Research Article

Critical Success Factors for Competitive Advantage in Iranian Pharmaceutical Companies: A Comprehensive MCDM Approach

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The unprecedented COVID-19 outbreak strengthened the critical manifestation of the rapid development vs. survival for pharmaceutical companies, deploying strategic conduct worldwide. This study therefore explores the endogenous relationship among pharmaceutical companies' manufacturing strategy and their performance indicators within the ambit of creating a long-lasting competitive advantage in turbulent times. Very often, it is not possible to launch a cause-effect relationship between performance and their drivers. To achieve this end, multiple-criteria decision-making (MCDM) techniques are employed in a hybrid fashion in this study. The notion has simultaneously ranked critical success factors (CSFs) in the manufacturing strategy and performance indicators in the limelight of managerial perceptions, while controlling the inherent bias concerning the causality direction in the ambit of these two entrenched concepts. A case study on the Iranian pharmaceutical companies is piloted to demonstrate this hybrid-fashion multifarious approach. Overall, the results revealed the most pertinent CSFs that reached superior-performance echelons in the Islamic Republic of Iran.

1. Introduction

Worldwide companies are strategically involved in reaching distinctive echelons of quality, cost, time, and operational flexibility simultaneously [1–5], ensuring restored performance intensities in such a competitive arena [6–8]. More than ever this is quite essential to sustaining a competitive advantage in this ongoing digital age of innovation, translating strategic modernism into epidemiological pressures [9–11]. As stated by numerous authors from diverse research streams over the past decades [12–16], a competitive advantage is interconnected to how manufacturing physical and human resources are deployed, exploited, and jointly managed to construct

distinctive competencies and superior performance over time in some feedback loop [6, 8]. This feedback loop encompasses creating distinct competencies where the reinforcement and formalization of the company's manufacturing strategy plays an ultimate role [17–20]. Besides the apprehension of a continuous improvement vs. development spirit, performance metrics also lean toward substantial light on manufacturing trade-offs and the possible venues for creating innovative, distinctive competencies and strategic refinement [19, 21, 22]. Thus, the competitive advantage would be sustained by cornerstone methods, procedures, and metrics that could provide robust, firm performance and indicate strategic paths during such turbulent times [23–28].

As a matter of fact, on the one hand, business executives pursue competitive advantages and new strategic venues through cautious speculations in developing and/or acquiring novel methods and procedures, capital assets, and strategic HR programs in order to achieve threshold performance [5, 19–21, 29–33]. The development of new strategic manufacturing venues pushes emerging firms towards groundbreaking strategic exploration-exploitation of knowledge and information [34, 35], the bonding of manufacturing and overall corporate strategy, and the dissemination and deployment of these innovations throughout the various levels of the company [21, 27, 31, 36–38]. Prior studies focused on the positive feedback loops between creating distinctive competencies and measuring performance after reaching and sustaining competitive advantages in manufacturing [22, 26, 27, 39–43]. One inclusive framework of manufacturing and corporate strategy proposed by Platts refers to “a configuration of conclusions, linking organizational and operational tasks—to govern the competency and skills to the developed system—to stipulate exactly in what way it will function, to encounter a complete system of these important intentions which are dependable with the whole corporate purposes.” [44].

Despite the prominent role that can be enjoyed by manufacturing within the ambit of corporate strategy, manufacturing strategies are frequently conceptualized as a business unit that enhances operational strengths [36, 40, 45–52] and consumes physical, financial, and human resources expressed in terms of performance metrics that characteristically comprise cost, quality, and lead time. These endogenous relationships between manufacturing strategy and performance indicators can be symbolized as the critical success factors—CSFs [52–56].

In accordance with the theory and literature, this study concentrated on ancient pharmacy firms working in the Islamic Republic of Iran, namely, Production Pharmacies in Iran dating back to Avicenna [57]. In the deep-rooted, ancient cultural heritage, Iranian physicians made pharmacy by practicing botanical medicine and delivered a remedy to their societies in multifarious ways [58]. With the development of advanced technologies, pharmacy fundamentals were transferred from botanical medicine to chemical medicine, and as a consequence, large corporations attempted to restructure the Iranian artisan technology of producing medicines into modern assembly lines, promoting medicines by themselves [58]. Besides, these corporations created R&D sectors to enhance their chemical production and exploit valuable synergies amid new pharmacy and botanical medicine as a strategic approach to gain esteem from society. In this paper, a strategic attempt is made to confine the most noteworthy CSFs that should be taken into legitimate reasoning by pharmaceutical companies. This is deemed necessary as no company possesses unlimited resources to split among different performance drivers. Therefore, these CSFs must be ranked systematically in such turbulent times as the COVID-19 pandemic. However, distinct methods could be pragmatic with filtering and ranking CSFs with a novel research stream of MCDMs based on a ranked relative importance from the most critical factor to the least. The advantages of such

approaches are correlated to a shorter computational time and ranking stability to variations in managerial preferences.

Beyond the above considerations, this study makes substantial contributions as it aims to identify and rank the CSFs for competitive advantage in Iranian pharmaceutical companies utilizing a hybrid multiple-criteria decision-making (MCDM) method that can disentangle the endogenous relationships between manufacturing strategy and performance indicators while allowing appropriate ranking of time needed for CSFs in this industry. Second, this study contributes to the extensive literature based on the MCDM method and techniques by focusing on endogenous relationships between manufacturing competence and performance indicators [59]. Hence, from the above reasoning, the research questions of this study can be formalized as follows:

RQ1: what CSFs are determinants to competitive advantages for Iranian pharmaceutical companies?

RQ2: what lessons can be derived from the companies in Iran that have implemented pharmaceutical best practices?

This paper is structured as follows. Section 2 is a literature review of the different aspects of competitive advantages in manufacturing offered with a contextual setting in the Iranian pharmaceutical industry. Subsequently, the methods are presented in Section 3 with the results being analyzed in Section 4. Finally, the conclusions and managerial implications are given in Section 5.

2. Literature Review

2.1. Building a Competitive Advantage from Manufacturing Strategy and Performance Indicators. Competitive advantage positions are often built based on the three pillars of operational superiority, consumer sensitivity, and product control [47], which are frequently apprehended as best practices or a scheme to harvest a manufacturing policy by classifying and employing existing best manufacturing beliefs, procedures, and the corporate representations for advancing the entire business [60–63]. Originally, the manufacturing strategy was self-evident [64, 65]. Skinner argued that the manufacturing strategy could play a significant role in the performance of organizations [13]. Numerous studies further developed and tested the propositions [66–69]. In fact, the endogenous relationship between manufacturing strategy and performance indicators is a frequent research object. For instance, Swamidass and Newell indicated that manufacturing superiority is accompanied by a virtuous cycle of performance indicators [66]. Further works have corroborated this endogenous relationship [17, 19, 22, 24, 26–28, 39–42, 61, 66, 67, 70–74].

The knowledge-based economy opened a new paradox for building a competitive advantage based on high-tech development and strategic human capabilities, scheming new productive chains grounded on data analytics and online information [75–81]. However, the manufacturing strategy and performance indicators that have a link and a role in building up a competitive advantage have been scarcely revisited in the digital era [82–89]. As argued by [27, 90], the

links between manufacturing strategy and performance indicators have been scarcely analyzed vis-à-vis how each CSF parallels each other [91]. Thus, this research gap is addressed by a hybrid MCDM approach that can disentangle the feedback relationship between manufacturing strategy and performance indicators (CSFs) while establishing an unbiased ranking.

Despite all the above reasoning, several companies pursue to increase their performance to earn more profit and loyalty from customers. For achieving these objectives, companies spend many scarce resources such as time, budget, strategic HR practices, etc., but many fail to reach such crucial targets because they do not distinguish how and when they can systematically accomplish them and only spend rare resources. For this reason, widespread knowledge about the returns of CSFs for getting the best competitive advantage from firms is crucial [81, 92]. Hence, a focus on these CSFs leads to the success of companies, but in the first step, all CSFs must be considered. This research attempts to collect all CSFs of competitive advantages and then to customize them for pharmacy companies in Iran. All these CSFs have a cause-and-effect relationship and must be considered in evaluating firms, as presented in Table 1.

2.2. Application of MCDM Models. As regards the MCDM models, two different approaches merit attention [38, 93]. In the first approach, the weights of alternatives are explicitly calculated, and then alternatives will be ranked based on these weights. For instance, the Analytical Hierarchy Process (AHP), Analytical Network Process (ANP), and Measuring Attractiveness through a Categorical-Based Evaluation Technique (MACBETH) are examples of this approach. In the second approach, alternative ranking is based on a decision matrix where weights may not be implicit such as Complex Proportional Assessment (COPRAS), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Vlse Kriterijuska Optimizacija I Komoromisno Resenje (VIKOR), Evaluation by an Area-Based Method of Ranking (EAMR), and so on. Hence, ancillary pairwise methods should be used for determining primary weights [36, 104]. The drawbacks of both approaches are twofold: first, when the number of criteria is larger than the number of alternatives, yielding nonacceptable consistency rates. The other drawback is related to processing time if pairwise comparisons increase more than proportionally with the criteria.

Biswas [94] demonstrated how MCDM methods in India measured healthcare supply chain performance. Factors used in this research were the sale, earnings before interest, cash, liability, cost of goods sold, average time elapsed between cash and disbursement, and collection, prioritized by PIPRECIA CoCoSo, MABAC, and MARCOS methods for measuring healthcare performance. Esfahani et al. [95] showed how to evaluate an MIS in a public hospital by using MCDM methods according to three dimensions (technology, organization, and human) and subcriteria DEMATEL and ANP methods. Sumrit [96] applied CSFs management inventory in healthcare by MCDM methods in an

TABLE 1: CSFs of competitive advantage.

Critical success factors	References
Formal strategy planning	[43]
New technology	[1, 43]
Manufacturing strategy	[1, 43]
Modularization of production	[43]
Manufacturing involvement	[43]
Supplier involvement	[43]
Product specification	[43]
Product capability	[1, 43]
On-time new product launch	[1, 43]
Product innovation	[43]
Customer support	[43]
Infrastructural organization	[43]
Cost	[2, 30, 47, 54, 81, 83]
Quality	[2, 30, 47, 54, 81, 83]
Delivery	[2, 30, 47, 54, 81, 83]
Flexibility	[2, 30, 47, 54, 81, 83]
Customer satisfaction	[2, 30, 47, 54, 81, 83]

uncertainty environment. Fuzzy Delphi extracted 18 CSFs, and then grey-DEMATEL relations among these factors were illustrated. Stevic et al. [97] measured sustainable supplier selection by the MARCOS method in the healthcare industry. Three criteria and 37 subcriteria have been considered for supplier selection by the MARCOS method. Emec et al. [98] used MCDM methods for medical supplier selection related to quality, cost, time, brand, technical service, customer representative, and diversity, which are factors that ranked four companies by AHP and fuzzy VIKOR. Chang et al. [99] demonstrated hybrid MCDM methods for evaluating the green biopharmaceutical industry. Twenty-five factors were considered for evaluating 5 alternatives with Best-Worst Method (BWM) and fuzzy TOPSIS. Hasani and Mokhtari [100] implemented dynamic network fuzzy DEA and MCDM methods in the healthcare service industry. Hospital reputation, patient satisfaction, service quality, and social responsibility were the factors of this research. Then, a healthcare system is evaluated based on a dynamic network, DEA, FDEMATEL, and BWM. Table 2 shows the previous research studies.

2.3. Research Gap. The gap in this research is motivated by the epistemic uncertainty regarding the cause-effect relationships between better performance in pharmaceutical companies and their underlying drivers. Unlike previous research, a hybrid approach based on Delphi's combined use, SWARA, and Additive Ratio Assessment (ARAS) methods is proposed here to filter and rank managerial preferences in a robust fashion, mitigating ranking stability issues due to variations in priorities of collecting different samples of respondents. Hence, sensitivity analyses are performed to verify the reliability and stability of results.

3. Methods

3.1. Justification of Selected and Hybrid Models. Although there are different MCDM techniques, each of them has a

TABLE 2: Summary of methods used in previous research studies.

Reference	Methods
[100]	Fuzzy DEA, dynamic network, FDEMATEL, and BWM
[99]	BWM, FTOPSIS
[98]	AHP, FVIKOR
[97]	MARCOS
[96]	Fuzzy Delphi, grey-DEMATEL
[95]	DEMATEL, ANP
[94]	PIPRECIA, CoCoSo, MABAC, and MARCOS
This research	Delphi, SWARA, and ARAS

specific function and is used for specific purposes. In this study, we use the ARAS method, and since this method is a kind of MCDM decision matrix method, it requires initial weight. To obtain the initial weight, decision-making techniques based on pairwise comparison methods should be used. One of them is the SWARA method. This method has some merits such as having a high key role in DMs. Also, the relative importance of each further factor is essential for obtaining each weight of factor. The merits of using ARAS method are that its logic concepts use simple mathematics and its computation is straightforward.

This hybrid method is used in this research for these reasons [31, 101].

3.2. Stepwise Weight Assessment Ratio Analysis (SWARA) Method. The SWARA technique is an MCDM method that falls within the first approach, relying on weighted replacements [102, 103]. This method's advantage is that it does not use pairwise comparisons and it compares one criterion against the others, assigning a unique weight for each criterion. In this method, experts assign weights to all criteria [38, 103] and then these criteria are then ranked in descending order, observing the following steps:

Step 1. Items are sorted based on expert inputs from the highest to the lowest importance.

Step 2. Preferences are allocated to the second criterion, and this allocation continues until the end of all criteria. Comparative importance average value, named S_j , is the ratio of this comparison.

Step 3. K_j comparative efficiency for criterion j is computed by

$$K_j = \begin{cases} 1, & j = 1, \\ S_j + 1, & j > 1. \end{cases} \quad (1)$$

Step 4. The intermediate weights (q_j) for criterion j are recomputed by

$$q_j = \begin{cases} 1, & j = 1, \\ \frac{K_{j-1}}{K_j}, & j > 1. \end{cases} \quad (2)$$

Step 5. The final weight for criterion j is calculated by $W_j = q_j / \sum_{k=1}^n q_k$.

3.3. A Novel Additive Ratio Assessment (ARAS) Method.

The novel ARAS method is based on a decision matrix approach, as demonstrated by [38], and falls within the second category of MCDM models. Steps of the ARAS method are given next:

Step 1. Create M_d as a decision-making matrix:

$$X = \begin{bmatrix} x_{11} & \cdots & x_{0n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mm} \end{bmatrix}, \quad (3)$$

where x_{ij} reveals the value for alternative i for criterion j ; n represents the number of alternatives, and m is the number of criteria. A given performance value x_{oj} is the optimal value of criterion j .

Step 2. Optimal value of criterion j is demonstrated as follows:

$$\begin{aligned} x_{oj} &= \max_i x_{ij}, \text{ if } \max_i x_{ij} \text{ is preferable} \\ x_{oj} &= \min_i x_{ij}^*, \text{ if } \min_i x_{ij}^* \text{ is preferable} \end{aligned}$$

Step 3. Normalized matrix value is

$$\bar{X} = \begin{bmatrix} x_{11} & \cdots & x_{0n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mm} \end{bmatrix}. \quad (4)$$

If the preferable values are maximum, the normalized criteria are demonstrated as follows:

$$\begin{aligned} x_{ij} &= \frac{x_{ij}}{\sum_{i=0}^m x_{ij}}, \\ x_{ij} &= \frac{1}{x_{ij}^*}, \\ \bar{x}_{ij} &= \frac{x_{ij}}{\sum_{i=0}^m x_{ij}}. \end{aligned} \quad (5)$$

Step 4. Weighted matrix is given next:

$$\hat{X} = \begin{bmatrix} \widehat{x}_{01} & \cdots & \widehat{x}_{0n} \\ \vdots & \ddots & \vdots \\ \widehat{x}_{m1} & \cdots & \widehat{x}_{mm} \end{bmatrix}. \quad (6)$$

The normalized-weighted value for all criteria is demonstrated as follows:

$$\widehat{x}_{ij} = \bar{x}_{ij} w_j. \quad (7)$$

Step 5. Calculate the optimal value of the function:

$$S_i = \sum_{j=1}^n \widehat{x}_{ij}. \quad (8)$$

Step 6. In this last step, the utility degree can be successfully computed:

$$K_i = \frac{S_i}{S_O}. \quad (9)$$

3.4. Research Methodology Procedure. The hybrid MCDM approach developed in this research is presented next. Readers should note that in Phase I, relevant CSFs are identified first from previous studies, while in Phase II, the Delphi method is used to filter the CSFs of the manufacturing strategy and performance indicators. In Phase III, the SWARA method is employed to determine the primary weights of these CSFs [6, 38]. These weights serve as inputs for the ARAS method in Phase IV to compute the final ranking of the pharmaceutical companies as per the preferences expressed by managers in terms of each CSF.

These significant steps are depicted in Figure 1.

3.5. Sampling. There are 25 pharmaceutical companies listed in the Iranian stock market whose data is easily accessed to identify experts/executives to be interviewed. Eleven companies responded favorably concerning participating in this research, which is in line with the Delphi formula that suggests the number of experts to vary between 5 and 15 respondents. Computations were performed using MS Excel. The detailed information of these experts is listed in Table 3.

3.6. Customized CSFs. In practice, the Delphi method examines unidentified specialist opinions and arranges their arguments and reactions in a printed, precise framework. This method enables advanced group conclusion-making by observing diverse interpretations resulting from face-to-face communication [103–106]. The Delphi method is considered a cornerstone tool for filtering CSFs based on expert opinions [14]. In this research, the questionnaire was developed from the CSFs collected in Table 1, while experts give their opinion based on a 5-point Likert scale. When the average score for all managerial preferences is less than four, that given CSF is eliminated [66].

In this research, 17 CSFs were successfully filtered based on the Delphi method. Table 4 reports the computations of their average scores. Five CSFs related to new technology, modularization of production, product specification, product competence, and product presentation were eliminated within the specific period, possibly due to limitations imposed by economic sanctions. It is interesting to note that the CSFs eliminated were all related to manufacturing strategy, thus suggesting an overrepresentation of CSFs related to performance indicators in the final CSF list, as depicted in Table 5.

4. Case Study

Columbus Langdell, the first dean of the law school, set the ball rolling in 1870 [107]. Case study research continues to

be poorly understood in psychology, sociology, anthropology, political science, and epidemiology since the strengths and weaknesses of case study research, and especially how to practice it well, still need clarification [108]. Case study is defined as a strategic method, methodology, or research design [109, 110]. This study chose a case study in the Islamic Republic of Iran that was primarily dedicated to ancient pharmaceutical companies to find various legitimate matrices in confirming critical success factors of manufacturing strategy during turbulent times of the COVID-19 pandemic.

4.1. Contextual Setting of the Pharmaceutical Industry in the Islamic Republic of Iran. This study found 25 pharmaceutical companies that are officially listed on the Islamic Republic of Iran's stock markets. Their overall value accounts for only 2% of the stock market of the Islamic Republic of Iran. This suggests that firms in this industry present a smaller scale when compared to firms of other industries. These companies produce innumerable pharmacy products such as tablets, medicinal draught, ampoules such as antibiotics, and medications such as those for diabetes, anesthesia, skin diseases, heart problems, and mental disorders. The assets of all pharmaceutical companies in the Islamic Republic of Iran are meager except for two companies. Most of these companies need to import raw materials that come from foreign countries with the US economic sanctions against the Islamic Republic of Iran affecting most pharmaceutical companies. In this industry, most of the raw material comes from foreign countries, but due to the US sanctions on transferring money between Iranian banks and international banks, these companies cannot buy raw material. Therefore, they can only produce limited goods for domestic customers based on traditional Iranian pharmacopeia.

4.2. Results. After filtering the CSFs, the first primary weights were obtained based on the SWARA method as presented in Table 6.

Firms were then ranked based on the ARAS decision matrix, as reported in Table 7. Normalized values for their decision matrix are given in Table 8, while the final ranks are shown in Table 9.

4.3. Sensitivity Analysis. There is no harmony on regulating the sensitivity analysis, i.e., the “quality” of a judgment method and the reliability of the results [111, 112]. The sensitivity analysis can be defined as constancy or conduct of the explanation to minor modifications in preferences that arise during the determination procedure [113] or small changes in the values taken for constraints. It is what some researchers reflect as competence multicriteria decision method [114, 115]. Barron and Schmidt [116] suggested two processes to achieve a sensitivity analysis in multiattribute value models (an approach grounded on entropy and a least-squares technique). For a specified pair of alternatives, these processes estimate the best option, the closest set of weights that equates their ranking with [117] demonstrating a sensitivity analysis in a decision modeling strategy.

FIGURE 1: Research methodology.

TABLE 3: Information of experts.

Expert	Education	Experience
Expert 1	Ph.D.	23
Expert 2	Ph.D.	28
Expert 3	M.S.	29
Expert 4	M.D.	30
Expert 5	Ph.D.	27
Expert 6	M.S.	26
Expert 7	M.D.	27
Expert 8	Ph.D.	29
Expert 9	M.D.	24

TABLE 4: Computation of the Delphi method.

	DM1	DM2	DM3	DM4	DM5	DM6	DM7	DM8	DM9	Average
Formal strategy planning	5	4	5	4	3	5	2	5	4	4.11
New technology	3	2	4	5	2	3	5	2	4	3.33
Manufacturing strategy	5	5	4	5	4	3	2	5	4	4.11
Modularization of production	3	4	2	3	5	4	2	3	5	3.44
Manufacturing involvement	5	4	5	5	3	2	5	4	4	4.11
Supplier involvement	5	4	5	4	3	5	5	4	3	4.22
Product specification	5	5	5	4	3	2	5	4	2	3.89
Product capability	3	2	3	2	4	2	3	2	5	2.89
On-time new product launch	3	2	3	4	3	5	3	2	4	3.22
Product innovation	5	4	5	4	2	3	5	4	5	4.11
Customer support	5	5	4	4	5	2	3	5	4	4.11
Infrastructural organization	5	5	4	5	5	4	2	3	5	4.22
Cost	4	4	5	5	4	2	3	5	4	4.00
Quality	5	5	5	4	5	4	3	2	5	4.22
Delivery	5	4	2	3	5	4	5	4	5	4.11
Flexibility	4	4	5	4	5	4	5	2	3	4.00
Customer satisfaction	5	4	5	5	5	4	2	3	5	4.22

TABLE 5: Result of the Delphi method.

Formal strategy planning	Accept
New technology	Reject
Manufacturing strategy	Accept
Modularization of production	Reject
Manufacturing involvement	Accept
Supplier involvement	Accept
Product specification	Reject
Product capability	Reject
On-time new product launch	Reject
Product innovation	Accept
Customer support	Accept
Infrastructural organization	Accept
Cost	Accept
Quality	Accept
Delivery	Accept
Flexibility	Accept
Customer satisfaction	Accept

Spearman's rank correlation coefficient test results show that the actual consequence computed using ARAS represents an effective compromise solution concerning other MCDM methods since all significances are less than 0.05. Table 10 points out the result of the MCDA methods, Table 11 demonstrates the Pearson correlation coefficient test result, and Figure 2 shows a sensitivity analysis.

5. Discussion and Contributions

Telemedicine and ancient pharmaceutical firms are trying to develop, manage, and improve competitive advantage through strategic manufacturing. However, manufacturing is challenging in turbulent times of the COVID-19 pandemic [118] for controlling customer orders, market dynamics, insufficient resource setups, government strategies, and turbulent supply issues. Moreover, the successful accomplishment of numerous business activities in pharmaceutical companies endures the paramount survival by deploying strategic conduct and establishing endogenous relationships among companies and a high-technology manufacturing strategy [49, 59], translating not only "challenging," but even "grand challenging" situations, especially for the Islamic Republic of Iran. Unzipping this critical spectrum, this study presents a new paradigm of prioritizing manufacturing strategy essential factors of success via MCDM methods, so this decision-making plays a crucial role in reaching a "win-win" scenario through SWARA methods, which is an appropriate technique because specialists can openhandedly deliberate and verbalize their conclusions [101, 119–121]. It does not seem that individual conditions can do anything in apprehension of anticipated perceptions; therefore, the additional investigation can be appropriate for this merging procedure as a malleable method for other situations. In accretion, a recent revision vs. exercise could emphasize a legitimate understanding of other MCDM techniques comprising ARAS, ANP, and PROMETHEE in order to accrue the absolute dream of different consequences [68, 122–124].

The baseline contribution areas are first; this study manifested exploration-exploitation and deliberated all

various manufacturing strategy characteristics and CSFs, which becomes incredibly substantial in turbulent times for the Islamic Republic of Iran. Moreover, these CSFs are screening and customizing those based on a structural system named the Delphi method [125, 126]. Second, the hybrid modeling fashion of MCDM methods has been functional to determine the optimum firms based on the CSFs of manufacturing strategy [26, 91].

Correspondingly, prior work on manufacturing strategy has been the various strategic theme of gigantic firm deliberation and operations of research interaction in uncertainty and risk environments to acquire sustainable productivity [127]. In this digital era when modernization shows high firm roles, this is when price, excellence, distribution, and novelty management are deep-seated priorities for any firm to boost attractiveness. The presentation dimension of manufacturing strategy is an authoritative vital issue to size the efficiency. Therefore, this research endeavor has been made to evaluate the literature based on manufacturing strategy, noticeably augmenting CSFs, the strategic necessity in turbulent times of the public emergency such as the COVID-19 pandemic. This study characterized CSFs and substantially construed them into advantageous positions. We reason that this study subsidizes a superior indulgence of CSFs linking MCDM methods, which have been extracted from previous investigations. Thus, this study found 17 CSFs from previous research simultaneously related to the core inquiry. Thus, by the exclusionary Delphi method, 5 of them were eradicated in this study and the remaining 12 CSFs were given a critical role position to answer the legitimate answer of RQ1. Besides, to provide and mark RQ2, a foundation based on 12 CSFs, where this study shortlisted 11 pharmacy companies, is evaluated by the ARAS method, a decision matrix method. Thus, our findings revealed that, besides 11 substantial companies, 5 companies are performing planned manufacturing in the Islamic Republic of Iran.

5.1. Managerial Implications. This study sets the MCDM method approach that consents a competitive and generic marketing strategy to be applied in pharmaceutical companies in the Islamic republic of Iran, translating to reach higher competitive advantages during turbulent times of the COVID-19 pandemic. Thus, managers taking such strategic actions could help support such companies to perform healthier in turbulent times [118]. Our work findings offer implications for considering sustainable manufacturing efforts in pharmaceutical companies. The Iranian government attempts to control limited resources to such pharmaceutical companies in turbulent times [118], so it should provide information technology tools and expert systems to perform more sustainable manufacturing productivity. However, the sustained manufacturing development vs. success in pharmaceutical companies is multifariously contingent on capabilities and competencies of agile R&D government management, which is lacking in the Islamic Republic of Iran [128, 129]. These company managers should regularly check the government R&D to deploy a sustainable manufacturing strategy.

TABLE 6: Computation of the SWARA method.

Attributes	Comparative importance of average value (s_j)	Coefficient $K_j = S_j + 1$	Recalculated weight $W_j = x_{j-1}/K_j$	Weight $q_j = W_j/\sum W_j$
Manufacturing strategy	—	1	1	0.413
Formal strategy planning	0.84	1.84	0.543	0.225
Manufacturing involvement	0.75	1.75	0.311	0.128
Supplier involvement	0.65	1.65	0.188	0.078
Product innovation	0.36	1.36	0.138	0.057
Customer support	0.49	1.49	0.093	0.038
Infrastructural organization	0.51	1.51	0.062	0.025
Cost	0.81	1.81	0.034	0.014
Quality	0.71	1.71	0.020	0.008
Delivery	0.42	1.42	0.014	0.006
Flexibility	0.39	1.39	0.010	0.004
Customer satisfaction	0.76	1.76	0.006	0.002

TABLE 7: Decision-making matrix.

CSFs	Max Manufacturing strategy	Max Formal strategy planning	Max Manufacturing involvement	Max Supplier involvement	Max Product innovation	Max Customer support	Max Infrastructural organization	Min Cost	Max Quality	Max Delivery	Max Flexibility	Max Customer satisfaction
Optimal value	8	9	9	9	9	8	9	3	9	9	9	9
Firm 1	7	8	9	4	5	8	9	6	5	7	8	7
Firm 2	5	4	8	7	9	6	9	5	8	7	2	6
Firm 3	4	7	5	8	9	6	7	4	8	5	9	8
Firm 4	8	7	5	9	6	8	7	4	5	4	8	9
Firm 5	7	8	8	9	8	5	6	4	7	8	9	3
Firm 6	7	8	9	5	4	2	6	3	5	4	7	8
Firm 7	6	9	8	7	8	5	6	4	7	8	9	6
Firm 8	5	4	6	3	9	8	7	8	9	8	7	9
Firm 9	3	5	6	8	9	7	7	8	9	8	7	8
Firm 10	6	6	5	9	8	6	7	8	9	4	3	5
Firm 11	4	3	6	5	9	8	7	8	8	9	7	6

TABLE 8: Normalized weight matrix.

CSFs	Max Manufacturing strategy	Max Formal strategy planning	Max Manufacturing involvement	Max Supplier involvement	Max Product innovation	Max Customer support	Max Infrastructural organization	Min Cost	Max Quality	Max Delivery	Max Flexibility	Max Customer satisfaction
Optimal value	0.129	0.130	0.120	0.122	0.107	0.116	0.115	0.048	0.113	0.125	0.118	0.120
Firm 1	0.113	0.116	0.120	0.054	0.060	0.116	0.115	0.076	0.063	0.097	0.105	0.093
Firm 2	0.081	0.058	0.107	0.095	0.107	0.087	0.115	0.091	0.100	0.097	0.026	0.080
Firm 3	0.065	0.101	0.067	0.108	0.107	0.087	0.090	0.114	0.100	0.069	0.118	0.107
Firm 4	0.129	0.101	0.067	0.122	0.071	0.116	0.090	0.114	0.063	0.056	0.105	0.120
Firm 5	0.113	0.116	0.107	0.122	0.095	0.072	0.077	0.114	0.088	0.111	0.118	0.040
Firm 6	0.113	0.116	0.120	0.068	0.048	0.029	0.077	0.152	0.063	0.056	0.092	0.107
Firm 7	0.097	0.130	0.107	0.095	0.095	0.072	0.077	0.114	0.088	0.111	0.118	0.080
Firm 8	0.081	0.058	0.080	0.041	0.107	0.116	0.090	0.057	0.113	0.111	0.092	0.120
Firm 9	0.048	0.072	0.080	0.108	0.107	0.101	0.090	0.057	0.113	0.111	0.092	0.107
Firm 10	0.097	0.087	0.067	0.122	0.095	0.087	0.090	0.057	0.113	0.056	0.039	0.067
Firm 11	0.065	0.043	0.080	0.068	0.107	0.116	0.090	0.057	0.100	0.125	0.092	0.080

TABLE 9: Weighted matrix and result of the computation.

CSFs	Max Manufacturing strategy	Max Formal strategy planning	Max Manufacturing involvement	Max Supplier involvement	Max Product innovation	Max Customer support	Max Infrastructurel organization	Min Cost	Max Quality	Max Delivery	Max Flexibility	Max Customer satisfaction	S	K	Rank
Optimal value	0.0533	0.0293	0.0154	0.0095	0.0061	0.0044	0.0029	0.0007	0.0009	0.0008	0.0005	0.0002	0.1239	1.000	
Firm 1	0.0466	0.0261	0.0154	0.0042	0.0034	0.0044	0.0029	0.0011	0.0005	0.0006	0.0004	0.0002	0.1057	0.853	3
Firm 2	0.0333	0.0130	0.0137	0.0074	0.0061	0.0033	0.0029	0.0013	0.0008	0.0006	0.0001	0.0002	0.0826	0.667	7
Firm 3	0.0266	0.0228	0.0085	0.0084	0.0061	0.0033	0.0022	0.0016	0.0008	0.0004	0.0005	0.0002	0.0816	0.658	8
Firm 4	0.0533	0.0228	0.0085	0.0095	0.0041	0.0044	0.0022	0.0016	0.0005	0.0003	0.0004	0.0002	0.1079	0.871	2
Firm 5	0.0466	0.0261	0.0137	0.0095	0.0054	0.0028	0.0019	0.0016	0.0007	0.0007	0.0005	0.0001	0.1095	0.883	1
Firm 6	0.0466	0.0261	0.0154	0.0053	0.0027	0.0011	0.0019	0.0021	0.0005	0.0003	0.0004	0.0002	0.1026	0.828	5
Firm 7	0.0400	0.0293	0.0137	0.0074	0.0054	0.0028	0.0019	0.0016	0.0007	0.0007	0.0005	0.0002	0.1040	0.840	4
Firm 8	0.0333	0.0130	0.0102	0.0032	0.0061	0.0044	0.0022	0.0008	0.0009	0.0007	0.0004	0.0002	0.0755	0.609	9
Firm 9	0.0200	0.0163	0.0102	0.0084	0.0061	0.0039	0.0022	0.0008	0.0009	0.0007	0.0004	0.0002	0.0701	0.566	10
Firm 10	0.0400	0.0196	0.0085	0.0095	0.0054	0.0033	0.0022	0.0008	0.0009	0.0003	0.0002	0.0001	0.0908	0.733	6
Firm 11	0.0266	0.0098	0.0102	0.0053	0.0061	0.0044	0.0022	0.0008	0.0008	0.0008	0.0004	0.0002	0.0676	0.545	11

TABLE 10: The result of MCDA methods.

	ARAS	TOPSIS	VIKOR	MABAC	CoCoSo	WASPAS
Firm 1	3	3	2	2	1	3
Firm 2	7	7	7	7	5	7
Firm 3	8	8	9	8	6	8
Firm 4	2	2	4	3	4	2
Firm 5	1	1	1	1	3	1
Firm 6	5	4	3	5	7	5
Firm 7	4	5	5	4	2	4
Firm 8	9	9	8	9	9	9
Firm 9	10	10	11	10	10	10
Firm 10	6	6	6	6	8	6
Firm 11	11	11	10	11	11	11

TABLE 11: Spearman's correlation test.

ARAS	TOPSIS	VIKOR	MABAC	CoCoSo	WASPAS
Significance	0	0	0	0.001	0
Correlation	0.991	0.936	0.991	0.855	1

FIGURE 2: Sensitivity analysis.

5.2. Limitations and Future Research Agendas. Explicit and publicly available decision-making can multifariously further reboot the transparency and accountability of the manufacturing conduct in pharmaceutical companies [113, 115]. This study is based on 25 pharmaceutical companies listed on the Iranian stock market, which probes this work's highest limitation. It simultaneously can build the forthcoming effort-exertion to exhibit the generalizability of more in-depth data in practical decision-making by using other MCDM method approaches. This study recommends that future exploration-exploitation should be led by emerging a crucial obligation based on performance schemes, translating multinational contrasts of manufacturing strategy with strategic Human Resources Management (HRM) through experimental cross-sectional investigation [130] of pharmaceutical companies by using an MCDM method approach. Besides the Islamic Republic of Iran's current turbulence section environment affecting

its severe foreign direct investment [131], this study cannot provide legitimate contextual experiment through MCDM methods even including a detailed limitation. Thus, future deliberation should be recommended to spur multifarious manifestation between cross-sectional studies between China and Iran to raise critical queries [132] such as what CSFs are determinant to competitive advantages in developing vs. emerging economy pharmaceutical companies. Finally, this study helped build a robust sustainable manufacturing strategy and suggested elaborating pharmaceutical companies vs. manufacturing strategy by using other theoretical and statistical lenses for future research agendas.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

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