Journal of Revenue and Pricing Management (2023) 22:85–100
https://doi.org/10.1057/s41272-022-00372-z

PRACTICE ARTICLE

Strategic pricing decision using the analytic hierarchy process

Ram Kumar Dhurkari[1]

Received: 7 May 2021 / Accepted: 8 February 2022 / Published online: 25 February 2022

Abstract
Among all the elements of the marketing mix, price is the only element that brings revenues to a firm. Pricing-related research is broadly carried out in two different disciplines, namely economics and marketing. The research in economics domain is primarily theoretical. The research in marketing is multi-disciplinary and uses principles of game theory, behavioral decision theory, psychology, and social dimensions to address various pricing-related managerial decision problems. Scholars have proposed multiple theories explaining the pricing-related decision-making processes of firms. However, most of the work is descriptive in nature and does not give adequate directions to operationalize the decisions related to pricing strategy. This paper is normative in nature and provides useful insides to practitioners on how pricing strategy decisions can be made. This paper proposes a decision hierarchy that can be used to operationalize decisions related to the pricing strategy of a firm. Since the inherent components of the problem structure closely resemble the axiomatic requirements of the Analytic Hierarchy Process (AHP) which is a popular multi-criteria decision-making method, this paper also demonstrates how the AHP method can be used to solve a strategic pricing decision problem.

Keywords Strategic pricing · Multi-criteria decision · Analytic hierarchy process

Introduction

Price is the only "P" of the marketing mix that generates revenues (Zimmerman and Blythe 2018), and therefore how firms should set and adjust their prices in order to maximize profitability is very important (Moro et al. 2017). A small increase in price can create a considerable impact on profitability (Roll et al. 2012) and performance (Liozu and Hinterhuber 2014). For example, using a sample from the list of Fortune 500 companies, Hinterhuber (2004) reported that a 5% increase in average selling prices increases earnings before interest and taxes (EBIT) by 22% on average. Pricing is a continuous process (Shipley and Jobber 2001) and therefore pricing-related decisions should reflect changes in market-specific conditions, marketing strategy, and customer needs. Indounas (2015) found a positive impact of strategic pricing on company performance in both quantitative (i.e., profitability, total revenue, cost-effectiveness) and qualitative (i.e., brand awareness, corporate reputation, degree of differentiation) terms. Despite this, pricing has not received as much attention as received by other elements of the marketing mix. It is not only the managers but the academicians who also showed little interest in the subject related to pricing decisions (Carricano et al. 2010; Homburg et al. 2012; Liozu and Hinterhuber 2017). As reported in the year 1996 by Malhorta (1996), the subject of pricing is covered by less than 2% of all articles published in major marketing journals. Some possible explanations could be like pricing-related decisions are complex strategic decisions (Akintoye and Skitmore 1992; Schau et al. 2005), which involve all aspects of the marketing mix, leading many managers to feel uncomfortable in taking decisions related to pricing strategies. Further, managers do not perceive pricing from a strategic perspective and are often found to rely on simplified (mainly cost-based) formulas (Indounas 2006). There is also a tendency within the marketing discipline suggesting that non-price elements are critical in achieving competitive advantage. Some of the non-price elements are advertising and communication efforts to differentiate a product or service or to add value to it, offer increased service quality, invest in branding, promote corporate image and fame, etc.

✉ Ram Kumar Dhurkari
ram.dhurkari@iimsirmaur.ac.in

[1] Indian Institute of Management Sirmaur, IIM Sirmaur Campus, Rampur Ghat Road, Paonta Sahib, Himachal Pradesh 173025, India

During the last few decades, scholars proposed different techniques to dynamically adjust prices so that the right prices are set at the right place at the right time, through the right channel, and for the right customer (e.g., Natter et al. 2007). Most of these methods are cost based (especially cost-plus, mark-up, and target profit) regardless of the industrial sector (Avlonitis and Indounas 2005; Carson et al. 1998; Meidan and Chin 1995; Shipley and Jobber 2001). Other than the cost factor, these methods also give some consideration to the market's average competitive price and an informal assessment of customers' reactions (Wang et al. 2018; Chen et al. 2020; Zhao et al. 2019). Even though the cost-based method dominates pricing practices because of its practicality, it is found that managers even find difficulty in comprehending the numerical implications of pricing decisions (Avlonitis and Indounas 2005). In addition, these quantitative techniques use precise historical data with some inherent assumptions (e.g., Smith 1986; Natter et al. 2007) and provide little scope to incorporate the knowledge and expertise of a manager for a particular market condition (e.g., Smith 1986; Lu and Comanor 1998; Janssen and Moraga-González 2004; Ellickson and Misra 2008). These quantitative techniques also lack in capturing the contextual and active realities through the lens of the decision-maker (DM). This is important because, in dynamic situations, the judgments of the DM can give superior results. The pricing-related decisions cannot be purely rational because the role of the DM in the strategic pricing decision is critical. For example, how well managers know consumers' price sensitivity determines the effectiveness of pricing strategies (Maderno and Nicolau 2012), and therefore organizations often rely on the experience of employees and their tacit knowledge to make pricing-related decisions (Hinterhuber 2015). An effective pricing strategy requires an understanding of product value and choosing profit-maximizing prices acceptable to the target segment (Nagle et al. 2014). Further, quantitative models are well suited to estimate an exact price offering, but judgment-based models can provide tremendous insides by identifying or prioritizing price brackets and positioning. This is because setting an exact price offering depends upon the price brackets and positioning, and the ultimate price figure should align with the marketing/pricing strategy of the firm. Deciding on the marketing/pricing strategy of a firm requires analysis of various quantitative and qualitative indicators of a specific market and the firm. This also requires effective cooperation among different departments within a firm. Developing a pricing strategy in line with the firm and market conditions necessitates a close collaboration among people with different managerial experience and backgrounds. This requires an understanding of the market through the expertise, knowledge, and preference of pricing experts and marketing managers.

From time to time, marketing scholars have proposed various theories explaining the pricing-related decision-making processes of firms. However, most of the work is descriptive (e.g., Udell 1972; Abratt and Leyland 1985; Morris and Leyland 1993) in nature and does not give adequate directions to operationalize the decisions related to the pricing strategy of a firm for new or existing products. Some of the studies are prescriptive in nature discussing what pricing strategies managers can follow under various conditions of market and competition (e.g., Guiltinan et al. 1997; Nagle and Holden 2001; Schoell and Guiltinan 1995; Tellis 1986). Indounas (2015) found that the stronger the market orientation of a firm, the weaker the effect of market turbulence on the adoption of strategic pricing. However, there is a scarcity of decision frameworks in the literature that can help a marketing manager to define his/her preferences on decisions related to the pricing strategy of a firm. Despite this, pricing-related decision-making is treated only as a tactical activity (Liozu 2015). There is a need to understand how strategic pricing decisions should be made.

This paper aims to contribute in this direction by providing practical recommendations in improving strategic pricing decisions. This paper is normative in nature and provides useful insides to practitioners on how pricing strategy decisions can be made. With the help of the findings of Rao and Kartono (2009), this paper proposes a decision hierarchy that can be modified and can be used by marketing managers while making decisions related to the pricing strategy of a firm. Since the inherent components of the problem structure closely resemble the axiomatic requirements of the Analytic Hierarchy Process (AHP) which is a popular multi-criteria decision-making (MCDM) method, this paper also demonstrates how the AHP method can be used to solve strategic pricing decision problems.

MCDM methods are well suited for strategic pricing decision problem because this kind of problem requires analysis and trade-off among a large number of quantitative as well as qualitative factors. MCDM methods provide an opportunity to articulate values, objectives, and priorities during a decision-making process and help the DM to understand the nature of the problem. The prescriptions of any MCDM method are mostly based on the DM's intuitive judgments, experience, and behavior. The marketing systems are influenced by many internal and external factors and often have a high level of dynamic complexity. MCDM methods can help in capturing the preference of the DM in successfully performing trade-offs among the influencing factors in strategic level marketing decisions. Researchers have applied a combination of MCDM methods to address various marketing strategy decision problems (Table 1).

Table 1 Marketing strategy decision using MCDM methods

Marketing decision context	MCDM method	References
Marketing support system in E-commerce	Weighted arithmetic mean (WAM)	Denguir-Rekik et al. (2009)
Marketing Strategy Selection in the Hotel industry	Fuzzy ANP (Analytic Network Process)	Lin et al. (2009)
Optimizing marketing strategy	ANP and TOPSIS	Wu et al. (2010)
Web-based marketing	ANP	Tsai et al. (2011)
Organizational strategy development in distribution channel management	Fuzzy AHP and hierarchical fuzzy TOPSIS	Paksoy et al. (2012)
Brand marketing	DEMATEL (Decision-Making Trial and Evaluation Laboratory), ANP and VIKOR	Wang and Tzeng (2012)
Marketing mix planning	fuzzy metric distance and AHP	Gürbüz et al. (2014)
Housing projects	fuzzy Quality Function Deployment (QFD) and AHP	Raut and Mahajan (2015)
Business intelligence systems	QFD, fuzzy DEMATEL, and fuzzy AHP methods	Wang (2015)
Internet marketing channels	Fuzzy DEMATEL, fuzzy AHP, and TOPSIS	Khatwani and Srivastava (2015)
Customer-focused profitability Analysis	Fuzzy AHP and TOPSIS	Lau et al. (2016)
Purchasing factors	AHP and gray relational Analysis	Huang et al. (2016)
New product launch strategy	ANP, TOPSIS, and multi-choice goal programming	Liao et al. (2016)
Effective strategic planning in a cosmetic industry	ANP and SWOT Analysis	Al-Refaie et al. (2016)
Adoption of online marketing	ANP	Ocampo et al. (2016)
Marketing decisions	Fuzzy rough sets and intuitionistic fuzzy rough sets	Das (2016)
Portfolio of new product development projects	fuzzy weighted average	Relich and Pawlewski (2017)
Prioritization strategies of sustainable development of ecotourism	Hybrid SWOT—ANP—Fuzzy ANP	Arsić et al.(2017)
Prioritization of production strategies	integrated intuitionistic fuzzy AHP & TOPSIS	Karasan et al. (2018)
Competitive market strategy selection	Fuzzy DEMATEL and fuzzy ANP	Gholami and Seyyed-Esfahani (2019)
Strategic marketing initiatives for small cooperative enterprises	SWOT–TOWS analysis and PROMETHEE–GAIA (Preference Ranking Organization Method for Enrichment Evaluation–Geometrical Analysis for Interactive)	Yamagishi et al. (2021)

Researchers have also developed various methodologies to hybridize the pricing decision with a variety of MCDM frameworks. For example, Chen et al. (2007) developed an algorithm to choose an appropriate pricing strategy for the online game industry in Taiwan. Kaka et al. (2008) proposed the usage of the AHP method to select appropriate pricing systems for construction projects based on circumstances surrounding the construction project. Wu et al. (2010) provided a five-step decision support framework to make and carefully assess the marketing strategies. The work of Wu and Lee (2010) addressed the condominium multiple attribute pricing problem using data envelopment analysis (DEA). Vadde et al. (2011) presented a multi-criteria decision model to select a pricing policy that can simultaneously address stabilization of inventory fluctuations and boosting of profits. Gallego-Ayala (2012) developed a multi-methodological approach to rank order the pricing policies in irrigation areas using a set of socio-economic and environmental attributes. Agustine and Lucas (2018) implemented a decision support system approach to help marketing managers in determining price discount alternatives using the Elimination et Choix Traduisant la Realite (ELECTRE) which is another MCDM method. Dogu and Albayrak (2018) proposed an intuitionistic cognitive map (ICM), a novel approach that can be used to assess the criteria which influence the pricing strategy of a firm in earlier stages of the product's life cycle in the market. However, there are fewer attempts in collecting preferences from the DM for the rank order of alternative pricing strategies. Few of the research studies attempted to collect preferences from the DM but it was limited to arrive at criteria weight evaluation and not able to provide an end-to-end procedure from the identification of alternative pricing strategies to rank-ordering them on the basis of the preferences defined by the DM using pricing objectives and pricing determinants. Further, most of the research work focused on a specific industry or market

segment, and the relationship between pricing objectives, pricing determinants, and pricing strategies is identified in a very specific context. In this paper, the findings of Rao and Kartono (2009) are used to design a decision hierarchy which is then used to demonstrate solving a hypothetical strategic pricing decision problem. The study of Rao and Kartono (2009) is a unique study in which a cross-country survey (across USA, India, and Singapore) was conducted to identify pricing objectives and strategies across various industries. The survey was conducted among pricing decision-makers. The rest of the paper is organized as follows.

Section 2 covers a literature review on pricing decisions and their significance in shaping a firm's marketing strategy. The section also covers previous works to strengthen the relationship between pricing strategy and the objectives & the determinants (internal and external) of a firm. Section 3 provides a brief summary of the AHP method. Section 4 discusses some of the earlier work on the application of MCDM methods for the selection of appropriate strategies. The section also covers how a strategic pricing decision problem can be formulated as a multi-criteria decision problem. Section 5 provides an application of the AHP method to solve an illustrative strategic pricing decision problem involving a few objectives of the firm and their determinants. Section 6 concludes the paper followed by the limitations of the proposed framework provided in Sect. 7.

Strategic pricing decision

The work of Morgenroth (1964) is one of the earliest works which addressed the pricing-related decision. Morgenroth (1964) simulated a binary flowchart to address decisions related to increasing or decreasing prices. The flowchart included various market and organizational factors. The judgment from the price analyst or district sales officer was simulated using a flowchart. The flowchart had decision points in the form of direct comparison (something like greater than or less than with an associated binary decision of Yes/No type) rather than seeking preference on a continuous scale. The flowchart was simulated and tested by comparing the expected outcome with the actual decisions in specific market conditions. Later, Jain and Laric (1979) provided a framework to arrive at a pricing decision by collecting and sensing inputs from the market. Even though the paper was written from the perspective of a price setter, it offered limited scope to capture the preference of the DM except that a set of criteria were defined to assess the strength of buyers and sellers. Using the comparative strength of buyers and sellers, a conceptual framework was proposed in the form of a pricing strategy quadrangle for choosing one among four pre-defined pricing strategies. Jain and Laric (1979) also illustrated the application of the proposed framework with an example.

However, price determination is a strategic level concept rather than an operational issue (Sainio and Marjakoski 2009), and therefore should be connected to the business strategy of the firm. Nagle and Holden (2001) also suggested the integration of pricing strategy within the overall marketing and corporate strategy of a firm. By doing this, the pricing-related decision reflects the firm's overall objectives. As recommended by Indounas (2015), the pricing-related decision should move away from simplified cost-based pricing formulas and focus on adopting a balanced approach involving a marketing point of view (e.g., customer reactions to different price levels, competitors' prices, and potential actions) as well as financial considerations (e.g., costs, profits, sales). This reconciliation is well proven (Indounas 2009; Morris and Fuller 1989) and requires treating pricing decisions from a long-term strategic perspective rather than a short-term competitive advantage. In this direction, the work of Cannon and Morgan (1990) offered a strategic pricing framework in a decision-ready format. The framework contained an organized set of decision rules suggesting the most appropriate pricing approaches under different environmental conditions in order to achieve a given objective. The pre-defined binary decision rules were developed to choose suitable strategies among 6 pricing strategies. However, the framework does not offer any opportunity to capture the preferences of the DM. Noble and Gruca (1999) conducted a descriptive study to understand factors that determine which pricing strategies are used by managers in industrial markets. Their study analyzed the relationship between the pricing environment and the manager's choice of pricing strategies. The study of Noble and Gruca (1999) was normative in nature which provided a set of market, company, and competitive conditions under which a given strategy should be used. These conditions are referred to as determinants of pricing strategy.

A similar set of determinants was provided by Tellis (1986) which is one of the earliest works to develop a parsimonious and logically derived classification of various pricing strategies. The work presented a number of pricing strategies with their underlying principles in comparable terms. Tellis (1986) classified nine different strategies by considering just two dimensions—firm objectives and consumer characteristics—each with three categories. Firm objectives were categorized into (1) Vary Prices among Consumer Segments, (2) Exploit Competitive Position, and (3) Balance Pricing over Product Line. Similarly, the consumer characteristics were categorized into (1) Having high search costs, (2) Having low reservation prices, and (3) Having special transaction costs. The proposed classification demonstrated the necessary and sufficient conditions for the classification of a combination of nine possible strategies. Tellis (1986)

also provided a comparison of these nine strategies on several other dimensions like product and cost characteristics, competition in the market, relevant legal constraints, etc.

The work of Diamantopoulos (1991) identified the objectives used by managers in pricing decisions. It was found that profit maximization is one of the primary objectives; however, it is not dominant across all firms (Shipley 1981; Jobber and Hooley 1987; Coe 1990; Diamantopoulos and Mathews 1994). While objectives are measurable, they are defined in terms of results a decision-maker seeks to achieve (e.g., profit maximization). A right pricing strategy is a means to achieve the desirable pricing objective. In addition, the determinants of the internal (firm's) and external (market) conditions also determine the choice of pricing strategy. However, most of the studies do not address clearly what pricing strategies will be used to accomplish the goals of a firm.

In another study, Shankar and Boton (2004) examined retailers' strategic pricing decision processes and identified the underlying dimensions of retailers' pricing strategies. Their study investigated how the dimensions are related to multiple factors. They also examined a comprehensive set of factors on multiple pricing strategy dimensions across different product categories and retail chains. However, the study was descriptive in nature without giving any directions on how pricing decisions should be made. Further, the scope was limited to retailers with a focus on the role of competitive factors. Hinterhuber (2004) presented a coherent framework leading to the implementation of a value-based pricing strategy which is useful in guiding product pricing decisions of new as well as existing products. The framework was illustrated with the help of a case study of a major product launch for a global chemical company. Lancioni (2005) provided a step-by-step plan to set up the pricing policy of a firm. The work of Lancioni (2005) is one of the first studies that bring together all three key elements of the pricing decision: the pricing objectives, the pricing strategy determinants, and the pricing strategies adopted. According to Lancioni (2005), *pricing strategies are the means by which the firm's pricing objectives are to be achieved, while the determinants are the internal and external conditions faced by the firm that influence managers' choice of pricing strategies*. The work of Avlonitis and Indounas (2005) was another maiden attempt to study the potential association between firms' pricing objectives and pricing methods in the context of the service industry.

However, in this paper, the proposed framework can be adjusted to fit any kind of product or service, or industry after making necessary adjustments in the decision hierarchy. This is important because the pricing objectives and determinants may change depending on the financial position of the firm as a whole, the success of its products, or the segment in which it is doing business (Kerin and Hartley 2017). The proposed framework uses the pricing objectives and pricing determinants as major criteria to assess and rank order alternative pricing strategies for a firm. The next section covers a brief about the AHP method which is one of the popular MCDM method and which is used to operationalize the strategic pricing decision with the help of an illustrative application in the subsequent section of this paper.

The analytic hierarchy process

The Analytic Hierarchy Process (AHP) helps a DM by modeling a complex problem in the form of a hierarchical structure. The hierarchical structure consists of a goal at the top followed by criteria (and associated sub-criteria)

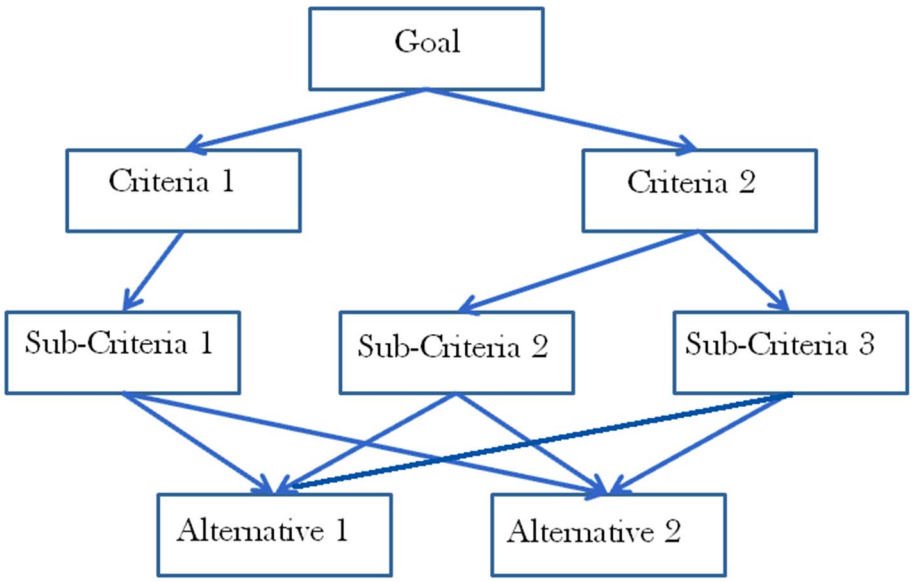

Fig. 1 A simple hierarchical model

and alternatives. A simple hierarchical structure with two criteria, three sub-criteria, and two alternatives is provided in Fig. 1. According to Saaty (1990), AHP has three phases (1) decomposition, (2) Comparative Judgment, and (3) Synthesizing.

In the decomposition phase, elements of the decision problem are arranged in the form of a hierarchy. There can be multiple levels (criteria and sub-criteria) until a level of operational sub-criteria is reached against which the alternatives can be assessed. The alternatives are placed at the bottom of the hierarchy. This hierarchical structure allows dependence of various elements placed at one level only with the elements present at an immediate level and the flow of influence is only assumed from top to bottom. In addition, the elements at a given level are considered to be mutually independent (Hamalainen and Seppalainen 1986).

In the next phase of comparative judgment, elements at one level are compared pairwise to calculate the strength of their influence on the elements present at the next level. The pairwise comparisons can either be computed using actual measurements (absolute measurements) or with the help of a fundamental scale to elicit relative preferences and feelings from the DM (Saaty 1986). The fundamental scale is a scale of absolute numbers used to assign numerical values to judgments made by comparing two elements in which the smaller element is used as a unit of measurement and the larger one assigned a value from this scale as a multiple of that unit (Saaty 1994). For comparing two elements, Saaty (1990) has suggested a scale of 1 to 9. A comparison score of 1 represents indifference between the two elements while a comparison score of 9 represents overwhelming dominance of one element over the other. Table 2 gives a brief description of various comparison scores and their description. According to Forman (2001), the human brain is limited to both its short-term memory capacity and its discrimination ability (channel capacity) to about only 7 to 9 things hence a scale of 1 to 9 is logical.

A pairwise comparison square matrix of size equal to the number of elements under comparison is prepared to compile the score of dominance of elements over each other. The score of dominance and its reciprocal is represented in the pairwise comparison square matrix on either side of the diagonal of the matrix. An illustrative pairwise comparison matrix is shown in Fig. 2 in which three alternative job offers are compared with each other using a criterion "location." Then, the largest Eigenvalue and the corresponding Eigenvector are computed for the pairwise comparison matrix. The normalized principal eigenvector gives local priorities in the form of ratio scales, representing the relative importance of elements present at a level in the decision hierarchy with respect to an element present at a level above.

Table 2 Score values from 1 to 9 and their significance

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Demonstrated importance	Activity is strongly favored and its dominance is demonstrated in practice
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between the two adjacent judgments	When compromise is needed
Reciprocals	If activity i has one of the above non-zero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i	

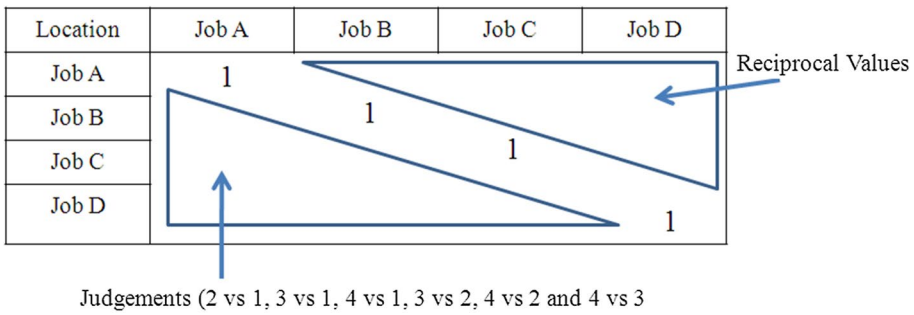

Fig. 2 An illustrative data collection matrix

In the last phase of synthesizing, the local priorities of elements at one level of the decision hierarchy are multiplied with the priorities of their parent elements. This multiplication produces global priorities throughout the hierarchy. The addition of these global priorities for the lowest level of elements (i.e., alternatives) gives final and overall scores of various alternatives. In between, it is also advised to test the pairwise comparison matrices for any inconsistency in preferences defined by the DM. A comparison matrix A is said to be consistent if $a_{ij} * a_{jk} = a_{ik}$ for all *i, j*, and *k*. Saaty (1990) proved that for a consistent pairwise comparison matrix, the largest Eigenvalue is equal to the size of the comparison matrix, or $\lambda_{max} = n$. A measure of consistency as defined in Saaty(1990) can be computed using the formula $CI = (\lambda_{max} - n)/(n - 1)$. This consistency measure is benchmarked with Random Consistency Index (RI). Saaty and Mauano (1979) randomly generated 500 reciprocal pairwise comparison matrices of various dimensions and estimated an average random consistency index as shown in Table 3.

The ratio of Consistency Index and Random Consistency Index gives a consistency ratio (Saaty 1990). This consistency ratio is used to measure the inconsistency of the DM in defining his/her preferences. It is recommended to maintain a 10% threshold consistency ratio. If the inconsistency exceeds this threshold level, the DM should ideally revise his/her preferences in order to adhere to the principles of the ratio scale. The next section covers how the strategic pricing decision problem can be formulated as an MCDM problem and how the AHP method can then be used to operationalize the strategic pricing decision.

Strategic pricing decision using AHP

With the advent of computational power and the internet, the environment in which pricing-related decisions are made has changed dramatically. In addition, scholars have also widened their horizons by incorporating developments in game theory, behavioral decision theory, psychology, and social dimensions. For example, Hinterhuber (2004) proposed a three-stage framework for effective pricing decisions. In the first stage, a clear definition of the objectives of the pricing process is developed. Other critical elements of a strategic level decision can also be considered like the company perspective, the customer perspective, and the competitive perspective. In the second stage, each of these perspectives is related to one specific tool to capture the implications for pricing purposes. In the third stage, profitable prices and a range of prices are selected which can be examined for implementation. The integrative framework of Hinterhuber (2004) is based on economic value analysis, cost volume profit (CVP) analysis, and competitive analysis, showing how to determine and implement profitable pricing decisions.

Since the marketing strategists generally analyze a large number of quantitative as well as qualitative factors while evaluating and selecting marketing strategies, MCDM methods are recommended to perform complex trade-offs among the criteria while evaluating marketing strategies. Along similar lines, strategic pricing decision problems are modeled as MCDM problems. For example, Chen et al. (2007) developed an algorithm to choose an appropriate pricing strategy for the online game industry in Taiwan. They used the eigenvector method, fuzzy Delphi method, fuzzy set theory, and multi-criteria decision-making method. Using literature and administering interviews with executives of the online game industry in Taiwan, they compiled seven criteria and nineteen sub-criteria to construct a decision hierarchy. Kaka et al. (2008) proposed the usage of the AHP method to select appropriate pricing systems for construction projects based on circumstances surrounding the construction project. Seven pricing objectives were identified for the evaluation of the alternative pricing system through a series of interviews followed by postal questionnaires. They prescribed a decision aid tool for use by the industry to select appropriate pricing systems.

Later, Wu et al. (2010) provided a five-step decision support framework to carefully assess the marketing strategies. Their work provided a practical implementation of the integration of the Analytic Network Process (ANP) and Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS) for determining an appropriate marketing strategy. While the ANP method was used to offer to the DM a set of guidelines for designing and implementing competitive marketing strategies through the efficient allocation of resources, the TOPSIS method was employed to rank order each of the marketing strategies with respect to marketing resources. The work of Wu and Lee (2010) addressed the condominium multiple attribute pricing problem using data envelopment analysis (DEA). They presented a new type of DEA model by simultaneously considering stochastic variables, non-discretionary variables, and ordinal data. Vadde et al. (2011) presented a multi-criteria decision model to select a pricing policy that can simultaneously address stabilization of inventory fluctuations and boosting of profits. Their work is useful in determining the prices of reusable and

Table 3 Random consistency index (RI)

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

recyclable components by maximizing revenue and minimizing product recovery costs. Gallego-Ayala (2012) developed a multi-methodological approach to rank order the pricing policies in irrigation areas using a set of socio-economic and environmental attributes. The study integrated the AHP and modified TOPSIS methods. The effectiveness and potential utility of the proposed methodological framework for irrigation water pricing instruments' selection is also shown in the study. Agustine and Lucas (2018) implemented a decision support system approach to help marketing managers in determining price discount alternatives using the Elimination et Choix Traduisant la Realite (ELECTRE) which is another MCDM method. Using a simulated e-commerce website, they implemented a method for consumer behavior simulation which can get affected by various criteria. They devised three different alternative price discounts viz. price discounts, brand discounts, and purchase discounts. The objective of their study was to simplify the complexity in finding a pricing strategy through discount evaluation. They used a dataset of e-commerce websites that gives discounts. Using simulation, they simulated pricing discount estimation to measure its effect in influencing consumer purchase behavior through various discount strategies. They found that the brand discount is the dominant alternative in the given context. They also recommended that the DM should focus discounts on certain brands more precisely as a marketing strategy than price discounts or purchase discounts. Dogu and Albayrak (2018) proposed an intuitionistic cognitive map (ICM), a novel approach that can be used to assess the criteria which influence the pricing strategy of a firm in earlier stages of the product's life cycle in the market. Using literature review and expert's opinion, they developed a framework showing causal relationships between pricing strategies and criteria affecting it. They studied a technological device manufacturing company and found seventeen factors that influence the pricing decision of the company. They found that the brand image, market share, consumer fidelity, market/segment size, and new product capability were the criteria that had the maximum positive influence on pricing decisions. The advantage of their method is that it can deal with the lack of information and hesitancy of the DM, compared to conventional methods that require complete data and information. A summary of applications of the MCDM methods in pricing decision-making is provided in Table 4.

However, there are fewer attempts in collecting preferences from the DM for the rank order of alternative pricing strategies. Few of the research studies attempted to collect preferences from the DM but it was limited to arriving at criteria weight evaluation and not providing an end-to-end procedure from identification of alternative pricing strategies to rank-ordering them using the preferences defined by the DM using pricing objectives and pricing determinants. Further, most of the research work focused on a specific industry or market segment, and the relationship between pricing objectives, pricing determinants, and pricing strategies is identified in a specific context.

This paper basically uses the findings of Rao and Kartono (2009) to design a decision hierarchy which further is used to demonstrate operationalization of strategic pricing decisions. Rao and Kartono (2009) have conducted a cross-country survey (across USA, India, and Singapore) to identify pricing objectives and strategies across various industries. Rao and Kartono (2009) reported 19 possible pricing strategies that are generally used across industries. They also reported relevant company/product conditions, market conditions, competitive conditions, and demographic conditions of firms. The survey was conducted among pricing decision-makers. Rao and Kartono (2009) first summarized various descriptive research

Table 4 Strategic pricing decision using MCDM methods

Pricing Decision Context	MCDM Method	References
Pricing strategy for the online game industry	Eigenvector method, fuzzy Delphi method, fuzzy set theory, and multi-criteria decision-making method	Chen et al. (2007)
Pricing systems for construction projects	AHP method	Kaka et al (2008)
To determine an appropriate marketing strategy	ANP and TOPSIS	Wu et al. (2010)
Condominium Pricing decision	DEA	Wu and Lee (2010)
Selecting pricing policy to address stabilization of inventory fluctuations and boosting of profits	Genetic algorithm based multi-criteria decision model	Vadde et al (2011)
Selection of pricing policies in irrigation areas using a set of socio-economic and environmental attributes	AHP and TOPSIS	Gallego-Ayala (2012)
Importance given to pricing attributes by customers	Conjoint Analysis	Dominique-Ferreira et al. (2016)
Choice of Price Discount Alternatives	ELECTRE	Augustine and Lucas (2018)
Identifying criteria that affect pricing strategy of a firm in earlier stages of the product's life cycle in the market	ICM	Dogu and Albayrak (2018)

(starting with Hall and Hitch (1939) and ending with Avlonitis and Indounas (2005)) on how firms decide on specific pricing strategies. Their literature review concluded that the firm's choice of pricing strategy can be determined by pricing objectives of the firm and the pricing strategy determinants viz. company/product conditions, market and customer (consumer) conditions, and competitive conditions that may influence the choice of pricing strategies.

Rao and Kartono (2009) concluded with a comprehensive list of 19 pricing strategies (Table 5) that firms generally may adopt and a list of twenty-four factors that may influence the selection of specific pricing strategies. These factors are classified into pricing objectives and pricing strategy determinants (Table 6). Indounas (2018) also argued that the market structure impacts pricing objectives. According to Indounas (2018), if the price does not reflect the value proposition from the customer's point of view, it may lead to under or overpricing in comparison to competitors. On the other side, ignoring the broader political or economic environment may affect the long-term position and survival of the firm. Pohland and Kesgin (2018) examined the pricing objectives, strategy determinants, and strategies employed by hotel managers. Using structured questionnaires and semistructured interviews of hotel managers, Pohland and Kesgin (2018) found that hotels generally employ different pricing strategies depending upon the pricing objectives and pricing determinants. Other studies also found that a thorough examination and understanding of the unique characteristics of the firm's environment is necessary for price setting (Burkert et al. 2017; Hutt and Speh 2013; Monroe 2011; Schau et al. 2005; Shipley and Jobber 2001). It is consistent across studies that a firm's choice of pricing strategy or strategies is influenced by the pricing objectives and pricing determinants (internal as well as external). Therefore, using a small and hypothetical example, the next section covers how these factors and the strategies can be arranged in the form of a decision hierarchy and thereafter how the AHP method can be used to collect the preference of the decision-maker on the selected factors and strategies in order to rank order the pricing strategies.

Table 6 Factors affective choice of pricing strategy

Pricing objectives	Pricing strategy determinants
Increase or Maintain Market Share	Capacity utilization
Increase or Maintain Profit	Intermediaries in the supply chain
Rational pricing	Other sources of profit
Competitor-based pricing	Cost disadvantages
Project desired product image	Company and product factors
Avoid government attention	Market and customer factors
Erect or maintain barriers to entry	Market share
Maintain competitive level	Product differentiation
Maintain distributor support	Market development costs
	Customer price sensitivity
	Competitive factors
	Market growth
	Market demand determination
	Impact of the Internet
	Customer costs

A business case of strategic pricing decision

The pricing strategy is one of the important priorities in retail management (Bell and Lattin 1998). The price war among retailers, especially grocery retailers, is one of their primary agendas (Diller 2008). This is because the margins in grocery retail are very low. In such an intensive competition, it is important for retailers to focus on profitable and successful pricing strategies (Bolton et al. 2010). According to Ahlert and Kenning (2007), price is one of the most important marketing instruments in retailing. With the right pricing strategy, the price–performance level of a retail store can significantly improve (Barth et al. 2007) and can help in long-term profitability (Ellickson and Misra 2008; Gauri et al. 2010). The target market should be analyzed carefully while setting an appropriate price (Indounas 2018). Therefore, a hypothetical example of strategic pricing decision using the AHP method for a retail fast-moving consumer good (FMCG) firm is demonstrated here.

Suppose an FMCG firm ABC Inc. is about to launch a new detergent in a particular market. An FMCG firm can

Table 5 Alternative pricing strategies

1	Price Skimming	7	Price Bundling	13	Second Market Discounting
2	Internet Pricing	8	Cost-plus Pricing	14	Perceived Value Pricing
3	Price Signaling	9	Break-Even Pricing	15	Penetration Pricing
4	Leader Pricing	10	Low Price Supplier	16	Experience Curve Pricing
5	Parity Pricing	11	Premium Pricing	17	Complementary Product Pricing
6	Image Pricing	12	Geographic Pricing	18	Periodic or Random Discounts
				19	Customer Value Pricing

take benefits from the right pricing strategy more than a firm belonging to any other industry and it is a challenging task. The right pricing strategy is required to ensure the long-term profitability of the business. Generally, not more than 12% of consumer brands have a winning pricing strategy. Therefore, setting the right pricing strategy to achieve the required objectives considering the market condition from the DM's point of view is extremely important. Setting the right pricing strategy that unifies all internal objectives is a vexing challenge and is faced by many FMCG firms. The internal objectives may be a combination of simultaneously boosting top-line growth, positioning the brand, increasing penetration and growth, etc., but having different priorities. And it is likely that the market conditions may not allow achieving some or all of these objectives. Experimenting with trade-offs among various objectives and market determinants is a tedious task if not done systematically.

After an initial assessment, suppose the marketing manager of ABC Inc. considers three main objectives that could be achieved with the launch of the new detergent. The objectives are 1. Project Desired Product Image, 2. Increase Profit, and 3. Maintain Distributor Support. It is assumed that the firm also has other FMCG products in its portfolio and would like to continue with the existing distributors for the distribution of the new detergent. Most of these distributors also channelize FMCG products of rival firms. The marketing manager has identified three important market determinants that can be considered in determining the right pricing strategy for the new detergent. The market determinants are 1. Sensitivity of customers to the price difference between brands, 2. Market Share, and 3. Market Growth Rate. The manager notices that the customers are very sensitive to price differences between brands because of low switching costs and the market growth rate of detergents is above average (average of FMCG products). The market share of ABC Inc. in the detergent segment is below average. The manager has identified three possible strategies that can be considered given the firm, product, and market conditions 1. Leader Pricing, 2. Parity Pricing, and 3. Low Price Supplier.

The hypothetical decision situation described above is structured using the axiomatic foundations of the AHP method. A hierarchy is prepared consisting of all the decision criteria and alternatives identified as above (Fig. 3). The overall objective of this decision problem is to select the best pricing strategy in the given situation. The two broad criteria considered here are the objectives of the firm and the market determinants. According to Shipley and Jobber (2001), the determination of the objectives of the pricing process is the starting point for taking strategic pricing decisions. It is expected that the DM (the marketing manager who is handling this decision situation) is fully aware of the product, firm, and market conditions. The decision hierarchy consists of two criteria, six sub-criteria, and three possible pricing strategies as alternatives. To select the best pricing strategy for the firm, the DM shall systematically define his/her preferences for various elements with respect to a connected element present at a level above in the decision hierarchy.

In the first step, the DM has realized that the right pricing strategy should help in achieving the objectives more than responding to the market conditions. Therefore, the

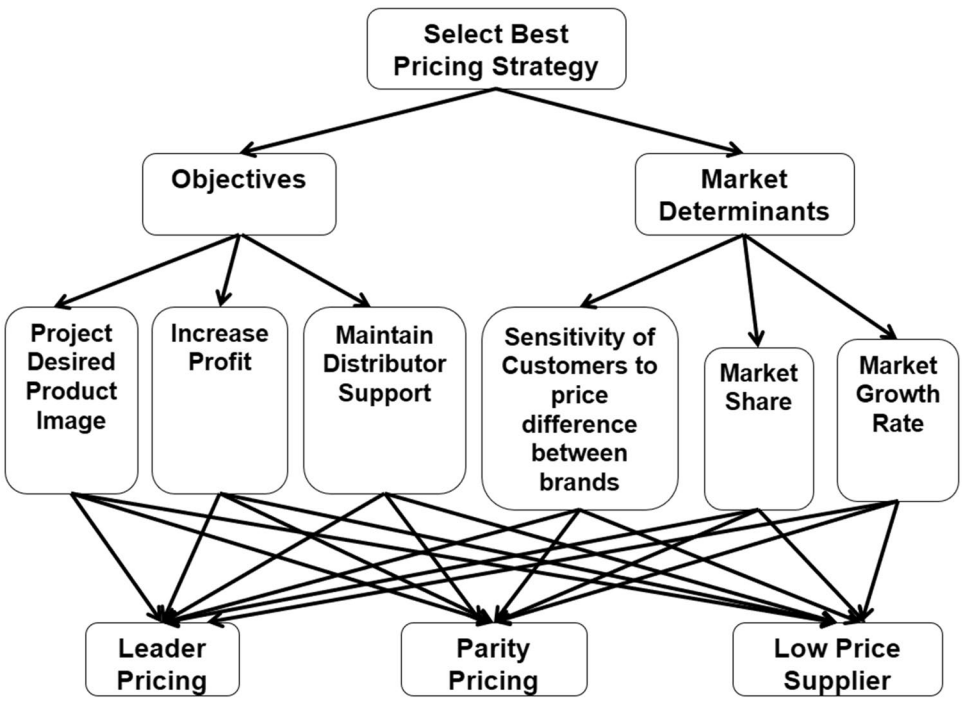

Fig. 3 A decision hierarchy to select the best pricing strategy

Table 7 Comparing two broad criteria with respect to the overall objective

	Objectives	Market determinants	Normalized principal eigen vector
Objectives	1	2	0.66
Market Determinants	1/2	1	0.33

Similarly, three market determinants are assessed in terms of their importance in shaping the pricing strategy of the firm. Since the market share of ABC Inc. is below average, the DM prefers market share as twice more important than the sensitivity of customers towards price difference. The DM also prefers market share as slightly more important than the market growth rate. However, the DM prefers the sensitivity of customers towards price difference as slightly more important than the market growth rate (Table 9).

Table 8 Comparing three objectives (inconsistency 5%)

	Project desired product image	Increase profit	Maintain distributor support	Normalized principal eigen vector
Project desired product image	1	2	2	0.49
Increase profit	1/2	1	1/2	0.20
Maintain distributor support	1/2	2	1	0.31

Table 9 Comparing three market determinants (inconsistency 5%)

	Sensitivity of customers towards price difference between brands	Market share	Market growth rate	Normalized principal eigen vector
Sensitivity of customers towards price difference between brands	1	1/2	3	0.33
Market share	2	1	3	0.53
Market growth rate	1/3	1/3	1	0.14

Table 10 Comparing three alternatives w.r.t. project desired product image (inconsistency 1%)

	Leader pricing	Parity pricing	Low price supplier	Normalized principal Eigen vector
Leader pricing	1	2	3	0.54
Parity pricing	1/2	1	2	0.30
Low price supplier	1/3	1/2	1	0.16

DM prefers that the objectives are twice as more important than the market determinants in selecting the best pricing strategy for the firm (Table 7). Further, out of the three objectives to be achieved, the DM feels that projecting the product's desired image is twice more important than increasing profit or maintaining distributor support. This is because the new detergent is of very high quality and the message should go to the market through the right pricing strategy. At the same time, the DM prefers that maintaining distributor support is twice more important than increasing profit because the firm shall be utilizing existing distribution channels which are also shared by rival firms. The right pricing strategy should receive appropriate support from the distributors in comparison to competitive products and this is possible by keeping appropriate margins for the distributors (Table 8).

Next, the three pricing strategies are compared with each other with respect to the three objectives and three market determinants separately. As the new product (detergent) is of high quality, the pricing strategy should signal it. Therefore, for the DM, in this case, the leader pricing strategy is twice as more important as the parity pricing strategy. Similarly, the leader pricing strategy is slightly more important than the low-price supplier strategy. Further, the DM prefers that the parity pricing strategy is twice more important as the low-price supplier strategy (Table 10).

If the objective is to increase profit, the right pricing strategy should be the leader pricing. Therefore, in this case, the DM prefers the leader pricing strategy as slightly more important than the parity pricing strategy. Similarly, the

Table 11 Comparing three alternatives w.r.t increase profit (inconsistency 3%)

	Leader pricing	Parity pricing	Low price supplier	Normalized principal Eigen vector
Leader pricing	1	3	5	0.64
Parity pricing	1/3	1	3	0.26
Low price supplier	1/5	1/3	1	0.10

Table 12 Comparing three alternatives w.r.t. maintain distributor support (inconsistency 2%)

	Leader pricing	Parity pricing	Low price supplier	Normalized principal Eigen vector
Leader pricing	1	2	4	0.56
Parity pricing	1/2	1	3	0.32
Low price supplier	1/4	1/3	1	0.12

Table 13 Comparing three alternatives w.r.t sensitivity of customers towards price difference between brands (inconsistency 0%)

	Leader pricing	Parity pricing	Low price supplier	Normalized principal Eigen vector
Leader pricing	1	1/3	1/5	0.11
Parity pricing	3	1	1/2	0.31
Low price supplier	5	2	1	0.58

Table 14 Comparing three alternatives w.r.t market share (inconsistency 0%)

	Leader pricing	Parity pricing	Low price supplier	Normalized principal Eigen vector
Leader pricing	1	1/2	1/4	0.14
Parity pricing	2	1	1/2	0.29
Low price supplier	4	2	1	0.57

DM gives strong importance to the leader pricing strategy in comparison to the low-price supplier strategy. Further, the DM prefers the parity pricing strategy slightly more important than the low-price supplier strategy (Table 11).

As ABC Inc. is going to use the same distribution channel for the detergent as being used for its other FMCG products, it is important to keep the margin of distributors high. This is also important because the same distributors may also be used by rival firms. Keeping the margins of the distributor high is possible only through a leader pricing strategy or parity pricing strategy. Therefore, the DM prefers the leader pricing strategy as twice more important than the parity pricing strategy. Similarly, the DM gives considerably more importance to the leader pricing strategy in comparison to the low-price supplier strategy. Further, the DM prefers the parity pricing strategy slightly more important than the low-price supplier strategy (Table 12).

As indicated in the case details mentioned above, the customers of the detergent market are highly price-sensitive because of the low switching cost. Therefore, in this case, the DM prefers to give strong importance to the low-price supplier strategy in comparison to the leader pricing strategy. The DM also prefers to give twice as much importance to the low-price supplier strategy than to the parity supplier strategy. However, the DM prefers to give slightly more importance to the parity pricing strategy than to the leader pricing strategy (Table 13).

The market share of ABC Inc. is below average. Therefore, to increase the sales and the market share of the new detergent product, the DM prefers to give considerable importance to the low-price supplier strategy in comparison to the leader pricing strategy. The DM also prefers to give twice as much importance to the low-price supplier strategy than to the parity supplier strategy and to the parity pricing strategy than to the leader pricing strategy (Table 14).

The market growth rate of detergent products in the market which is referred to in this case is above average (average of all FMCG products). It indicates that there is sufficient market opportunity for the new product. Since the new detergent product of ABC Inc. is of high quality, the firm can plan to charge either at par or more than the competitor's prices. Therefore, the DM prefers the leader pricing strategy as twice more important than the parity pricing strategy. Similarly, the DM gives slightly more importance to the leader pricing strategy in comparison to the low-price supplier strategy. Further, the DM prefers the parity pricing strategy twice as more important as the low-price supplier strategy (Table 15).

Table 15 Comparing three alternatives w.r.t market growth rate (inconsistency 1%)

	Leader pricing	Parity pricing	Low price supplier	Normalized principal eigen vector
Leader pricing	1	2	3	0.54
Parity pricing	1/2	1	2	0.30
Low price supplier	1/3	1/2	1	0.16

Table 16 Aggregation of local priorities

	Objectives			Market determinants			
	0.67			0.33			
	Project desired product image	Increase profit	Maintain distributor support	Sensitivity of customers towards price difference between brands	Market share	Market growth rate	
	0.49	0.20	0.31	0.33	0.53	0.14	
Leader pricing	0.54	0.64	0.56	0.11	0.14	0.54	0.44
Parity pricing	0.30	0.26	0.32	0.31	0.29	0.30	0.30
Low price supplier	0.16	0.10	0.12	0.58	0.57	0.16	0.27

The final priorities of the alternative pricing strategies can be computed by multiplying the local priorities of each of the alternatives (Tables 10, 11, 12, 13, 14, 15) with respective criteria weights (Tables 7, 8, 9) up in the hierarchy. This is shown in Table 16. These final priorities can be used to rank order the alternative pricing strategies. Clearly, the DM's preferences indicate a choice of strong priority for leader pricing strategy followed by parity pricing strategy and low-price supplier strategy, respectively.

Conclusion

Pricing is an important element of the marketing mix and how firms should decide pricing strategies is equally important. The comprehensive list prepared by Rao and Kartono (2009) contains 19 pricing strategies that firms generally may adopt and a list of twenty-four factors that may influence the selection of a specific pricing strategy. These factors are classified as pricing objectives and pricing strategy determinants. This paper is a first-of-its-kind attempt to put these elements in the form of a decision hierarchy. Since the strategic pricing decision is found to have a positive impact on firm performance, this paper prescribed a systematic method to make strategic pricing decisions. The methodology presented in this paper also provides an opportunity for pricing experts to define their preferences on decisions related to the pricing strategy of a firm. This paper contributed to this direction by providing practical recommendations in improving strategic pricing decisions. The proposed methodology may help overcome the pricing manager's problem of solely relying on rational processing. In an uncertain environment, the rational procedures may incur larger errors due to its inability to correct for noise in the data while a methodology that relies on the intuition, judgment, knowledge, and experience of pricing experts can make the strategic pricing decision more robust and high-performing. Since the pricing process is highly dynamic in nature and cannot be dealt with using repetitive procedures, pricing practitioners needed to adapt to newer situations. Improved pricing processes as proposed in this paper will enable firms to act smarter in competition and achieve higher profits with appropriate pricing propositions because pricing is the most accessible lever to manage profitability and can easily be adjusted with the changes in the market.

Limitations

One of the primary limitations in using AHP for strategic pricing decisions is that the DM must have complete information on the objectives and market determinants. This is because the trade-off between various objectives, market determinants, and strategies highly depends on the preferences defined by the DM on the basis of knowledge, experience, and expertise of the DM. Wrong inputs can ruin the entire exercise. Further, the outcome of the AHP method is biased by the preferences of a particular DM. To overcome this, AHP can also be employed in group decision settings, and strategic pricing decisions can be arrived at by collecting preferences from a group of individuals. For example, while the managers possess superior internal information

(information on cost, capacity, and strategy), salespeople possess important insides about customers and competition. Balancing and combining these two sources of knowledge has the power to increase the effectiveness of strategic pricing decisions using the AHP method. It is also assumed in the AHP method that the elements at any level in the decision hierarchy are independent of each other. The DM is advised to be careful in selecting the objectives or market determinants that are independent of each other. Further, the inconsistency in preferences needed to be controlled by the DM while defining preferences. Intransitivity in preferences or higher inconsistencies has the power in invalidating the outcome of the entire decision-making process.

References

Abratt, R., and F.P. Leyland. 1985. Pricing practices in two industries. *Industrial Marketing Management* 14: 301–306.

Ahlert, D., and P. Kenning. 2007. *Handelsmarketing*. Heidelberg: Springer.

Akintoye, A., and R. Skitmore. 1992. Pricing approaches in the construction industry. *Industrial Marketing Management* 21 (4): 311–318.

Al-Refaie, A., E. Sy, I. Rawabdeh, and W. Alaween. 2016. Integration of SWOT and ANP for effective strategic planning in the cosmetic industry. *Advances in Production Engineering & Management* 11 (1): 49–58.

Arsic, S., D. Nikolic, and Ž Živan. 2017. Hybrid SWOT-ANP-FANP model for prioritization strategies of sustainable development of ecotourism in national park Djerdap, Serbia. *Forest Policy and Economics* 80: 11–26.

Augustine, V.W., and T. Lucas. 2018. Decision support system of discount pricing analysis using method of elimination et choix traduisant la realite (ELECTRE). *Computer Science* 19 (1): 65–80.

Avlonitis, G., and K. Indounas. 2005. Pricing objectives and pricing methods in the services sector. *Journal of Services Marketing* 19 (1): 47–57.

Barth, K., M. Hartmann, and Schro¨der, H. 2007. *Betriebswirtschaftslehre des Handels*, 6th ed. Wiesbaden: Gabler.

Bell, D.R., and J.M. Lattin. 1998. Shopping behavior and consumer preference for store price format: Why '"large basket"' shoppers prefer EDLP. *Marketing Science* 17 (1): 66–88.

Bolton, R.N., V. Shankar, and D.Y. Montoya. 2010. Recent trends and emerging practices in retailer pricing. In *Retailing in the 21st century: Current and future trends*, 2nd ed., ed. M. Krafft and M.K. Mantrala, 301–318. Berlin: Springer.

Burkert, M., B.S. Ivens, S. Henneberg, and P. Schradi. 2017. Organizing for value appropriation: Configuration and performance outcomes of price management. *Industrial Marketing Management* 61 (2): 194–209.

Cannon, H., and F. Morgan. 1990. A strategic pricing framework. *Journal of Service Marketing* 4: 19–30.

Carricano, M., J.-F. Trinqueste, and J.A. Mondejar. 2010. The rise of the pricing function: Origins and perspectives. *Journal of Product & Brand Management* 19: 468–476.

Carson, D., A. Gilmore, D. Cummins, A. O'Donnell, and K. Grant. 1998. Price setting in SMEs: Some empirical findings. *Journal of Product and Brand Management* 7 (1): 74–86.

Chen, Yaw-Chu, Yang Chih-Hung and Chang Kuei-Lun. 2007. Applying fuzzy multi-criteria decision method to select pricing strategy of taiwan online game industry, information sciences, (pp. 369–375).

Chen, K., Y. Zha, L.C. Alwan, and L. Zhang. 2020. Dynamic pricing in the presence of reference price effect and consumer strategic behaviour. *International Journal of Production Research* 58: 546–561.

Coe, B.J. 1990. Strategy in retreat: pricing drops out. *Journal of Business and Industrial Marketing* 5 (1): 5–25.

Das, T.K. 2016. Multi-criteria decision making in marketing by using fuzzy rough set. In *Handbook of research on intelligent techniques and modeling applications in marketing analytics*, 101–118. Hershey: IGI Global.

Denguir-Rekik, A., J. Montmain, and G. Mauris. 2009. A possibilistic-valued multi-criteria decision-making support for marketing activities in e-commerce: Feedback based diagnosis system. *European Journal of Operational Research* 195: 876–888.

Diamantopoulos, A. 1991. Pricing: Theory and evidence literature review. In *Perspectives on marketing management*, ed. M.J. Baker. Chichester: Wiley.

Diamantopoulos, A., and B.P. Mathews. 1994. The specification of pricing objectives: Empirical evidence from an oligopoly firm. *Managerial and Decision Economics* 15: 73–85.

Diller, H. 2008. *Preispolitik*, 4th ed. Stuttgart: Kohlhammer.

Dogu, E., and Y.E. Albayrak. 2018. Criteria evaluation for pricing decisions in strategic marketing management using an intuitionistic cognitive map approach. *Soft Computing* 22: 4989–5005.

Dominique-Ferreira, S., H. Vasconcelos, and J.F. Proença. 2016. Determinants of customer price sensitivity: An empirical analysis. *Journal of Services Marketing* 30 (3): 327–340.

Ellickson, P.B., and S. Misra. 2008ba. Supermarket pricing strategies. *Marketing Science* 27 (5): 811–828.

Forman, E.H. 2001. *Decision by objectives*. Washington: George Washington University Text Books.

Gallego-Ayala, J. 2012. Selecting irrigation water pricing alternatives using a multi-methodological approach. *Mathematical and Computer Modelling* 55 (3–4): 861–883.

Gauri, D., R. Janakiraman, K. Kalayanam, P.K. Kannan, B. Ratchford, R. Song, and S. Tolerico. 2010. Strategic online and offline retail pricing: A review and research agenda. *Journal of Interactive Marketing* 24 (2): 138–154.

Gholami, M.H., and M. Seyyed-Esfahani. 2019. An integrated analytical framework based on fuzzy DEMATEL and fuzzy ANP for competitive market strategy selection. *International Journal of Industrial and Systems Engineering* 31 (2): 137–167.

Guiltinan, J.P., G.W. Paul, and T.J. Madden. 1997. *Marketing management: Strategies and programs*, 6th ed. New York: McGraw-Hill.

Gürbüz, T., Y.E. Albayrak, and E. Alaybeyoglu. 2014. Criteria weighting and 4P's planning in marketing using a fuzzy metric distance and AHP hybrid method. *International Journal of Computational Intelligence Systems* 7: 94–104.

Hall, R., and C. Hitch. 1939. Price theory and business behavior. *Oxford Economic Papers* 2 (1): 12–45.

Hamalainen, R.P., and O.T. Seppalainen. 1986. The analytic network process in energy policy planning. *Socio-Economic Planning Science* 20: 399–405.

Hinterhuber, A. 2004. Towards value-based pricing – an integrative framework for decision making. *Industrial Marketing Management* 33: 765–778.

Hinterhuber, A. 2015. Violations of rational choice principles in pricing decisions. *Industrial Marketing Management* 47: 65–74.

Homburg, C., O. Jensen, and A. Hahn. 2012. How to organize pricing? Vertical delegation and horizontal dispersion of pricing authority. *Journal of Marketing* 76 (5): 49–69.

Huang, S.W., Y.C. Lin, and C.H. Liao. 2016. Applying analytic hierarchy process (AHP) and grey relational analysis (GRA) to purchase

factors of university students for smart phones. *Journal of Technology* 31: 193–208.
Hutt, M.D., and D.W. Speh. 2013. *Business marketing management: B2B*, 11th ed. Mason: South-Western Cengage Learning.
Indounas, K. 2006. Making effective pricing decisions. *Business Horizons* 49 (5): 415–424.
Indounas, K. 2009. Successful industrial service pricing. *Journal of Business and Industrial Marketing* 24 (2): 86–97.
Indounas, K. 2015. The adoption of strategic pricing by industrial service firms. *Journal of Business & Industrial Marketing* 30 (5): 521–535.
Indounas, K. 2018. Market structure and pricing objectives in the services sector. *Journal of Services Marketing* 32 (7): 792–804.
Jain, S.C., and M.V. Laric. 1979. A framework for strategic industrial pricing. *Industrial Marketing Management* 8 (1): 75–80.
Janssen, M., and J.L. Moraga-González. 2004. Strategic pricing, consumer search and the number of firms. *Review of Economic Studies* 71 (4): 1089–1118.
Jobber, D., and G. Hooley. 1987. Pricing behaviour in UK manufacturing and service industries. *Managerial and Decision Economics* 8: 167–171.
Kaka, A., C. Wong, and C. Fortune. 2008. Culture change through the use of appropriate pricing systems. *Engineering Construction and Architectural Management* 15 (1): 66–77.
Karasan, A., M. Erdogan, and E. Ilbahar. 2018. Prioritization of production strategies of a manufacturing plant by using an integrated intuitionistic fuzzy AHP & TOPSIS approach. *Journal of Enterprise Information Management* 31 (4): 510–528.
Kerin, R.A., and S.W. Hartley. 2017. *Marketing*. Thirteenth. Boston: McGraw Hill/Irwin.
Khatwani, G., and P.R. Srivastava. 2015. Identifying organization preferences of internet marketing channels using hybrid fuzzy MCDM theories. *Journal of Electronic Commerce in Organizations* 13: 26–54.
Lancioni, R. 2005. A strategic approach to industrial product pricing: The pricing plan. *Industrial Marketing Management* 34: 177–183.
Lau, H., D. Nakandala, P. Samaranayake, and P. Shum. 2016. A hybrid multi-criteria decision model for supporting customer-focused profitability analysis. *Industrial Management & Data Systems* 116 (6): 1105–1130.
Liao, C.N., C.H. Lin, and Y.K. Fu. 2016. Integrative model for the selection of a new product launch strategy, based on ANP, TOPSIS and MCGP: A case study. *Technological and Economic Development of Economy* 22: 715–737.
Lin, C.T., C. Lee, and C.S. Wu. 2009. Optimizing a marketing expert decision process for the private hotel. *Expert Systems with Applications* 36: 5613–5619.
Liozu, S.M. 2015. *The pricing journey: The organizational transformation toward pricing excellence*. Stanford, CA: Stanford University Press.
Liozu, S.M., and A. Hinterhuber. 2014. Pricing capabilities: The design, development, and validation of a scale. *Management Decision* 52: 144–158.
Liozu, S. M., and A. Hinterhuber. 2017. Organizing for pricing excellence [Call for papers]. https://www.journals.elsevier.com/industrial-marketing-management/calls-forpapers/organizing-for-pricing excellence
Lu, Z., and W. Comanor. 1998. Strategic pricing and new pharmaceuticals. *Review of Economics and Statistics* 80: 108–118.
Maderno, L., and J. Nicolau. 2012. Price sensitivity to tourism activities: Looking for determinant factors. *Tourism Economics* 18 (4): 675–689.
Malhorta, N. 1996. The impact of the academy of marketing science on marketing scholarship—An analysis of the research published in JAMS. *Journal of the Academy of Marketing Science* 24 (4): 291–298.
Meidan, A., and A. Chin. 1995. Mortgage-pricing determinants: A comparative investigation of national, regional and local building societies. *International Journal of Bank Marketing* 13 (3): 3–11.
Monroe, K.B. 2011. Some personal reflections on pricing research. In *Review of marketing research: Special issue: Marketing legends*, ed. N.K. Malhotra, 209–241. Bingley: Emerald Group Publishing.
Morgenroth, W.M. 1964. A method for understanding price determinants. *Journal of Marketing Research* 1 (3): 17–26.
Moro, S., P. Rita, and C. Oliveira. 2017. Factors influencing hotels' online prices. *Journal of Hospitality Marketing and Management* 27 (4): 443–464.
Morris, M.H., and F.P. Leyland. 1993. Do strategy frameworks apply in the United States and abroad? *Industrial Marketing Management* 22: 215–221.
Morris, M.H., and D.A. Fuller. 1989. Pricing an industrial service. *Industrial Marketing Management* 18 (2): 139–146.
Nagle, T., J. Hogan, and J. Zale. 2014. Strategic pricing: Coordinating the drivers of profitability. In *The strategy and tactics of pricing: A guide to growing more profitably*, 5th ed., ed. T. Nagle, J. Hogan, and J. Zale, 1–16. Essex: Pearson Education Limited.
Nagle, T.T., and R.K. Holden. 2001. *The strategy and tactics of pricing: A guide to profitable decision-making*, 3rd ed. Englewood Cliffs, NJ: Prentice-Hall.
Natter, M., T. Reutterer, A. Mild, and A. Taudes. 2007. Practice prize report—An assortment wide decision support system for dynamic pricing and promotion planning in DIY retailing. *Marketing Science* 26 (4): 576–583.
Noble, P.M., and T.S. Gruca. 1999. Industrial pricing: Theory and managerial practice. *Marketing Science* 18 (3): 435–454.
Ocampo, L., R.M. Berdin Alarde, D.A. Kilongkilong, and A. Esmero. 2016. Adoption of onlinemarketing for service SMEs with multicriteria decision-making approach. In *Handbook of research on intelligent techniques and modeling applications in marketing analytics*, 226–243. Hershey: IGI Global.
Paksoy, T., N.Y. Pehlivan, and C. Kahraman. 2012. Organizational strategy development in distribution channel management using fuzzy AHP and hierarchical fuzzy TOPSIS. *Expert Systems with Application* 39 (12): 2822–2841.
Pohland, L., and M. Kesgin. 2018. Pricing determinants in hotels: The case of luxury, upscale, and mid-scale price segments‖. *Journal of Revenue & Pricing Management* 17 (4): 218–230.
Rao, V.R., and B. Kartono. 2009. *Pricing objectives and strategies: A cross-country survey*. Cheltenham: Edward Elgar Publishing Inc.
Raut, R.D., and V.C. Mahajan. 2015. A new strategic approach of fuzzy-quality function deployment and analytical hierarchy process in construction industry. *International Journal of Logistics Systems and Management* 20 (2): 260–290.
Relich, M., and P. Pawlewski. 2017. A fuzzy weighted average approach for selecting portfolio of new product development projects. *Neurocomputing* 231: 19–27.
Roll, O., P. Kai, and B. Gregor. 2012. *Praxishandbuch Preismanagement. Strategien - Management - Lösungen*. Weinheim: WILEY-VCH.
Saaty, T.L. 1986. Axiomatic foundations of analytic hierarchy process. *Management Science* 32 (7): 841–855.
Saaty, T.L. 1990. *The analytic hierarchy process*. Pittsburgh, PA: RWS Publications.
Saaty, T.L. 1994. How to make a decision: The analytic hierarchy process. *Interfaces* 24 (6): 19–43.
Saaty, T.L., and Reynaux S. Mauano. 1979. Rationing energy to industries: Priorities and input–output dependence. *Energy Systems and Policy* 3: 85–111.
Sainio, L.M., and E. Marjakoski. 2009. The logic of revenue logic? Strategic and operational levels of pricing in the context of software business. *Technovation* 9 (5): 368–378.

Schau, H.J., F.M. Smith, and P.I. Schau. 2005a. The healthcare network economy: The role of internet information transfer and implications for pricing. *Industrial Marketing Management* 34 (2): 147–156.

Schoell, W.F., and J.P. Guiltinan. 1995. *Marketing: Contemporary concepts and practices*. Boston, MA: Allyn and Bacon.

Shankar, V., and R. Bolton. 2004. An empirical analysis of determinants of retailer pricing strategy. *Marketing Science* 23 (1): 28–49.

Shipley, D. 1981. Pricing objectives in British manufacturing industry. *The Journal of Industrial Economics* 29 (4): 429–443.

Shipley, D., and D. Jobber. 2001. Integrative pricing via the pricing wheel. *Industrial Marketing Management* 30: 301–314.

Smith, S. A. 1986. New product pricing in quality sensitive markets. *Marketing Science* 5 (l), 70–87

Tellis, G. 1986. Beyond the many faces of price: An integration of pricing strategies. *Journal of Marketing* 50: 146–150.

Tsai, W.H., W.C. Chou, and J.D. Leu. 2011. An effectiveness evaluation model for the web-based marketing of the airline industry. *Expert Systems with Applications* 38: 15499–15516.

Udell, J.G. 1972. *Successful marketing strategies*. Madison, WI: Mimir Publishers.

Vadde, S., A. Zeid, and S.V. Kamarthi. 2011. Pricing decisions in a multi-criteria setting for product recovery facilities. *Omega* 39 (2): 186–193.

Wang, C.H. 2015. Using quality function deployment to conduct vendor assessment and supplier recommendation for business-intelligence systems. *Computers & Industrial Engineering* 84: 24–31.

Wang, H., S. Li, and J. Luo. 2018. Optimal markdown pricing for holiday basket with customer valuation. *International Journal of Production Research* 56 (18): 5982–5996.

Wang, Y.L., and G.H. Tzeng. 2012. Brand marketing for creating brand value based on a MCDM model combining DEMATEL with ANP and VIKOR methods. *Expert Systems with Applications* 39: 5600–5615.

Wu, C.S., C.T. Lin, and C. Lee. 2010. Optimal marketing strategy: A decision making with ANP and TOPSIS. *International Journal of Production Economics* 127: 190–196.

Wu, D., and C.G. Lee. 2010. Stochastic DEA with ordinal data applied to a multi-attribute pricing problem. *European Journal of Operational Research* 207 (3): 1679–1688.

Yamagishi, K., A.R. Sañosa, and Melanie Ocampo. 2021. Strategic marketing initiatives for small co-operative enterprises generated from SWOT-TOWS analysis and evaluated with PROMETHEE-GAIA. *Journal of Co-Operative Organization and Management* 9 (2): 100–149.

Zhao, N., Q. Wang, P. Cao, and J. Wu. 2019. Dynamic pricing with reference price effect and price-matching policy in the presence of strategic consumers. *Journal of the Operational Research Society* 70 (12): 2069–2083.

Zimmerman, A., and J. Blythe. 2018. *Business to business marketing management: A global perspective*, 3rd ed. New York, NY: Routledge.

Ram Kumar Dhurkari is an Assistant Professor Information Technology and Systems Management area at the Indian Institute of Management Sirmaur, Himachal Pradesh, India. Prior to this, he was associated with IFMR Graduate School of Business Krea University, SDMIMD Mysore (ACBSP and EFMD EPAS accredited) and TAPMI Manipal (AACSB accredited). He is a Fellow of Indian Institute of Management Kozhikode. In addition, he holds a Master's degree in Computer Application from Rajiv Gandhi Technological University Bhopal and Bachelor of Science in Mathematics from Devi-Ahilya University Indore. Before joining Doctoral program, he worked as an Academic Associate at Indian Institute of Management Ahmedabad, and as a Lecturer at SGSITS Indore.