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Analysis of Marketing Innovation Risk Based on Network Model

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Abstract

This paper puts forward the network model to analyze the marketing innovation risk, according to the characteristics of modern enterprises' marketing innovation, importing the concept of project network figure from the theory of project management. In order to provide an effective marketing innovation risk analysis method for modern enterprises. This paper also uses the network model to analyze two new marketing innovation policy of an automobile company.

Keywords: *marketing innovation, risk, network model, project network figure, aftereffect*

1. Introduction

Marketing innovation is the driving force of modern enterprise's development, as well as the key to gaining competitive advantage in the market competition. Marketing innovation is one of enterprise's technological charactering by high-risk and high-yield, which is crucial to the development of enterprises whether they can reasonably analyze and avoid marketing innovation risk or not.

Marketing innovation risk is a kind of speculative risk which is manageable, and there are three theory modes of study on marketing innovation risk management: first, draw the theory of risk identification, prevention and control in Insurance, and study issues of marketing innovation risk management. Second, draw the theory of enterprise risk management to research marketing innovation risk. Third, prevent and control risks through corporate marketing innovations. Therefore, in order to guard against the risk of marketing innovation and achieve the goal of marketing innovation, we need to carry out effective prediction and assessment analysis for marketing innovation risk, and constantly improve the marketing innovation management, such as conducting market research, evaluating innovative ideas, advancing marketing innovation according to the needs of the customers and requirements of the enterprise's development strategy, and implementing effective marketing strategies.

According to the features of modern enterprise's marketing innovation, this paper imports the theory of project management network figure, and analyzes the marketing innovation risk based on the network model, in order to provide an effective risk analysis way for modern enterprises to develop marketing innovation activities.

2. Introduction of Risk Theory and Network model Theory

2.1. Introduction of Risk and Marketing Innovation Risk Theory

The risk theory is divided into pure risk and speculative risk[1]. Pure risk is the risk without profit opportunity except loss opportunity, such as fires, earthquakes, etc. And there are two possible consequences which are Loss and no Loss. Speculative risk is the risk that has both loss opportunity and profit opportunity, with three possible

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consequences of earnings, loss and the break-even, such as the risk exists in equity investments and business activities. Speculative risk has variable degrees of attractiveness because of profitability, and leads people willingly to take risks to obtain the benefit.

Marketing innovation risk is a kind of speculative risk that is manageable, preventable, controllable and dynamic. It refers to the possibility leading to the failure, suspension, revocation, extension of marketing innovation activities or failure to reach the expected economic indicators, which is because of the uncertainty in the external environment, the difficulty and complexity of marketing innovation project itself, and the limitation of innovators' ability and strength. The marketing innovator hopes to get the desired benefits through successful marketing innovation. However, as marketing innovation system is under the action of external factors and internal factors, innovation activities eventually have three possible consequences: first is successful innovation of achieving the desired objectives; second is failed innovation of immaterializing the intended goals, and even failing to recycle the invested funds; third is marketing innovation does not produce the ideal results, only makes the investment and revenue essentially flat[2].

In order to ensure the success of marketing innovation, many domestic and foreign experts conducted intensive research to predict and prevent the innovation risk, such as AHP, Fuzzy Evaluation Method, RAROC Management, Macaulay Model, and BP Artificial Neural Network Forecasting Analysis, but it has great limitations to be applied to predicting and evaluating marketing innovation risk. Therefore, it is a more effective way to analyze the marketing innovation risk by inciting network model.

2.2. Introduction of Project Network Figure and Network Model Theory

To analyze marketing innovation activity from the perspective of project management, the activity can always be divided into several stages, and every stage of the risk has the characteristic of passing back from the former. Project network diagram in project management is a directed acyclic graph, it represents the work that is necessary to push forward the plan according to the time order and subordinate relationship, it makes the comprehensive description of the developing process and its internal logic of the project at the aid of networks, and it is the basis for planning and calculation, also a notable feature of the network planning technology.

Marketing innovation can be divided into many stages, including originality, scheme, implementation, evaluation etc. These stages are of interdependence and mutual constraints in time series, organization and other aspects, and network diagram can clearly express the relation of dependence and restriction of the various stages. Similarly, project network diagram can also clearly depict the influential relationship of the risk of each stage. Therefore, network diagram is also an important tool to study risk transfer in each stage of marketing innovation.

The precondition to study the marketing innovation risk by network model is to convert the process of marketing innovation into a project network diagram. The basic idea is as follows: the marketing innovation project stage is represented by the nodes, and the universal set of nodes recorded as $\boldsymbol{W}$. Set $\boldsymbol{w_1}$, $\boldsymbol{w_2}$: to be the two stages of marketing innovation project, $\boldsymbol{w_1}$, $\boldsymbol{w2} \in \boldsymbol{W}$. If w_1 completes before $\boldsymbol{w_2}$, or $\boldsymbol{w_2}$ has to start after the success of stage $\boldsymbol{w_1}$, then there is a directed arc ($\boldsymbol{w_1}$, $\boldsymbol{w_2}$) from $\mathbf{w_1}$ to $\boldsymbol{w_2}$, and the universal set of the directed arc is recorded as $\boldsymbol{U}$. Though such analysis, the process of marketing innovation project can be represented by a directed network $\boldsymbol{N} = (\boldsymbol{W}, \boldsymbol{U})$, which is called the process diagram of marketing innovation project.

Each stage of a marketing innovation activity is always sequential in time. Therefore, for a marketing innovation activity of n stages, we can use the sequence of $w_1, w_2, \ldots, w_n$ to represent the process of the project. If $i < j$, then it means $w_i < w_j$. If there is a directed arc (w_i, w_j), then it is said w_j has an aftereffect on w_i, and w_j is called residual node for w_i. Particularly, if $j = i + 1$, we say w_j has tight aftereffect on w_i, and w_j is called tight residual node for w_i.

3. Analysis of Network Model for Single Marketing Innovation Project

Set $D = (W, U)$ is a marketing innovation project diagram, and define a real-valued function P on U as follows:

$$0 < P(\alpha) \leq 1.$$

We call $P(\alpha)$ as the successful rate of directed arc of α.

If the arc α is (w_1, w_2), then $P(\alpha)$ is called the success rate from stage w_1 to stage w_2, and represented as $P(w_1, w_2)$. We assume that the marketing innovation project can be divided into 6 stages, as shown below:

$$W_1 \xrightarrow{p_2} W_2 \xrightarrow{p_2} W_3 \xrightarrow{p_3} W_4 \xrightarrow{p_4} W_5 \xrightarrow{p_5} W_6$$

The success rate of a marketing innovation activity refers to the success rate from the start node of the project to the end node. And the failure rate of the project is obtained by subtracting the success rate of 1, which can represent the failure risk of the marketing innovation project[3].

As we decide to carry out a marketing innovation project activity, it means the beginning and implementation of the first node of the marketing innovation project. Therefore, the success rate of the first node of a marketing innovation activity is 1, and the success rate of the various stages of marketing innovation project D is calculated as follows.

$P(w_1 \rightarrow w_2) = 1$

$P(w_1 \rightarrow w_2) = P(w_1 \rightarrow w_2) P_1 = P_1$

$P(w_1 \rightarrow w_2) = P(w_1 \rightarrow w_2) P_2 = P_1 \cdot P_2$

$P(w_1 \rightarrow w_2) = P(w_1 \rightarrow w_2) P_2 = P_1 \cdot P_2 \cdot P_3$

…… …… …… …… …… …… …… ……

$P(w_1 \rightarrow w_6) = P(w_1 \rightarrow w_2) P_5 = P_1 \cdot P_2 \cdot P_3 \cdot P_4 \cdot P_5$

It can be derived that success rate of the marketing innovation project is

$P = P_1 \cdot P_2 \cdot P_3 \cdot P_4 \cdot P_5$

Similarly, we can derive the success rate of the market innovation activity with n nodes is

$\overline{P} = P_1 \cdot P_2 \cdot \ldots \cdot P_{n-1}$

The failure rate of the marketing innovation project is

$F = 1 - \overline{P} = 1 - P_1 \cdot P_2 \cdot \ldots \cdot P_{n-1}$

4. Analysis of Risk Network Model for Multiple Marketing Innovation Project

Network model analysis of individual marketing innovation risk only studys the success rate and failure risk of innovation itself, but the actual marketing innovation activity often contains several projects, and each item is mutually influential, so study on the risk of multiple marketing innovation projects will be universally significant when they are interacted.

We assume that the marketing innovation of an enterprise includes two major innovation projects N_1 and N_2, and contains two project process diagrams $D_1 = (W_1, U_1)$, $D_2 = (W_2, U_2)$, among them, $W_1 = \{w_1, w_2, \ldots, w_n\}$, $W_2 = \{v_1, v_2, \ldots, v_m\}$, and $w_1, w_2, \ldots, w_n$ means the n stages of project N_1, and $v_1, v_2, \ldots, v_m$ means the m stages of project N_2. If w_i has influence on w_j, then it is recorded as a directed arc (w_i, w_j). The network diagram represents by a directed arc of the interaction of each stage of different project, we call it project network diagram, as shown below.

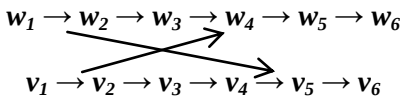
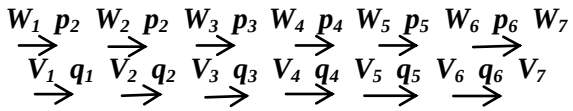


Diagram of the Project Network

In the project network diagram, if when it is $i < j$, there is a directed arc (w_i, w_j), then we call the stage w_i of D_1 has the tight postrelevence with the stage v_j of D_2. If all the stages of the two innovation project N_1 and N_2 form the tight postassociation with each other, then it is said the two project N_1 and N_2 have tight postassociation. Similarly, the relationship diagram of more than two projects can be defined[4].

In the project of general marketing innovation, the influence of different stages in the same project is only of tight aftereffect, the influence in different projects is of tight postrelevence, and only when the two projects are carried out at the same time, the tight postrelevence occurs. This paper takes the mutual influence of two marketing innovation projects as an example, studying the marketing innovation risk, and by analogy, the project network diagram is as follows.



Diagrams of Two Marketing Innovation Project

For the stages of two different projects D_1 and D_2, the relationship between w_i and w_j measures with the probability of E_{ij} for w_i's influence on v_j, as the following formula shown below.

$E_{ij} = f_1 (w_i, v_j)$ (i = j)

$0 <= E_{ij} <= 1$.

Similarly, we can also get the probability S_{ij} for v_j's influence on w_i

$S_{ij} = f_2 (v_j, w_i)$ (i = j + 1)

$0 <= S_{ij} <= 1$.

For the beginning of two marketing innovation project, we assume that

$P (w_1 \rightarrow w_1) = 1$

$P (v_1 \rightarrow v_1) = 1$.

In the network diagram of two marketing innovation project, the success rate of project D_1 is calculated as follows.

$P (w_1 \rightarrow w_2) = P (w_1 \rightarrow w_2) = P (w_1 \rightarrow w_1) P_1 = P_1$.

When i>3, due to the impact of project D, the success rate is calculated as follows.

$$W_{i-1} \xrightarrow{P_{i-1}} W_1$$
$$V_{i-1} \xrightarrow{S_{i-1}} W_i$$

The Success Rate of Di When the Two Marketing Innovation Projects Interact

According to the combination probability theory, we can get the success rate of $P(w_1 \rightarrow w_i)$ is

$P(w_1 \rightarrow w_i) = 1 - [1 - P(w_1 \rightarrow w_{i-1}) P_{i-1}] [1 - P(v_1 \rightarrow v_{i-1}) S_{i-1,i}] \quad i \geq 3.$

And the failure rate $f(w_1 \rightarrow w_i)$ is

$f(w_1 \rightarrow w_i) = 1 - P(w_1 \rightarrow w_i) = [1 - P(w_1 \rightarrow w_{i-1}) P_{i-1}] [1 - P(v_1 \rightarrow v_{i-1}) S_{i-1,i}]$

The success rate of project D_2 is calculated as follows.

$$W_{t-1} \xrightarrow{s_{t-1}} V_t$$
$$V_{i-1} \xrightarrow{q_{t-1}} V_i$$

The Success Rate of D2 when the Two Marketing Innovation Projects Interact

According to the analysis method above, we can get the calculation formula of success rate of project D_2 is as follows:

$P(v_1 \rightarrow v_i) = 1 - [1 - P(v_1 \rightarrow v_{i-1}) q_{i-1}] [1 - P(w_1 \rightarrow w_{i-1}) E_{i-1,i}].$

And the calculation formula of failure rate of project D_2 is as follows:

$f(v_1 \rightarrow v_i) = 1 - P(v_1 \rightarrow v_i) = [1 - P(v_1 \rightarrow v_{i-1}) q_{i-1}] [1 - P(w_1 \rightarrow w_{i-1}) E_{i-1,i}] \quad i >= 2.$

Similarly, we can derive the calculation formula of success rate and failure rate of more than two marketing innovation projects when they interact[5].

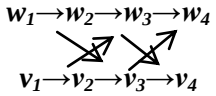
5. A Case Study

In order to improve the overall downturn situation of the current auto market, a domestic auto company wants to launch two marketing innovation programs to stimulate the market and excite the consumers' purchasing desire: one is the innovation program N_1 of the car price system, the other is the innovation program N_2 of strengthening the dealer channel control, and these two marketing innovation programs affect each other. The rationality of establishing vehicle price system innovation scheme will directly affect the attraction to customers, thereby affect the enthusiasm of the dealers, thus affect the auto company's control power on the reseller channel, and ultimately affect the effective implementation of innovation scheme of the channel control. At the same time the effort of channel control and the effort of the implementation of innovation scheme will also affect the implementation of the price innovation program. In order to ensure the effective implementation of the two innovation program, and effectively control the marketing innovation risk, the car company will take risk assessment of its two marketing innovation programs, we use the network model of marketing innovation risk analysis to analyze the risk of the two new marketing innovation.

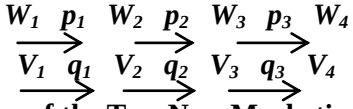
The first step: We conduct stage division for the two new marketing innovation programs.

Project	Stage 1	Stage 2	Stage 3	Stage 4
The car price system innovation scheme	A comprehensive survey of the existing price system	Developing detailed vehicle price system innovation scheme	The implementation of the price system innovation scheme	The further implement and evaluation of the price system innovation scheme
Code	W_1	W_2	W_3	W_4
Strengthening the innovation scheme of dealer channel control	A comprehensive survey of the existing innovation scheme of channels control	Developing detailed innovation scheme of strengthening channel control	Implementation of strengthening the innovation scheme of channel control	Further implementation and evaluation of the innovation scheme of strengthening the channel control
Code	V_1	V_2	V_3	V_4

The second step: Make the project network diagram of the two new marketing innovation programs



Network diagram of the project



Network Diagram of the Two New Marketing Policy Projects

The third step: Determine the success rate and the influence probability

According to current situation of the marketing innovation plan, we make a detailed investigation analysis of the implementation and the influence between the two marketing innovation plans, then preliminarily draw the following data.

The Success Rate in Different Stages of the Project			
Stage	$W_1 \rightarrow W_2$	$W_2 \rightarrow W_3$	$W_3 \rightarrow W_4$
Success rate P	P_1	P_2	P_3
Numerical value	0.80	0.76	0.84
Stage	$V_1 \rightarrow V_2$	$V_2 \rightarrow V_3$	$V_3 \rightarrow V_4$
Success rate q	q_1	q_2	q_3
Numerical value	0.82	0.78	0.81

Influence probability matrix between each project node:

	Project N_2	Stage 1	Stage 2	Stage 3	Stage 4
Project N_1		V_1	V_2	V_3	V_4
Stage 1	W_1	0.50	0.66	0.54	0.55
Stage 2	W_2	0.54	0.65	0.81	0.63

Stage 3	W_3	0.45	0.75	0.82	0.68
Stage 4	W_4	0.46	0.55	0.58	0.61

Note: The above data synthesized from the actual investigation and analysis of experts

The fourth step: Calculate the success rate and failure rate of the two new marketing innovation programs

The success rate of project N_1 is calculated as follows

$P(w_1 \rightarrow w_1) = 1$,

$P(w_1 \rightarrow w_2) = P(w_1 \rightarrow w_1) P_1 = P_1 = 0.80$,

$P(w_1 \rightarrow w_3) = 1 - [1 - P(w_1 \rightarrow w_2) P_2][1 - P(v_1 \rightarrow v_2) S_{2,3}] = 0.8491$,

$P(w_1 \rightarrow w_4) = 1 - [1 - P(w_1 \rightarrow w_3) P_3][1 - P(v_1 \rightarrow v_3) S_{3,4}] = 0.8589$.

Failure rate: $f = 1 - P(w_1 \rightarrow w_4) = 0.1411$.

The success rate of project N_2 is calculated as follows

$P(v_1 \rightarrow v_1) = 1$,

$P(v_1 \rightarrow v_2) = P(v_1 \rightarrow v_1) P_1 = P_1 = 0.82$

$P(v_1 \rightarrow v_3) = 1 - [1 - P(v_1 \rightarrow v_2) q_2][1 - P(w_1 \rightarrow w_2) E_{3,3}] = 0.8760$,

$P(v_1 \rightarrow v_4) = 1 - [1 - P(v_1 \rightarrow v_3) q_3][1 - P(w_1 \rightarrow w_3) E_{4,4}] = 0.8600$.

Failure rate: $f = 1 - P(v_1 \rightarrow v_4) = 0.1400$.

According to the calculation, when the two projects are implemented jointly, due to the influence of strengthening the innovation plan of channel control, the success rate of the innovation plan of the vehicle price system is 85.89%, and because of the impact of the vehicle price system, the success rate of the innovation plan of strengthening the channel control is 86%. With the calculation results, the car company has successively launched the two new marketing innovation programs, on one hand to stimulate the car market through the vehicle price system innovation, to relieve the downturn in the auto market since June this year; on the other hand, at the same time to strengthen the management of distributors through strengthening the channel control innovation program, to avoid the project problems of "goods string" phenomenon and the disunity of price, *etc*.

6. Conclusion

To sum up, the marketing innovation is often the key to obtain the competitive advantage for enterprises, a successful marketing activity can make enterprises obtain powerful development force, but a failed one will often make enterprises lose vitality. Therefore, the analyzing method of the marketing innovation risk based on the network model that proposed in this paper, carries out a comprehensive analysis of the marketing innovation activity risk from a new angle, and proposes a calculating formulas for marketing innovation risk, in addition, it has certain theorical innovation value and practical application value, and provides a valuable analyzing method for the modern enterprise to carry out marketing innovation activities.

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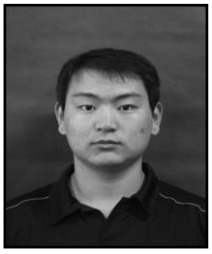

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