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Case Study:

Use of Simple Multi-Attribute Rating Technique (SMART)

A Decision-Making Technique in Choosing an Appropriate Supplier

I. Introduction

The owner of Company XZY in Algeria plans to expand its business. XYZ started in 1992 as a paint manufacturing company. In 2015, they build a new facility for personal care and detergents product lines. After years of operation, the owner noticed a significant monthly demand of approximately 20 metric tons of perfumes for the said lines of product. With this, the owner begins to consider setting-up a perfume company to improve the company's profitability, since the process is easy – cold blend and no chemical reaction is involved.

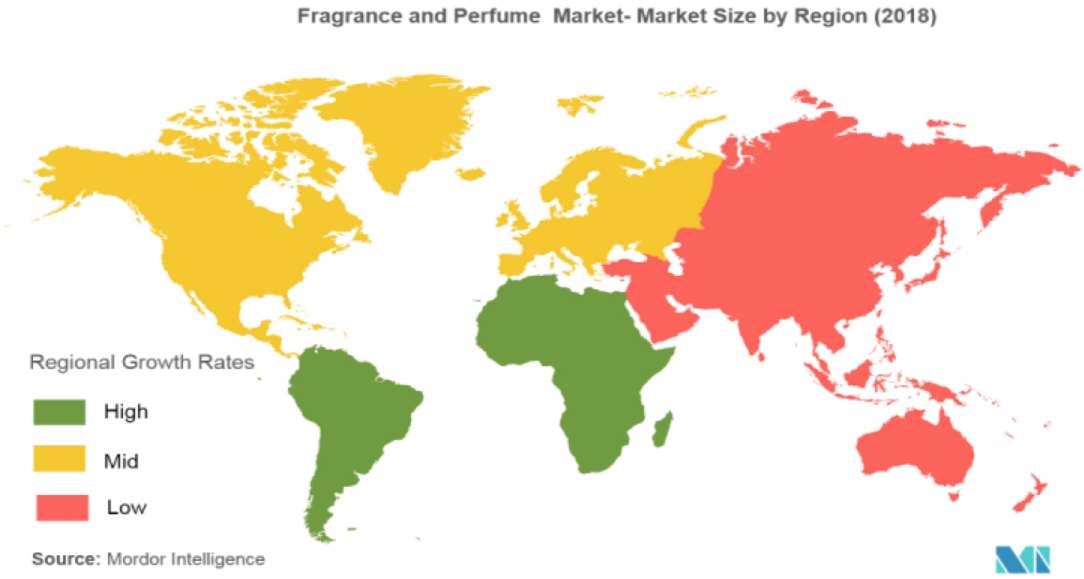
II. Literature Review

From a cost-savings perspective, Company XYZ aimed to develop new perfume products and to explore more business opportunities. As mentioned earlier, XYZ needed to purchase 20MT perfume every month as part of material requirement for personal care and detergents products. Therefore, the company made a research and examined the current status and market prospects of the perfume industry in developing new products.

Perfume history has thousands of years. In ancient times, perfumes or balms were mainly used in sacrifices and religions, and fragrances have a high value. In 2005, the Italian archaeological team discovered the oldest perfume factory on the island of Cyprus, and archaeologists indicated that in the Bronze Age, which is 4000 years ago, people made and used perfumes and perfumes (Morgan, 2005). Nowadays, consumers have never lost their enthusiasm for perfumes. People buy and use scents to maintain their style and personality.

1. The Current of the Perfume Industry

In the report "Fragrances and Perfumes Market - Growth, Trends, and Forecast (2019 - 2024)" (2018), according to the research paper, the value of the perfume market is $52.7 billion in 2018 and is expected to reach $72.3 billion by 2024. Consumers' spends on personal care products are increasing (Mordorintelligence, 2018). Research institutions have also found that the Asia-Pacific region has the most significant growth potential. Especially for young consumers, they are changing from batch perfumes to premium perfumes. Under the impetus of emerging, middle-class consumers and millennials pursuing high-end lifestyles, scents play an increasingly important role in their lifestyles (Mordorintelligence, 2018).



https://www.mordorintelligence.com/industry-reports/fragrance-and-perfume-market

The article also illustrates the competitive landscape of the perfume market. The perfume market is a highly fragmented market that consists of international and regional competitors. Some famous companies like include Shiseido Co., Ltd., Revlon, Chanel, Hermès, and the rest of the market is dominated by small manufacturers that specialize in

a variety of personal care and cosmetics (Mordorintelligence, 2018). The primary purpose of this research paper is to help XYZ to identify the needed initial raw materials requirements for the start-up and to facilitate them to decide the appropriate suppliers.

2. The Prospect of the Perfume Market

In the article "Fragrance and Perfume Market 2019: Industry Trends, Size, Growth Insight, Share, Competitive Analysis, Statistics, Regional, and Global Industry Forecast to 2024," which is written in 2019, the author analyzes and predicts the future of the perfume market. The global perfume and fragrance market will grow at a rate of 6.2%. The leading players in the market have been looking for an exciting, unique and new fragrances to appeal to different consumer groups around the world. The perfume market is expected to grow slowly compared to the overall perfume market. However, perfumes and colognes, as well as body sprays and other scented body products, may experience significant growth during the forecast period (Marketreportsworld, 2019).

III. Problem Statement

The company decided to push the project of setting-up the perfume company since the industry is promising, and aside from the fact that they already have an internal customer waiting.

Company XYZ was able to identify nine perfumes that they will initially produce. The list are as follows:

1.Lime 2.Lavender 3.Green Apple 4.Lemon 5.Strawberry 6.Fresh Laundry (Fabric Conditioner) 7.Field Flowers (Fabric Conditioner) 8.Floral (Liquid Detergent) 9. Oriental Fresh (Liquid Detergent)

The formulations of those nine perfumes were determined and the list of raw materials for the initial investment were generated. Seventy-one raw materials were needed to start with. Different suppliers from different countries were contacted, and the company were interested only with 5 suppliers as shown below:

Company XYZ is then facing a big challenge on how to choose only one appropriate supplier that will meet the company's raw materials requirements. At the same time, there's a need to figure out the best technique and methodology to use to come up with the best recommendation of which supplier the company will partner with.

IV. Methodology

1. Apply appropriate decision analysis technique.

Simple Multi-Attribute Rating Technique (SMART) is chosen for the decision analysis project because it is relatively simple since the attributes of the right supplier were already figured out for the company. "SMART is relatively simple, transparent, and it highlights the important aspects of the problem and how it relates to each other (Goodwin & Wright, 2014)."

2. List and decide the attributes of the appropriate supplier.

Five attributes are vital for SMART method on choosing an appropriate supplier.

2.1 Attributes Definition

2.1.1 Quality of Raw Materials - Raw materials are materials or substances used in the primary production or manufacturing of goods. Quality rating of raw materials is based on the country source. US companies is given the highest value followed by France then China. Values are assessed based on

the certification, accreditation, facility and production volume capacity of the company.

2.1.2. Service and Technical Support - This refers to the ability of the supplier to respond to the customer's need. Value given is based on the ability of the supplier to submit their quotation when they were contacted.

2.1.3. Mode of Payment - Value assessment is based on the following order of preference of the company: Letter of Credit (L/C), 50% advance through electronic money transfer (TT), 100% advance payment.

2.1.4 Raw Materials Availability (at least 70%)- Since raw materials are many and the volume requirement is 1 drum for each material, it is practical to purchase everything from one supplier in 1x20" full container load (FCL) and pay for one shipping cost only.

2.1.5 Delivery Lead Time- Values are assigned based on the suppliers' geographical location in reference to Algeria

3. Decide on the values.

The attributes are carefully assessed, and values are allocated on a scale of O (worst) to 100 (best).

Attributes	Suppliers				
	Berje	Prodasynth	Lys Chem	Vigon	Advanced BioTech
Quality of raw material	100	70	60	90	80
Service & Tech Support	60	70	50	90	20
Delivery	50	60	80	30	40
Ability to supply 70% of raw material required	70	30	40	50	10
Mode of Payment	30	50	60	40	20

4. Make a decision based on the result of SMART.

V. Data / Information Collection and Analysis

1. Total Raw Material Cost per suppliers

Suppliers	Total Cost, USD
Prodasynth (France)	96,414.50
Lys Chem (China)	100,520.00
Advance Bio Tech(USA)	184,336.80
Berje (USA)	196,311.38
Vigon (USA)	344,008.00

2. Itemized Raw Material Cost

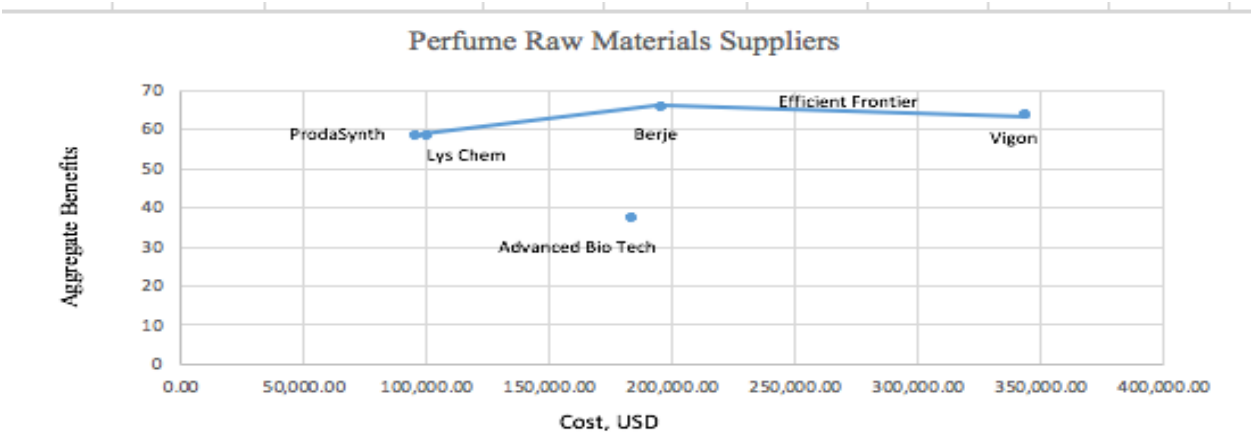
See separate page

			Price Per Kg, USD					Price per drum, USD				
		QTY/drum	Berje	Prodasynth	LYS Chem	Vigon	ABT	Berje	Prodasynth	LYS Chem	Vigon	ABT
1	Aldehyde C-12	170.00	7.30	10.00	12.00	23.00	15.00	1241.00	1700.00	2040.00	3910.00	2550.00
2	Aldehyde C-14	200.00	12.70	19.00	14.00	17.00	12.70	2540.00	3800.00	2800.00	3400.00	2540.00
3	Aldehyde C-16	200.00	11.80	9.50	9.00	13.00	7.15	2360.00	1900.00	1800.00	2600.00	1430.00
4	Aldehyde C-9	200.00	16.70	17.00	25.00	22.00	20.00	3340.00	3400.00	5000.00	4400.00	4000.00
5	Aldehyde C11 Undecylenic 10%	160.00	24.25	8.10	10.00	39.00	44.00	3880.00	1296.00	1600.00	6240.00	7040.00
6	Allyl Amyl Glycolate	200.00	9.60	12.00	12.00	35.00	30.00	1920.00	2400.00	2400.00	7000.00	6000.00
7	Allyl Hexanoate	180.00	10.17	15.00	15.00	20.00	25.00	1830.60	2700.00	2700.00	3600.00	4500.00
8	Alpha Ionone	180.00	37.90	16.85	15.00	65.00	50.00	6822.00	3033.00	2700.00	11700.00	9000.00
9	Alpha-Terpineol	200.00	15.80	12.10	13.00	20.00	13.20	3160.00	2420.00	2600.00	4000.00	2640.00
10	Amyl Acetate	180.00	6.17	8.10	6.00	8.00	10.00	1110.60	1458.00	1080.00	1440.00	1800.00
11	Amylcinnamic Aldehyde	190.00	5.70	5.00	7.00	9.00	2.58	1083.00	950.00	1330.00	1710.00	490.20
12	Anisic Aldehyde	225.00	10.45	11.50	22.00	14.00	9.68	2351.25	2587.50	4950.00	3150.00	2178.00
13	Benzyl Acetate	220.00	2.44	3.00	8.00	12.00	9.68	536.80	660.00	1760.00	2640.00	2129.60
14	Benzyl Benzoate	225.00	3.07	4.00	3.50	7.00	10.00	690.75	900.00	787.50	1575.00	2250.00
15	Bergamot	10.00	120.00	200.00	120.00	230.00	250.00	1200.00	2000.00	1200.00	2300.00	2500.00
16	Beta-Ionone	170.00	39.70	15.80	46.00	28.00	52.25	6749.00	2686.00	7820.00	4760.00	8882.50
17	Cedarwood	190.00	14.50	16.00	20.00	26.00	22.00	2755.00	3040.00	3800.00	4940.00	4180.00
18	Cinnamaldehyde 10%	200.00	3.90	5.00	18.00	20.00	58.00	780.00	1000.00	3600.00	4000.00	11600.00
19	Cinnamyl Isobutyrate	10.00	46.00	50.00	40.00	77.00	60.00	460.00	500.00	400.00	770.00	600.00
20	Citral	190.00	9.85	10.00	25.00	30.00	30.00	1871.50	1900.00	4750.00	5700.00	5700.00
41	Geranyl Butyrate	180.00				64.00		0.00	0.00	0.00	11520.00	0.00
42	Hedione	180.00			16.00	25.00		0.00	0.00	2880.00	4500.00	0.00
43	Hexyl Acetate	180.00	6.35	71.00		12.00		1143.00	12780.00	0.00	2160.00	0.00
44	Hexyl Salicylate	200.00	7.50	6.50		8.00		1500.00	1300.00	0.00	1600.00	0.00
45	Hydroxycitronellal	180.00	39.20	44.00		45.00		7056.00	7920.00	0.00	8100.00	0.00
46	Iso Super E	200.00			20.00	40.00		0.00	0.00	4000.00	8000.00	0.00
47	Isoeugenol	200.00	38.80	25.00		50.00		7760.00	5000.00	0.00	10000.00	0.00
48	Labdanum		32.00					0.00	0.00	0.00	0.00	0.00
49	Lavandin Oil Grosso	200.00	53.00			40.00		10600.00	0.00	0.00	8000.00	0.00
50	Lemon	175.00	20.00			42.00	25.00	3500.00	0.00	0.00	7350.00	4375.00
51	Lilial	190.00	190.00	16.00		19.00		36100.00	3040.00	0.00	3610.00	0.00
52	Lime	175.00	29.00			60.00		5075.00	0.00	0.00	10500.00	0.00
53	Linalool	170.00	10.40	9.30	25.00	14.00		1768.00	1581.00	4250.00	2380.00	0.00
54	Linalyl Acetate	170.00	12.40	13.00	24.00	19.00		2108.00	2210.00	4080.00	3230.00	0.00
55	Maltol	200.00	31.90	33.60	42.00	90.00	66.00	6380.00	6720.00	8400.00	18000.00	13200.00
56	Mandarin Oil	170.00	15.00			15.00		2550.00	0.00	0.00	2550.00	0.00
57	Methyl Ionone Bj	190.00	23.50			35.00		4465.00	0.00	0.00	6650.00	0.00
58	Musk Ketone	200.00	34.65	27.05	40.00			6930.00	5410.00	8000.00	0.00	0.00
59	N Methyl Ionone	200.00	28.40			60.00		5680.00	0.00	0.00	12000.00	0.00
60	Orange Oil	170.00	6.50			16.00		1105.00	0.00	0.00	2720.00	0.00
61	Patchouli	200.00	56.00			85.00		11200.00	0.00	0.00	17000.00	0.00
62	Petitgrain Oil	25.00	54.00			86.00		1350.00	0.00	0.00	2150.00	0.00
63	Phenylethanol	200.00	4.85	5.30	10.00			970.00	1060.00	2000.00	0.00	0.00
64	Rose Crystal	25.00	9.40					235.00	0.00	0.00	0.00	0.00
65	Rose Oxide	180.00		65.00		85.00		0.00	11700.00	0.00	15300.00	0.00
66	Rosemary Oil	180.00	47.00			72.00		8460.00	0.00	0.00	12960.00	0.00
67	Triplal (Methyl Anthranilate)	50.00				45.00		0.00	0.00	0.00	2250.00	0.00
68	Ultrazur	25.00				217.00		0.00	0.00	0.00	5425.00	0.00
69	Vanillin	25.00	11.30			24.00		282.50	0.00	0.00	600.00	0.00
70	Verdox	190.00				6.00		0.00	0.00	0.00	1140.00	0.00
71	Ylang Synth		445.00					0.00	0.00	0.00	0.00	0.00
	Total							196311.38	96414.50	100520.00	344008.00	184336.80

V. Results

Using Smart Analysis:

Attributes	Raw Weights	Normalized Weights	Suppliers				
			Berje	Prodasynth	Lys Chem	Vigon	Advanced BioTech
Quality of raw material	100	25.0	100	70	60	90	80
Service & Tech Support	90	22.5	60	70	50	90	20
Delivery	80	20.0	50	60	80	30	40
Ability to supply 70% of raw material required	70	17.5	70	30	40	50	10
Mode of Payment	60	15.0	30	50	60	40	20
Total	400	100					
Aggregate Benefits			65.3	58.0	58.3	63.5	37.3
Maximum Aggregate Benefits			65.3				



VI. Conclusion & Recommendation

From the smart analysis, Berje Company was found to provide maximum aggregates. Central to the company's service is Berje's guarantee of quality. The company's analytical technology and software are aligned to meet the most stringent needs of the perfume industry. The company's regulatory capabilities ensure that the company continues to provide Company XYZ with a wide range of products and services. The company's regulatory navigation allows the customers to meet the requirement of their industries. Berge Company offers fast turnaround services. For example, the company's production facility is designed for efficiency; thus, allowing the company to get their

customers what they need, when they need it. Therefore, the paper concludes that Berje Company serves as the appropriate supplier for Company XYZ in terms of the quality of raw material, technical support and services, delivery, ability to supply at least 70% of the needed raw materials and mode of payment.

In order to develop new perfume products and explore more business opportunities, the paper recommends that:

- Company XYZ sources a growing list of naturals to help the business transition its products lines to use all the natural ingredients in the production of new perfumes. This will help the company implement the practice of cultivating and extracting important oils with the modern techniques of analysis, traceability, and thorough quality assurance.
- Company XYZ actively supports the organic segment of the marketplace in cosmetics. This can be achieved by collaborating with Berje Company so as to balance the economic and social responsibility and at the same time deliver the standards the company customers expect.

VII. Future Work

A firm foundation of regulatory and quality assurance practices will help earn Company XYZ a place at the top of perfume ladder. This can be achieved by collaborating with organizations, which work to keep the products safe, for example, the Food Chemicals Codex and the United States Pharmacopeia. These organizations will enable the company to have stringent traceability procedures and test the chemicals rigorously with different mock recall programs.

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