Identifying and Prioritizing Key Branding Factors in the Pharmaceutical Industry in Metaverse: An Integrated DEMATEL-ANP Approach

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Abstract

The purpose of this study was to identify the key factors playing a role in branding the pharmaceutical industry in Metaverse. The statistical population of study included a group of experts in the field of branding of the pharmaceutical industry and Metaverse. This research was conducted in two phases, qualitative and quantitative. In the qualitative phase, the theme analysis method was used to identify the factors. In the quantitative phase, integrated DEMATEL-ANP approach and Excel and Super Decisions software were used to prioritize the factors. Finally, the study identified and prioritized seven key factors. According to the research results, the first three factors were flexibility in using ever-changing formats, pharmaceutical companies use advanced 3D Analytics and Data in branding process design, and integrate users' brand experience in the real and virtual world, respectively.

Keywords: Metaverse, Branding, Pharmaceutical Industry.

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INTRODUCTION

1. Introduction

Since 2021, the concept of the metaverse has been widely discussed.1 It refers to the internet accessed via virtual reality (VR) and augmented reality (AR) glasses, and is considered to be the next-generation mobile computing platform that will be widely used in the future. Others believe that the metaverse is a ternary digital world established on the basis of digital technology integrating the virtual and the real worlds, which people enter with digital identities.2 The idea originated from the novel True Names by Professor Vernor Vinge, an American mathematician.3 In this story, published in 1981, the author creatively conceived a virtual world that enters and obtains sensory experience through a brain-computer interface. Later, in 1992, the term "metaverse" was coined by American science-fiction writer Neal Stephenson in his novel Snow Crash, in which he characters explore an internet world parallel to the real world, using digital avatars of themselves for perception and interaction.4

The metaverse, the digital world's Next Big Thing, is touted as the internet domain where animated avatars of our physical selves will be able to virtually do all sorts of interactivities, from shopping to gaming to traveling — someday.1 Wonks say it could be a decade or longer before the necessary technologies catch up with the hype. Right now, though, the health-care industry is utilizing some of the essential components that will ultimately comprise the metaverse — virtual reality (VR), augmented reality (AR), mixed reality (MR), and artificial intelligence (AI) — as well as the software and hardware to power their applications. For example, medical device companies are using MR to assemble surgical tools and design operating rooms, the World Health Organization (WHO) is using AR and smartphones to train Covid-19 responders, psychiatrists are using VR to treat post-traumatic stress (PTS) among combat soldiers, and medical schools are using VR for surgical training.5

The pharmaceutical industry's current environment is a bit dynamic in many ways as the stakeholders show severe fluctuations, which eventually affect the pharmaceutical industry's market condition all over the globe. The industry from the last ten years has been growing substantially from the growth rate of 7% as a whole, including the health care sector (Healthcare equipment' & healthcare services).6, 7 Entering the world of Metaverse, the branding methods of companies and products will change. The pharmaceutical industry is no exception.

The broad term of "branding" is often misunderstood and mixed with the alienated term of "marketing".8 Both terminologies are utterly different in each other's working manual; however, the terms mentioned above work consecutively to make a company successful. Before diving into the mystery behind what branding is, on the first hand, it is vital to understand what a brand is.9 A brand is a name, logo, tagline, design, packaging, and every other constituent that distinguishes an individual brand from another. It is ultimately the specific component of a company that is not similar to any other company.10

Recent studies have advanced that such authenticity enhances the extent to which consumers experience the products as if they were in a physical store.11 Thus, VR can provide deeper insights into the visual salience processes that affect individuals' decisionmaking in front of retail shelves, where brand awareness and brand salience play a pivotal role in directing consumers' attention toward the shelved products.12

Although the metaverse is developing quickly, we're still quite far away from it overtaking current digital marketing. For starters, most metaverse's, including Facebook's, require a VR headset – something not everyone has yet. Until then, brands have a bit of breathing space to start pulling together marketing strategies that work.13 A review of the literature on common areas of Metaverse and the pharmaceutical industry shows that there is a deep study gap in the branding of pharmaceutical companies in Metaverse. This means that no reference scientific research has been done in this field so far. Meanwhile, senior executives in the pharmaceutical industry will face many branding challenges in the near future as they enter Metaverse; And if proper research is not done in this field from now on, the managers of this industry will face many mistakes when deciding on branding strategies in Metaverse. Accordingly, the present study has tried to answer the question of what are the key branding factors of the pharmaceutical industry in Met Metaverse avars and how are they prioritized?.

2. Methodology

This research was carried out in two phases, as shown in Figure 1:

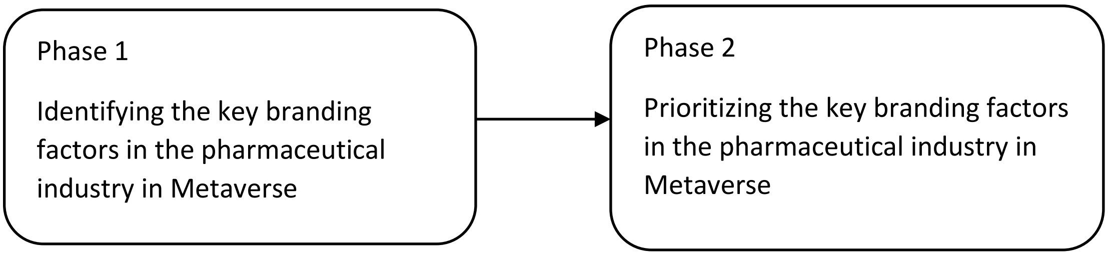

Figure 1. Executive phases of research

In both phases of the research, the statistical population included a group of 83 experts in the field of branding of the pharmaceutical industry and Metaverse. Based on the judgmental sampling method, 35 people from the statistical population were selected as the sample.

In order to identify the key factors in the first phase of the research, a qualitative method of theme analysis was used. In the second phase of the research, DEMATEL1-ANP2 methods were used to determine the internal relationships of factors and to determine their weight and priority. In this phase, Excel and Super Decisions software were used.

The data collection tool in the first phase was open interviews with experts. In the second phase, two researcher-made questionnaires were used to collect data.

3. Data analysis

3.1. Identifying the key factors

As mentioned in the previous section, in this study, theme analysis method was used to identify the key branding factors of the pharmaceutical industry in Metaverse. In this process, after conducting 16 interviews, the researcher reached theoretical saturation. After analyzing the interviews, 47 sub-themes and 7 main themes were identified. These seven main themes were considered as the key branding factors of the pharmaceutical industry in Metaverse, which are presented in Table 1:

Table 1. The key branding factors of the pharmaceutical industry in Metaverse

Lable	Key branding factors
A	Pharmaceutical companies use advanced 3D Analytics and Data in branding process design
B	Integrate users' brand experience in the real and virtual world
C	Using sensory marketing techniques in the Metaverse to engage the five senses of pharmaceutical audiences
D	Design and use of new tools for evaluating the branding process of the pharmaceutical industry in Metaverse
E	Creating virtual communities by pharmaceutical brands in Metaverse
F	Flexibility in using ever-changing formats
G	Strengthening the legal infrastructure of pharmaceutical companies to protect brand rights in Metaverse

3.2. Prioritizing the key factors

3.2.1. DEMATEL analysis

To identify the key factor relationships, an N × N matrix was first formed. This matrix is called the direct connection matrix (Table 2). Experts were then asked to rate each factor on other factors in numerical terms:

Table 2. Average opinions of experts

(A)	(D)	(F)	(C)	(E)	(G)	(B)	
4. 93	3. 64	4. 95	4. 19	4. 29	4. 29	0	(B)
3. 46	4. 29	2. 64	3. 65	3. 61	0	4. 28	(G)
4. 97	4. 97	3. 64	2. 37	0	2. 96	3. 65	(E)
3. 59	2. 98	4. 98	0	4. 37	4. 25	4. 45	(C)
2. 54	3. 68	0	4. 32	3. 65	4. 92	4. 42	(F)
4. 24	0	3. 59	4. 26	4. 69	4. 45	1. 78	(D)
0	4. 42	4. 35	4. 65	4. 86	4. 26	2. 15	(A)

1 Decision making trial and evaluation laboratory

2 Analytic network process

In the next step, tried to convert the initial matrix to a normalized matrix (N). For normalization, the relation N = k * M was used. In this formula, k was calculated as follows: First, the sum of all rows and columns is calculated, the inverse is the largest number of rows and columns k (Table 3):

Table 3. Normalized matrix (N)

(A)	(D)	(F)	(C)	©	(G)	(B)	**N**
0. 07	0. 05	0. 07	0. 06	0. 06	0. 06	0	(B)
0. 05	0. 06	0. 03	0. 05	0. 05	0	0. 06	(G)
0. 07	0. 07	0. 05	0. 03	0	0. 04	0. 05	©
0. 05	0. 04	0. 07	0	0. 06	0. 06	0. 06	©
0. 03	0. 05	0	0. 06	0. 05	0. 07	0. 06	(F)
0. 06	0	0. 05	0. 06	0. 06	0. 06	0. 02	(D)
0	0. 06	0. 06	0. 06	0. 07	0. 06	0. 03	(A)

In the next step, tried to get the matrix one (I), then subtract the matrix N from it (Table 4):

Table 4. I-N matrix

(A)	(D)	(F)	(C)	(E)	(G)	(B)	I-N
-0. 07	-0. 05	-0. 07	-0. 06	-0. 06	-0. 06	1	(B)
-0. 05	-0. 06	-0. 03	-0. 05	-0. 05	1	-0. 06	(G)
-0. 07	-0. 07	-0. 05	-0. 03	1	-0. 04	-0. 05	(E)
-0. 05	-0. 04	-0. 07	1	-0. 06	-0. 06	-0. 06	(C)
-0. 03	-0. 05	1	-0. 06	-0. 05	-0. 07	-0. 06	(F)
-0. 06	1	-0. 05	-0. 06	-0. 06	-0. 06	-0. 02	(D)
1	-0. 06	-0. 06	-0. 06	-0. 07	-0. 06	-0. 03	(A)

The following matrix I-N was inverted based on the MINVERSE function (Table 5):

Table 5. Inverse of I-N matrix

(A)	(D)	(F)	(C)	(E)	(G)	(B)	MINVERSE
0. 55	0. 54	0. 53	0. 55	0. 55	0. 56	1. 46	(B)
0. 47	0. 50	0. 45	0. 49	0. 49	1. 44	0. 47	(G)
0. 48	0. 49	0. 45	0. 46	1. 43	0. 47	0. 45	(E)
0. 49	0. 49	0. 49	1. 45	0. 51	0. 51	0. 48	(C)
0. 48	0. 50	1. 43	0. 52	0. 51	0. 53	0. 48	(F)
0. 48	1. 44	0. 46	0. 50	0. 50	0. 50	0. 43	(D)
1. 46	0. 54	0. 51	0. 54	0. 54	0. 54	0. 47	(A)

Next, based on the N*((I-N)^-1) function, the MMULT matrix is obtained (Table 6):

Table 6. MMULT matrix

(A)	(D)	(F)	(C)	(E)	(G)	(B)	MMULT
0. 55	0. 54	0. 53	0. 55	0. 55	0. 56	0. 46	(B)
0. 47	0. 50	0. 45	0. 49	0. 49	0. 44	0. 47	(G)
0. 48	0. 49	0. 45	0. 46	0. 43	0. 47	0. 45	(E)
0. 49	0. 49	0. 49	0. 45	0. 51	0. 51	0. 48	(C)
0. 48	0. 50	0. 43	0. 52	0. 51	0. 53	0. 48	(F)
0. 48	0. 44	0. 46	0. 50	0. 50	0. 50	0. 43	(D)
0. 46	0. 54	0. 51	0. 54	0. 54	0. 54	0. 47	(A)

Next, the threshold value must be calculated to determine the network relationship map (NRM). In this way, minor relationships can be ignored and a network of important relationships can be drawn. Once the threshold intensity is determined, all values of the complete correlation matrix that are smaller than the threshold are zero, meaning that this causal relationship is not considered. In this study, the threshold value was equal to 1.332074665 and the matrix for determining the criteria relationships was determined using the arithmetic mean as follows (Table 7):

Table 7. Matrix of determining criteria relationships using arithmetic mean

(A)	(D)	(F)	(C)	(E)	(G)	(B)	Relationships
1	1	1	1	1	1	0	(B)
0	1	0	1	1	0	0	(G)
1	1	0	0	0	0	0	(E)
1	1	1	0	1	1	1	(C)
0	1	0	1	1	1	1	(F)
1	0	0	1	1	1	0	(D)
0	1	1	1	1	1	0	(A)

The next step was to determine the causal diagram. In this process, the following instructions were followed. The sum of the elements of each row (D) for each factor shows the effect of that factor on other factors (Table 8):

Table 8. The degree of influence of factors

D	(A)	(D)	(F)	(C)	(E)	(G)	(B)
	10.19375	9.63105	8.998032	8.914185	9.244355	9.578224	8.712062

The sum of the elements of each column (R) for each factor indicates the extent to which that factor is affected by other factors (Table 9):

Table 9. The degree of influenced of factors

R	(D)	(F)	(C)	(E)	(G)	(B)	(A)
	9.179797	9.443748	9.896641	9.397072	9.297792	9.770043	8.286565

Accordingly, the horizontal vector (D+R) indicates the degree of interactivity of the agent. In other words, the higher the coefficient (D+R) of the factor, the more it interacts with other factors. Also, the vertical vector (D-R) indicates the degree to which one factor is affected by another. In general, if (D-R) is positive, it indicates the causality of the factor; And if (D-R) is negative, it indicates the inability of the agent (Tables 10 and 11):

Table 10. The degree of interaction of the factors

D+R	(A)	(D)	(F)	(C)	(E)	(G)	(B)
	18.48032	18.81085	18.44178	18.81083	18.64143	18.87602	18.4821
			The least interaction			The most interaction	

Table 11. The degree of influence of factors

D-R	(A)	(D)	(F)	(C)	(E)	(G)	(B)
	1.907186	0.451253	-0.44572	-0.98246	-0.15272	0.280432	-1.05798
	The most effective						The most impressive

Finally, a Cartesian coordinate system is drawn. In this device, the longitudinal axis is (D+R) and the transverse axis is based on (D-R). The position of each factor is determined by a point with coordinates [(D+R),(D-R)] in the device. In this way, a graphic diagram was obtained as follows (Figure 2):

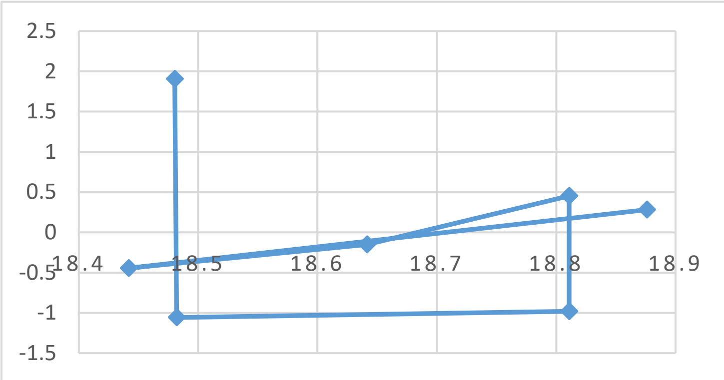

Figure 2. Causal Diagram

3.2.2. ANP analysis

In this study, ANP method was used to achieve the final weight of factors and their prioritization. Preliminary data of this method were obtained by pairwise comparison of factors with each other. In this pairwise comparison, the following spectrum was used:

Table 12. Pair comparison tool of ANP method

Factor	Pair comparison																	Factor
A	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	B

Then, based on the initial data obtained from pairwise comparisons, a model was formed for the seven research factors in Super Decisions software (Figure 3):

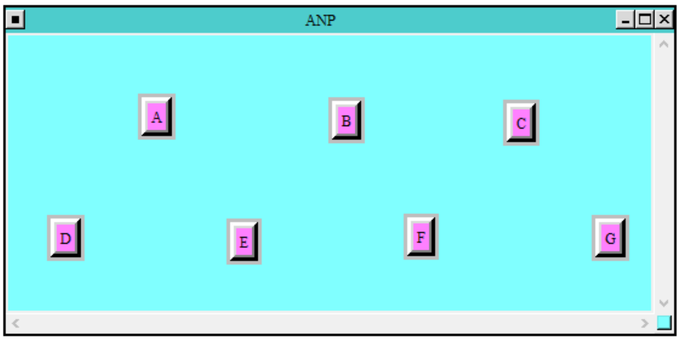

Figure 3. An integrated ANP model for the seven key research factors

The figure 4 shows the pair comparisons of research factors by ANP technique in Super Decisions software environment:

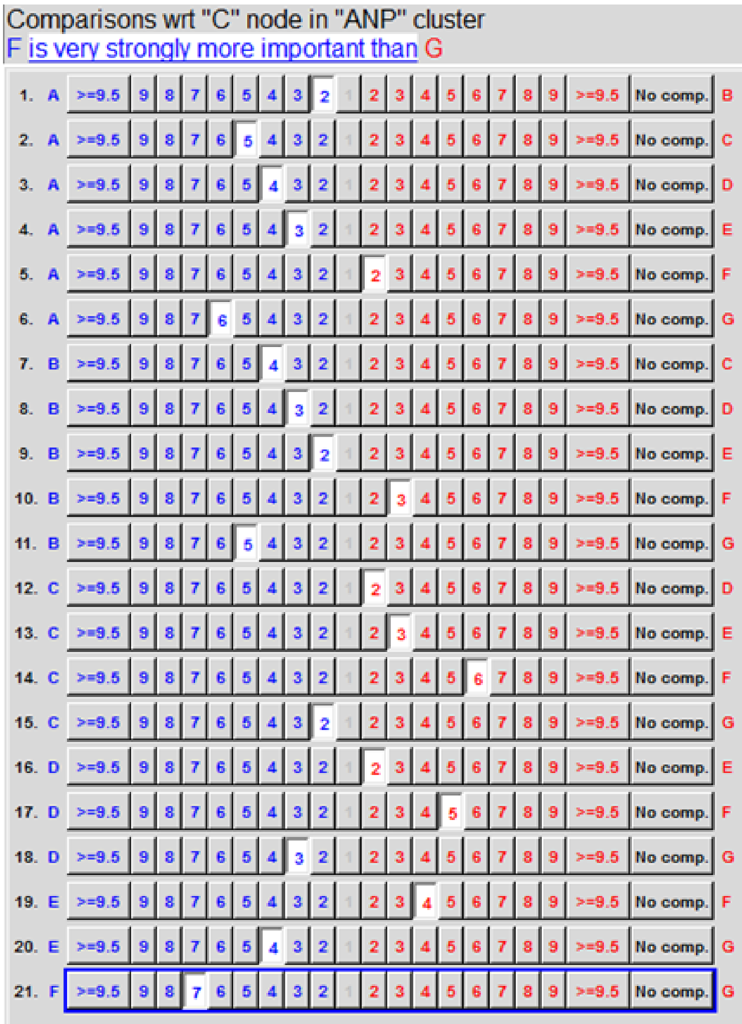

Figure 4. The pair comparisons of research factors

The figure 5 shows the relative weight of the research factors obtained based on the ANP technique in the Super Decisions software environment (To ensure the reliability of the analysis, the In-consistency rate was also calculated and the number 0.02414 was obtained. Given that this number is smaller than 0.1, the reliability of ANP analyzes can be fully assured):

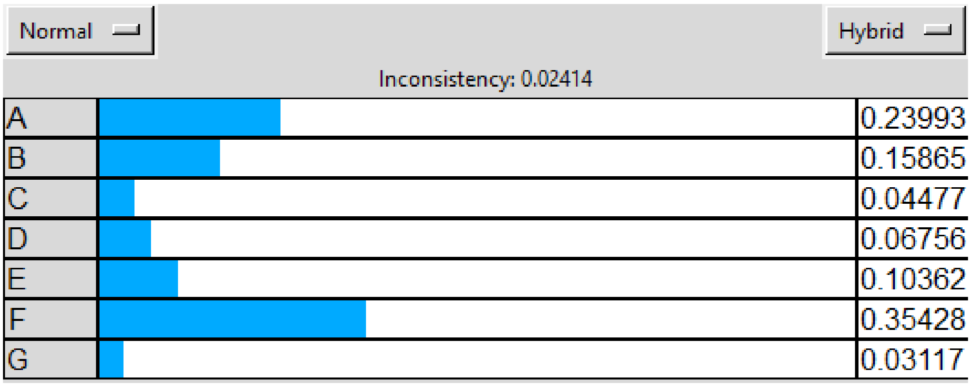

Figure 5. The relative weights of research factors

Based on the relative weights obtained, the final prioritization of research factors is shown in Table 13:

Table 13. The final prioritization of research factors

Rank	Factor	Weight
1	F	0.35428
2	A	0.23993
3	B	0.15865
4	E	0.10362
5	D	0.06756
6	C	0.04477
7	G	0.03117

4. Discussion

Based on the research results, seven key factors for better and more successful branding of pharmaceutical companies in Metaverse were identified and prioritized. These factors are discussed in order of priority below. The most important factor is flexibility in using ever-changing formats. Because branding of the pharmaceutical industry will be very emerging in Metaverse, companies must be prepared at the beginning for flexibility and trial and error of various formats and techniques. The second important factor is using advanced 3D Analytics and Data in branding process design by pharmaceutical companies. Until now, the data we could collect was two dimensional. Introducing the Z-dimension allows for real time heat maps of global customer behaviour. The third important factor is Integrating users' brand experience in the real and virtual world. The Metaverse blends real and virtual worlds with users frequently switching between the two, For this reason, and pharmaceutical companies must be able to integrate brand experiences. The fourth important factor is creating virtual communities by pharmaceutical brands in Metaverse. Pharmaceutical brands can build engaging communities that provide a place for customers to participate with both the brand itself and fellow supporters of the brand. The fifth important factor is designing and using of new tools for evaluating the branding process of the pharmaceutical industry in Metaverse. Effective tools in the real world are unlikely to work well in the virtual world. The sixth important factor is using sensory marketing techniques in the Metaverse to engage the five senses of pharmaceutical audiences. The main emphasis of this factor is on the importance of using sensory marketing in the branding of the pharmaceutical industry in Metaverse, because in the Metaverse environment, all the audience's senses will be targeted so that they can gain a more real experience. For this reason, pharmaceutical companies need to be well-prepared on how to use sensory techniques in branding. Finally, the seventh important factor is strengthening the legal infrastructure of pharmaceutical companies to protect brand rights in Metaverse. The Metaverse is a new space that requires its own legal and commercial laws, and on the other hand, companies operating in Metaverse must be legally prepared for this space. Certainly, there will be new legal challenges in the field of corporate branding in Metaverse that we have not faced so far in the real world. Therefore, pharmaceutical companies must also prepare and equip themselves to face such challenges.

5. Limitations and future research

One of the inherent limitations of this research was its focus on the pharmaceutical industry, and therefore the results can not be confidently generalized to other industries. Another limitation of this study was the lack of access to sufficient resources for branding in Metavars. There is a lot of research in this area and we are still at the beginning of the road. The third limitation of this research was the lack of accurate knowledge of marketing experts in the pharmaceutical industry with Metavres. Metavars is still very opaque to experts in many respects, and it is difficult to comment on it due to the lack of practical experience in this field. Given the aforementioned limitations, future researchers are encouraged to continue identifying key branding factors in the pharmaceutical industry in Metavars (initiated by the present study) and to add new ones to the existing list. In addition, try to achieve a process model for branding in Metavars.

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Consent for publication

Not applicable.

Ethics approval and consent to participate

Not applicable.

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