ij}^{k} \right)^{\beta_k} \qquad (19)$$

Find out the maximum eigenvalue using equation (20), where ω is the local priority vector and λ_{max} is the maximum eigenvalue

$$A\omega = \lambda_{max}\omega \qquad (20)$$

Compute for the consistency index (C.I.) where n is the number of elements being compared.

$$C.I. = \frac{\left(\lambda_{max} - N \right)}{N-1} \qquad (21)$$

Determine the consistency ratio (C.R.)through actual consistency divided by the random consistency. Normally, a C.R. value is ≤ 0.10 otherwise, decision-makers have to repeat assigning weights of each criterion.

$$C.R. = \frac{C.I.}{R.I.} \qquad (22)$$

4. Method

The proposed MCDM model was applied in a furniture manufacturing industry in the Philippines with a higher concentration in Cebu City. According to the Chamber of Furniture Industries of the Philippines (2012), the Philippines is recognized as the "Milan of Asia" globally due to its world-class craftsmanship of locally made products earning a well-deserved spot in the international market. Hence, the Department of Trade and Industry (2008) recognizes the Philippine furniture industry as one of the highest export sales earners in the country. Based on the latest statistical figures, the industry posted a 5.4% market share in export sales in 2013 and has declined by 0.1% in 2014 from $3.337 billion to $3.334 billion (PSA, 2015). The Gross Value Added (GVA) of the furniture (and fixture) industry based on the Philippine Statistical Authority for 2014 (at current prices) is Php 34,093,000 with a 9.9% growth rate from the previous year. The manufacturing sector remains the main driver of growth in the fourth quarter of 2014 with 7.3% growth; however, it was recorded slower than 12.0 percent growth in the same quarter in 2013. The furniture industry was recorded to have a 1.32% share in the manufacturing industry based on the 2014 GVA (PSA, 2014). However, the Furniture industry is identified as one of the major contributors to the decline of GDP in the manufacturing sector with a -0.4% decline in the furniture industry in the first quarter of 2015

(PSA, 2015). According to the Centre for Industrial Studies (2012), there are about US$536,000,000 furniture produced with US$399,000,000 sales locally.

Nevertheless, the furniture manufacturing sector produced for 2012 is just about 0.15% of the world's production of about US$347 billion. With regards to the contribution in the employment sector, the furniture industry's 98% of the total are considered SMEs, which provides 1.9 million indirect workers nationwide and 5.4 million in the supply chain in 2013, it was said that workers in the said industry have flexible working hours and provide seasonal employment for underemployed. Due to the increasing competition arising from trade liberalization, the furniture industry recognizes the need to boost its marketing efforts to improve its competitiveness locally and internationally (Philippine Star, 2003). Online Marketing promotes online sales and customer support and may also be used for brand-building, generating word-of-mouth communication, buzz marketing, and crowdsourcing, breaking potential reach barriers among businesses and customers, thus increasing competition (Tiago & Verissimo, 2014).

Figure 1 - Theoretical and Conceptual Framework
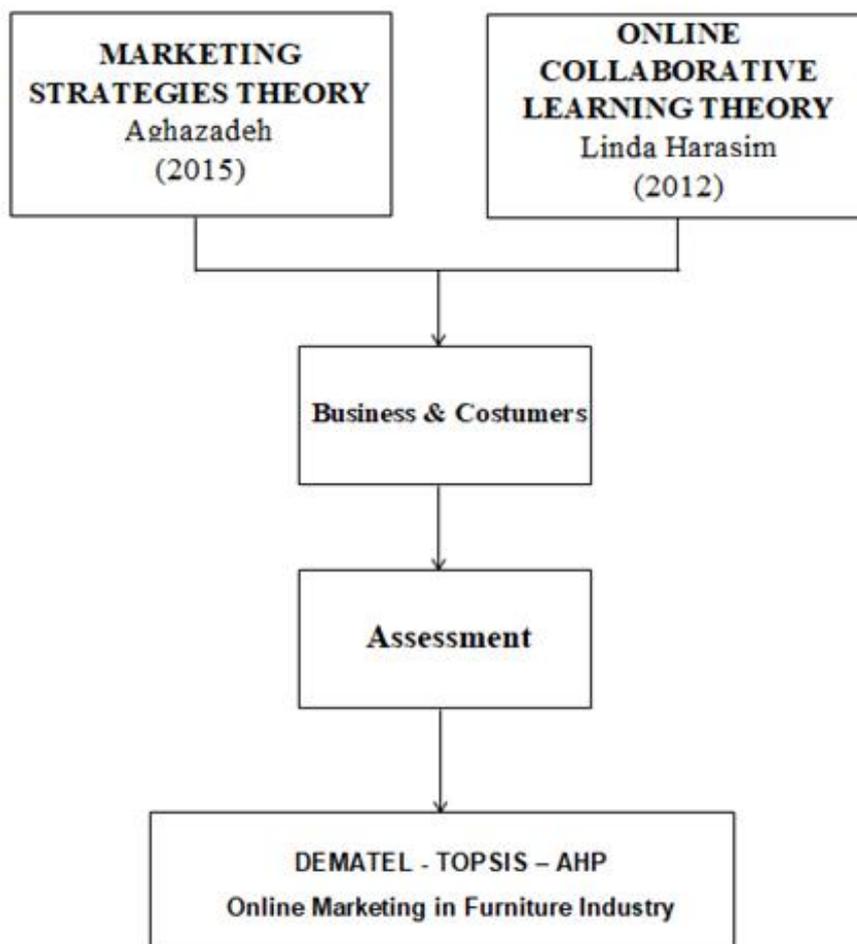
From businesses' perspective, respondents were selected based on experience, position, and educational background. According to the Institution of Psychoanalysis (2003), experience is a gauge of knowledge. Hence Ian H. King (2014) stated that educational background is a set of standards in making moral judgments that have been collected through the theories and knowledge gathered in an institution or university. Ten experts were selected to elicit judgments for the case study. This is consistent with the works of Ocampo and Clark (2014), judges were selected based on their knowledge and practical experience on subject matter. While in customers' perspective, respondents were selected based on the following criteria of experience in e-commerce and the degree of engagement with online marketing, both selling, and buying. As stated in the business perspective aspect, experience is a gauge of knowledge, skills, and techniques that a person has acquired over time; while Sutcliffe (2010) defined degree of engagement in his book "Designing User Engagement" as a reinforcing aspect to experience supplied by interaction and a basis of coping-up through the changes of time. The study used purposive sampling specifically criterion sampling involving individuals who meet certain criteria for a respondent to be capable and qualified to address the needed elements of the study. The structure presented illustrates a hierarchical structure of the proposed model in ranking online marketing strategies for SMEs. The structure consists of four levels respectively; each level represents a certain aspect in obtaining the goal of the study; Level 1 contains the goal of the study, Level 2 consist of the criteria of both business and customer perspective, Level 3 comprises the initial alternatives, Level 4 is composed of the different final alternatives concerning its initial alternatives.

The objective of the study is to guide SMEs in their bid to choose and implement an online marketing strategy that fits in terms of business and customer needs. Level 2 of the hierarchical structure shows the interdependencies among criteria with respect to customer and business perspective; Level 3 and Level 4 of the structure illustrate the final alternatives regarding its dependency on the initial alternatives.
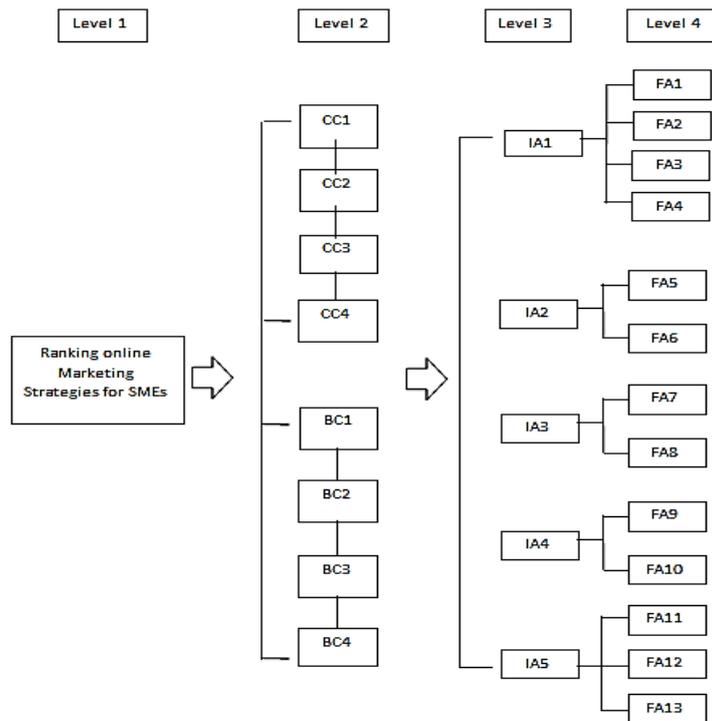
5. Decision Framework

Selecting an online marketing strategy requires a decision-making model. An integrated model, which includes seven phases, is proposed, and its overview is presented on the following page. Moreover, the phases will be discussed in detail below. The first phase of this study defined the main goal. The goal is to map the online marketing strategies for SMEs. Moreover, the analytical structure on the second phase was used to assess the online marketing strategies. The analytical structure is based on literature that includes the four groups: goal, perspectives, criteria, and alternatives. These groups form a decision-making model for online marketing strategies. The framework considered two perspectives, namely business needs and customer needs. Additionally, there is an interrelationship between these two perspectives. From the perspective of customer needs, the criteria emphasized what customer needs on an online marketing strategy, and they are reliability (CC_1), responsiveness (CC_2), credibility (CC_3), and convenience (CC_4). Similarly, from the perspective of business needs, the criteria considered the needs of firms on what online marketing strategy to adopt, and these are cost (BC_5), coverage (BC_6), communication (BC_7), and convenience (BC_8). On the other hand, there are five main alternatives of the study where each has identified sub-alternatives, and these are: Social Media (IA_1) whose sub-alternatives are social networking pages

(FA$_1$), tagged-based marketing (FA$_2$), celebrity referral (FA$_3$), and referral (FA$_4$); search engine marketing (IA$_2$) where search engine optimization (FA$_5$) and pay-per-click advertising (FA$_6$) are listed as sub-alternatives; e-mail marketing (IA$_3$) and under it are viral marketing (FA$_7$) and direct e-mail marketing (FA$_8$); corporate website (IA$_4$) where a concise website (FA$_9$) and a comprehensive website (FA$_{10}$) are considered as sub-alternatives; and content marketing (IA$_5$) whose sub-alternatives include blogs (FA$_{11}$), online news articles (FA$_{12}$) and commerce communities (FA$_{13}$).

The third phase applied the DEMATEL method that will be used to deal with interrelationships among criteria and can quantify complex relationships between criteria (Chou et al., 2011). This method was also used to identify the weight of each criterion. Subsequently, the TOPSIS method, whose main objective is to define an index called similarity to the positive ideal solution and the remoteness from the negative ideal solution (Sun, 2010), was used to identify the weight of each initial alternative. The fifth phase applied the AHP to determine the weight of each final alternative. Next, phase 6 ranked the different online marketing strategies from the outcome of the applied MCDM approaches. Finally, the last phase involved plotting the results of the final alternatives concerning the two perspectives where business needs represent the y-axis and customer needs represent the x-axis. The proposed decision-making model can deal with interrelationships between criteria and allow firms to decide what online marketing strategy to adopt based on the scatter plot graph.

Figure 3 - Decision Framework

1. Defining the decision goal

2. Establishing an analytical structure

3. Applying DEMATEL to determine the weight of each criterion

4. Applying TOPSIS to determine the weight of each initial alternative

5. Applying AHP to determine the weight of each final alternative

6. Ranking final alternatives

7. Plotting the results to give decision-makers the option on what to adopt

Data Gathering and Treatment

Questionnaires were distributed to the selected respondents and were entrusted to fill in the necessary information. Data were then collected, and the interdependencies of criteria were solved through DEMATEL; ranking among initial alternatives concerning the criteria was made through TOPSIS, and ranking and designating global weights among the final alternatives with respect to the criteria initial alternatives were derived through the AHP approach. An Excel-based macro program developed by a De La Salle University professor was utilized for solving AHP, while the proponents programmed an Excel-based template to solve for DEMATEL and TOPSIS. Then the results were congregated and anatomized, leading to the ranking among alternatives for online marketing strategy among SMEs.

Generally, the procedure of processing the data is as follows:

- Develop decision models that reflect the decision process of businesses' and customers' needs. The goal-criteria- alternative structure is widely adopted. Criteria and alternatives are usually determined from literature and practice.

- Construct a direct-relation matrix among interdependencies of criteria using equation (1) for each decision-maker.

- Aggregate the direct-relation matrices using equation (2) with the corresponding weight importance β_k of each decision maker. Normalize the direct-relation matrix through equations (3) to (5), where all principal diagonal elements are equal to zero.

- Obtain the total relation matrix among criteria. After establishing step 4, a total relation matrix is calculated using equation (6) where I signifies as an identity matrix.

- Compute the values of influence and relation among criteria through equations (7) to (9), corresponding to the sum of columns and corresponding to the sum of rows in the total relation matrix T.

- Compute for $D_i + R_i$ and $D_i - R_i$ for each criterion i. If $D_i + R_i \geq 0$, then criterion i is a dispatcher, i.e., net cause, otherwise is a receiver, i.e. net effect. Plot the ordered pair $(D_i + R_i, D_i - R_i)$ on a $D+R$ $D-R$ plane.

- Set the threshold value using equation (10). If $t_{ij} > \alpha$ then there is an arrow that emanates from criterion i to criterion j in the $D+R$ $D-R$ plane.

- Construct a normalized matrix $P = (p_{ij})_{nxn}$ where $p_{ij} = \dfrac{t_{ij}}{d_i}$ Raise p to large powers until row values converge as shown in the equation $W = \lim\limits_{M \to \infty} p^M$. This is analogous to the limiting supermatrix approach of the ANP. Each column of W is the priority vector of the set of criteria.

- Aggregate the decision matrix using equation (11).

- Calculate the normalized decision matrix using equation (12).

- Calculate the weighted normalized decision matrix and determine the ideal and negative ideal solution, where the normalized value is derived using equation (13). After deriving the normalized value, ideal and negative ideal solutions is solve through equation (14) for the ideal solution and equation (15) for the negative ideal solution.

- Calculate the separation measures using the m-dimensional Euclidean distance, equation (16) for the positive ideal solution, and equation (17) for the negative ideal solution.

- Calculate the relative closeness to the ideal solution using equation (18), the relative closeness of the alternative A_i with respect to A^+.

- Rank the preference order among initial alternatives in connection to the criterion. The alternative with the highest closeness coefficient represents the best alternative and is closest to the positive ideal solution and farthest from the negative ideal solution.

- Construct pairwise comparison matrices among all the final alternatives in the dimension of the hierarchical structure using a scale in Table 1.

- Aggregate individual judgement a_{ij}^k using equation (19), where a_{ij}^k be the influence of final alternative i to final alternative j perceived by the kth decision-maker with respect to their parent initial alternative.

- Compute for the principal eigenvector W_f corresponding to the maximum eigenvalue $A\omega = \lambda_{\max}\omega$ using equation (20).

- Compute for the consistency index using equation (21), where n is the number of final alternatives being compared.20.) Determine the consistency ratio using equation (22), a consistency ratio should be ≤ 0.10 otherwise; decision-makers have to repeat in assigning the weights of each final alternatives.

- Compute for the global weights of the final alternatives with relation to

$$W_F = \left(W_f\right)_{13x5}\left(W_i\right)_{5x4}\left(W_c\right)_{4x1}$$ where W_c represents weights for criteria, W_i for initial

alternatives, and W_f for final alternatives.

- Perform steps 1 to 21 for the two hierarchies (i.e. business and customer perspectives)
- Form a map representing customer needs for the horizontal and business needs on vertical and position all final alternatives in this map where their positions are denoted by the ordered pair , which W_F^c signifies customer perspective and W_F^b signifies business perspective. This map guides decision-makers in positioning their suitable online marketing strategy.

6. Result and Discussion

Each decision- maker's response generated a direct- relation matrix Z^k using equation (1), wherein these direct-relation matrices were aggregated using equation (2) with the corresponding weight importance β_k of each decision-maker. The weights of each decision-maker in the furniture industry, as presented in Table 2, were determined by ranking their years of experience, educational background, and current position, with ten as the highest rate and one as the lowest rate. The summed-up rankings of all criteria per expert were then divided with the total rankings to obtain the weights of each expert, whereas the e-commerce experts were given equal value of weights.

Table 2 - Weight Importance β_k of Decision- Makers in the Furniture Industry

Respondents	Years of experience	Educational background	Position	Total	Weights
1	9	1	8	18	0.118
2	3	1	8	12	0.079
3	1	8	1	10	0.066
4	10	8	8	26	0.171
5	7	7	6	20	0.132
6	6	1	5	12	0.079
7	3	1	4	8	0.053
8	3	6	3	12	0.079
9	8	10	6	24	0.158
10	2	5	3	10	0.066
				152	1.000

Tables 3 and 4, which presents the total relation matrices of the decision-makers in the furniture industry and experts in e-commerce, respectively, were computed using equation (6). These tables show values of influence and relation generated through equations (7) to (9) where D corresponds to the sum of columns and R corresponds to the sum of rows in the total relation matrix T.

As evident from the results, the highest row sum indicates the order of criteria that strongly influence other criteria. For instance, by seeing Table 3, it is realized that communication is the criterion that has the maximum effect on other business criteria identified in this research. Also, the highest column sum indicates the order of criteria which receive the highest impact among other criteria. For example, communication is also the criterion that gets the highest effect from other business criteria identified in this research.

Table 3 - Total Relation Matrix, T (Business' Perspective)

T	BC1	BC2	BC3	BC4	D
Cost (BC1)	1.799	2.193	2.272	2.153	8.417
Coverage (BC2)	2.393	2.379	*2.738	*2.513	10.023
Communication (BC3)	*2.430	*2.756	*2.571	*2.666	10.422
Convenience (BC4)	2.216	*2.473	*2.597	2.182	9.467
R	8.838	9.800	10.177	9.513	

Similarly, by seeing Table 4, it is realized that responsiveness is the criterion that has the maximum effect on other customer criteria identified in this research, and reliability is the criterion that receives the highest impact from other customer criteria.

Moreover, the emphasized values are above the threshold value, 2.396 and 1.430 for business' and customers' perspectives, respectively, computed through equation (10). This implies that there exists an interdependence from criterion i to the criterion j of these elements.

Table 4 - Total Relation Matrix, T (Customers' Perspective)

T	CC1	CC2	CC3	CC4	D
Reliability (CC1)	1.260	1.420	1.413	1.338	5.431
Responsiveness (CC2)	*1.767	*1.438	*1.632	*1.640	6.477
Credibility (CC3)	*1.448	1.394	1.158	1.313	5.313
Convenience (CC4)	*1.528	*1.492	*1.431	1.202	5.653
R	6.003	5.744	5.634	5.493	

Tables 5 and 6 determine whether the criterion is a dispatcher (net cause) or a receiver (net effect). Column (D-R) represents the position of an element along the lateral axis, and in instances where an element is positive, it indicates that the criterion is influential, and in cases where it is negative, it shows that other criteria influence those criteria. Hence in Table 5, communication and coverage influence cost and convenience, and similarly, cost and convenience are greatly influenced by communication and coverage. In Table 6, responsiveness and convenience influence credibility and reliability, and similarly, credibility and reliability are greatly influenced by responsiveness and convenience.

Table 5 - Values of Influence and Relation of Business Criteria

	D+R	D-R
Cost (BC1)	17.255	-0.422
Coverage (BC2)	19.823	0.223
Communication (BC3)	20.600	0.245
Convenience (BC4)	18.980	-0.046

Also,, (D+R) column indicates the total sum of the influence of an element on the longitudinal axis with regard to its influence and the influence exerted on it. Therefore from the business' perspective, through the above analysis, we consider communication. This criterion greatly influences other criteria and receives the greatest influence from other criteria, as the most important criterion as also perceived by the experts in the furniture industry.

Table 6 - Values of Influence and Relation of Customer Criteria

	D+R	D-R
Reliability (CC1)	11.434	-0.572
Responsiveness (CC2)	12.220	0.733
Credibility (CC3)	10.947	-0.321
Convenience (CC4)	11.146	0.160

Communication works toward creating a meaningful relationship and interaction with the customer, focusing on what they need. Through interaction with customers, businesses can maintain existing relationships with customers and attract new ones; hence, an online marketing strategy must be a channel where businesses can communicate with customers. This can be done when business entities also invest in an online marketing strategy that can establish good communication and good communication is easier to happen when a wider scope of customers is already reached. This is supported by the testaments of most decision-makers in the selected furniture industries during the interview. Remarkably most decision-makers have considered communication as the most important

criterion for having good communication with the customers ensure repeat visits and purchase decisions.

From the customers' perspective, responsiveness, the criterion that greatly influences other criteria and receives the greatest influence from other criteria, is the most important customer criterion as also perceived by the experts in e-commerce. Responsiveness deals with the provision of information on Frequently Asked Questions (FAQs), wherein customers are given feedback for the transactions and results and are provided with prompt assistance in solving problems. Since responsiveness concerns the willingness and readiness of the business entity to provide service, it also proves the reliability of the provider because the promise to perform the service is honored and is made at the designated time. This also reflects the provider's credibility because providing a responsive online marketing strategy means that the customers' best interest is being considered, and it gives the customers the convenience of accessing the information they want.

This is consistent with Lee & Kozar (2006), asserting that having functions such as complaint management systems provides superior service to customers. Furthermore, the effectiveness evaluation model for the web-based marketing of airline industries by Chou et al. (2011) reveals that responsiveness is a prerequisite for effective web-based marketing. The performance of an online marketing strategy relies on its capability to deliver quality customer service by providing timely service and prompt assistance.


Figure 4 - Influence-relation Map of Business criteria
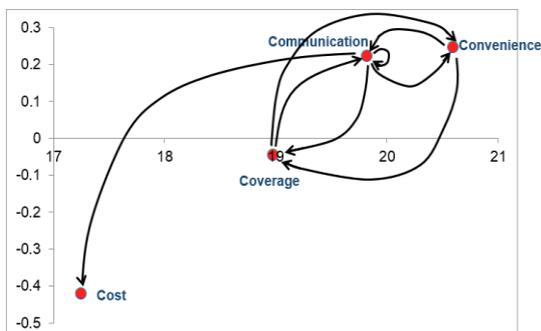
Figure 5 - Influence-relation Map of Customer criteria
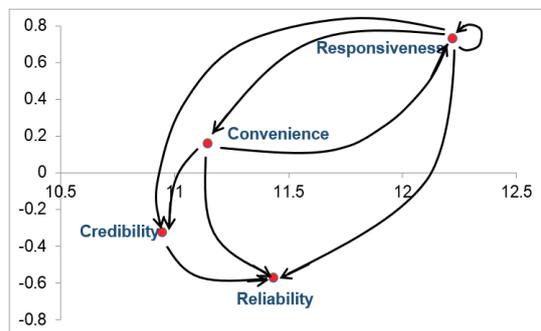
Figures 4 and 5 show the interdependence relationships that emanate from criterion i to criterion j. As illustrated in Figure 4, communication is interdependent with cost, coverage, convenience, and with itself. Moreover, coverage is interdependent with communication and convenience, and convenience is interdependent with coverage and communication. As illustrated in Figure 5, reliability is interdependent with the other three criteria, credibility is interdependent with convenience and responsiveness, and responsiveness is interdependent with convenience and with

itself. After obtaining the weights of each criterion, weights of initial alternatives are calculated using the TOPSIS approach.

Figure 6 - Priority Map of Online Marketing Strategies based on Businesses' and Customers' Perspective
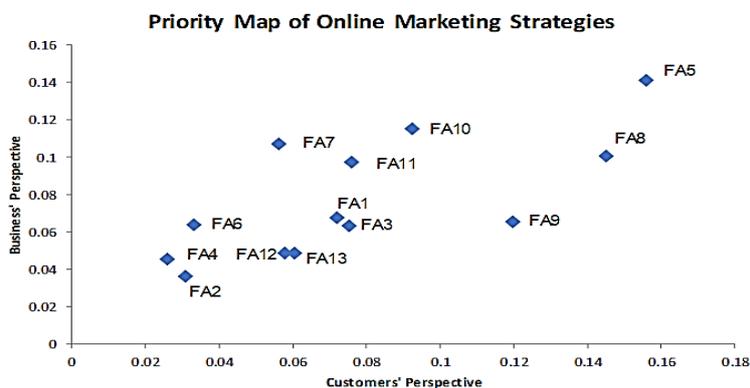
Figure 6 shows the positions of each final alternative based on the businesses' and customers' perspectives. According to assessment of business ' perspective, the abscissa represents the global weight of an alternative according to the assessment of results of the customers' perspective and the ordinate represents the global weight of an alternative. This priority map will be beneficial to any furniture company in selecting an online marketing strategy based on their discretion. For example, if a business desires to practice a strategy that focuses equally on both business' and customers' needs, the best alternative is FA5 or search engine optimization, which is superior on both viewpoints. Search Engine Optimization is a system that enables a website to be on top of the list. Seven out of ten internet users evaluate only the top 5 list of related subjects search while the rest are not examined. Eighty percent of internet users rely on searching engines to find products and services (Yalcin & Kose, 2010). 3.5 internet users rely on SEO in Google every second, which implies that 9.1 million users gather information through SEO wherein most searches in SEO are about companies, services, and tools, and the countries that are most dependent on SEO are India, Pakistan, and Philippines (Egri & Barack, 2014). With this, SEO is a powerful marketing tool in reaching a number of people locally and globally, where gathering new information through search engines leads to a higher chance of visibility of the firm's information and products to those without knowledge and expertise. However, the quality and usability of the firm's designed website must also be taken into consideration, wherein it should represent the firm, structured in a way that it may fully give significant details that will encourage customers to avail.

According to the results using DEMATEL, communication to coverage has the greatest influence among interrelationships between criteria for businesses' perspective. Attracting more customers in a specific online marketing strategy can only be realized when the company creates quality interaction with the customers since communication is one of the important determinants of service quality. Moreover, communication and coverage influence cost and convenience. Hence, communication, which was the most important criterion with the highest calculated weight, should be considered by businesses first before any other criteria. On the other hand, among the four criteria for customers' perspective, responsiveness gives the most influence towards other criteria. Likewise, responsiveness also receives the most influence from other criteria. In addition, reliability is the criterion that was most influenced by responsiveness. An online marketing strategy should allow effective FAQs and customer responses first to have a well-functioned online marketing strategy. Henceforth, a customer considers reliable online marketing when the company is responsive to their needs. The criteria that gained the highest importance for businesses' and customers' perspectives are communication and responsiveness. Communication and responsiveness were similarly defined as the quality interaction between the business and the customers. This showed consistency of results regardless of the viewpoint of a person involved in online marketing. The ranking of alternatives was obtained through the use of TOPSIS. Businesses' preference for an online marketing strategy with respect to all criteria is social media marketing. Experts in the furniture industry favor social media marketing because it is cheaper and interacts with highly dispersed customers. Consequently, e-mail marketing was the second preferred online marketing strategy as it creates direct promotion and interaction to a specific target market. It is an important medium of communication to build and maintain closer relationships with customers. Nonetheless, a corporate website was the least preferred strategy for businesses because designing it as well as keeping it allows furniture industries to incur higher marketing costs.

Meanwhile, customers favor corporate websites as the preferred strategy because it is considered the most credible alternative for most respondents. Although social media marketing is the most convenient strategy to use, customers do not find it as credible as corporate websites. Customers select an online marketing strategy that gives them trustworthy information and transactions. Based on the rankings of initial alternatives for both businesses' and customers' perspectives, decision-makers considered corporate websites as the least online marketing strategy to adopt; dissimilar for the customers, where it is the most preferred strategy for them. These outcomes explain that businesses and customers have different needs in terms of marketing. The aforementioned online strategies rankings were only focused on initial alternatives evaluation which does not permit

decision-makers a more specific option. Thus, a more definite selection must be taken to attain a more direct and definite result. Search engine optimization was chosen as the best alternative for both businesses and customers using the analytic hierarchy process. Although social media marketing was positioned first in the initial alternative evaluation, SEO was still considered the more preferred strategy than any other alternative. This strategy enables internet users to gather new information through search engines leading to a higher chance of visibility of a company or product.

On the contrary, tagged-based marketing and referrals were the least preferred strategies by both businesses and customers since the two do not strongly attract customers due to their poor credibility of information. Ordinary referrals, including tagged posts, do not possess credibility since their sources are possibly untrustworthy. Hence, the number of customer visits for these alternatives is limited. Weights assigned to each of the decision-makers have a slight effect on the final ranking of alternatives. This shows that there was consistency in the answers for the majority of the respondents. Since the furniture industry practices export marketing, their online marketing involvement must be encouraged for them to connect with their customers internationally. Hence, furniture companies can make use of the priority map proposed in this study to select a specific online marketing strategy that suits their business' principles. The placement of the final alternatives in the graph represented its performance for businesses or customers based on the study results. Small and Medium Enterprises can make use of this study by engaging themselves in online marketing. Pragmatically, the developed model may be applied to any industry under SMEs. The multi-criteria decision-making framework was developed to show the relationship between the criteria and alternatives with respect to the goal. Furthermore, the complexity of the decision process can also be addressed.

7. Conclusion

Even though customer and business needs differ, the results show that both perspectives have largely similar rankings. Customers' first choice in selecting an online marketing strategy is, pragmatically, the company's search engine optimization. Customers discovered that SEO was the most accessible channel for finding reliable furniture inquiries. Direct e-mail marketing, on the other hand, came in second because it allows businesses to interact directly with their customers. Similarly, corporate websites have a higher level of credibility and dependability. On the other hand, customers prefer a concise website to a comprehensive one because it is easier to use and takes less time to absorb the information. Finally, blogs were regarded as one of the most preferred online marketing

strategies for their engaging content advertising, similar to the viewpoint of businesses. Participating in online marketing allows a company to increase its market participation and maintain its competitiveness against other businesses. This research gives a broad overview of Cebu's furniture industry. More research in various sectors is needed to help with the decision-making process for online marketing strategy. Although technology is considered dynamic, the benefits of this proposed model are expected to last for a longer time.

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