Research on the choice of the "Internet +" business model based on a multi-level grey evaluation method

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Abstract. Through the morphological matrix combination, the industrial chain integration driving body, the flow degree of the value chain, and the way of value creation are divided into 12 business models. Based on the analysis of the value proposition, value transmission, value realization, and scope of application of the 12 business models, the optimization law of the business model is considered. After deleting two unfeasible business models, 10 "Internet +" business model sets are finally obtained; Next, the multi-level grey evaluation method is used to construct the "Internet +" business model selection model; Finally, through typical cases to verify the "Internet +" business model selection model, to illustrate the feasibility of the study.

Keywords: "Internet +"; business model; multi-level grey evaluation method

1 Introduction

The concept of "Internet +" was first proposed in the industry in 2012, and the concept of "Internetization" appeared in 2007. The process of reducing operating costs through the online and digitization of data [1]. Enterprises are trying to use a new generation of information technology and Internet thinking to innovate business models: the fuzziness of the Internet can break the original successful business model, the industrial division of labor is gradually replaced by cooperation, and the cross-border industry can be related to the original complementary and relevant industries, forming different new business forms. In short, the different characteristics of the Internet reflect the different ideas of reshaping the business value chain with Internet thinking [2], resulting in the emergence of a variety of disruptive innovation, cross-border innovation, and cross-generation innovation operating models. Internet information technology has become an incubator for a new generation of technological innovation, business model innovation, and talent innovation.

However, Internet thinking brings opportunities to enterprise business models [3], helps realize intelligent production, network supply, and meets personalized and diver-

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sified consumer demand, while enterprises are faced with a huge test of business transformation. For example, business models within the original industrial boundaries are difficult to adapt to the new business formats of industrial integration. The original trust mode among stakeholders is difficult to support the communication intention of information symmetry, and the original value creation logic is difficult to realize the new requirements of a win-win situation between customer value creation and enterprise value realization [4]. In addition, in the external environment, the formulation of relevant government policies and the development of information technology has a subversive impact on the original strategy and business model of enterprises. Moreover, the research shows that in today's dynamic changes in the external environment, No business model is static [5], and no business model is universally applicable [6]. Only when enterprises choose business models with competitive advantages along with their business strategies can they continue to survive and develop [7]. Based on the above background, the research on the "Internet +" business model and its selection has become the next problem that needs to be urgently solved.

2 "Internet +" business model collection characteristics and feasibility analysis

The value proposition, value delivery, value realization, and scope of application of the 12 identified "Internet +" business models are analyzed [8], as shown in Table 1.

Table 1. Analysis of the "Internet +" business model

No.	Pattern name					
M_1-M_6	Focused business model	Channel business model	Coordinated business model	Focused business model	All-rounder business model	Open business model
M_7-M_{12}	Long tail business model	Development business model	Freemium business model	Lock the business model	Community-based business model	Network business model

According to the morphological matrix, the classification dimensions and their classification marks are combined to form a complete set of "Internet +" business models. Any combination of categories in different classification dimensions may cause unreasonable or unfeasible business models. Based on the analysis of the characteristics of the complete set of 12 "Internet +" business models, combining the finiteness theory, knowledge dispersion theory, and economic man hypothesis, Considering the two business model formation methods of interpretation and analysis, the formation of business model is divided into two corresponding stages. The expert scoring method is used to evaluate the compatibility of the model from the perspective of whether it can guide the practice of the enterprise, and the infeasible business model is eliminated through rational thinking. The specific steps are as follows[9].

2.1 Description of related symbols

As can be seen from the above morphological matrix, the classification dimensions of the "Internet +" business model are as follows: respectively represent the main driver of industrial chain integration, the degree of two-way value chain flow, and the way of value creation, respectively represent the $F=\{F_1,F_2,F_3\}$ F_1、F_2、F_3 L_{ij} j classification mark in the i classification dimension, and there is a total set of "Internet +" business models. $d=12$ Set of experts, this paper selects $P=\{P_1,\ P_2,\ldots,P_5\}$ 5 experts and believes that the relative importance of experts is the same. $t=(1,2\ldots,5)$

2.2 Experts give the compatibility judgment between classification and identification

For the "Internet +" business model set, the judgment matrix of the t expert on the compatibility between the classification signs in the d business model is, indicating that the t $U_d^t=\left[\delta^t\left(L_a^d,L_b^d\right)\right]_{3*3}$ $\delta^t=\left(L_a^d,L_b^d\right)$ expert evaluates the compatibility between the classification signs in the d business model. L_a^d L_b^d The evaluation does not consider the compatibility of its classification marks. The value on the main diagonal is recorded as 0, which is not included in the calculation, and the evaluation value of the upper diagonal and the lower diagonal in the compatibility judgment matrix is equal, so only the upper diagonal is calculated for simplification. 1 indicates Incompatible. 2 indicates Poor compatibility. 3 indicates compatibility. 4 indicates High compatibility. 5 indicates Completely compatible.

The compatibility judgment matrix of p experts is listed one by one, thus obtaining the compatibility group judgment matrix of the D-th business model, representing the classification identification of the D-th business model $U_d=\left[\delta\left(L_a^d,L_b^d\right)\right]_{3*3}$ and the evaluation value of inter-group compatibility. The calculation formula is as follows: $\delta=\left(L_a^d,L_b^d\right)$ L_a^d L_b^d

$$\delta\left(L_a^d,L_b^d\right)=\frac{1}{s}\sum_{t=1}^{s}\delta^t\left(L_a^d,L_b^d\right),d\in\{1,2,\ldots,12\} \tag{1}$$

The compatibility evaluation matrix obtained by the five experts is converted into the compatibility group evaluation matrix according to formula (1) as follows:

$$U_1=\begin{bmatrix}- & 4.2 & 2.8\\ \vdots & - & 4\\ - & \cdots & -\end{bmatrix}\quad U_2=\begin{bmatrix}- & 4.2 & 3.8\\ \vdots & - & 4.2\\ - & \cdots & -\end{bmatrix}\quad U_3=\begin{bmatrix}- & 4.2 & 4\\ \vdots & - & 2.8\\ - & \cdots & -\end{bmatrix}\quad U_4=\begin{bmatrix}- & 2.8 & 2.8\\ \vdots & - & 3\\ - & \cdots & -\end{bmatrix}$$

$$U_5=\begin{bmatrix} - & 2.8 & 3.8 \\ \vdots & - & 4.2 \\ - & \cdots & - \end{bmatrix} \quad U_6=\begin{bmatrix} - & 2.8 & 4 \\ \vdots & - & 4.2 \\ - & \cdots & - \end{bmatrix} \quad U_7=\begin{bmatrix} - & 3 & 4 \\ \vdots & - & 4 \\ - & \cdots & - \end{bmatrix} \quad U_8=\begin{bmatrix} - & 3 & 4.2 \\ \vdots & - & 4.2 \\ - & \cdots & - \end{bmatrix}$$

$$U_9=\begin{bmatrix} - & 3 & 2.6 \\ \vdots & - & 2.8 \\ - & \cdots & - \end{bmatrix} \quad U_{10}=\begin{bmatrix} - & 3.8 & 4 \\ \vdots & - & 3 \\ - & \cdots & - \end{bmatrix} \quad U_{11}=\begin{bmatrix} - & 3.8 & 4.2 \\ \vdots & - & 4.2 \\ - & \cdots & - \end{bmatrix} \quad U_{12}=\begin{bmatrix} - & 3.8 & 2.6 \\ \vdots & - & 4.4 \\ - & \cdots & - \end{bmatrix}$$

2.3 Compatibility calculation

According to Formula (2), the group judgment matrix of compatibility among classification marks of each "Internet +" business model is calculated, 12 overall compatibility evaluation values are obtained, and the compatibility average evaluation value of $\delta(M_d)$ the "Internet +" business model is obtained according to formula (3). $\bar{\delta}(M)$

$$\delta(M_d)=\sum_{a=1}^{3}\sum_{b=2}^{3}\delta\left(L_a^d,L_b^d\right), d\in\{1,2,\ldots,12\} \tag{2}$$

$$\bar{\delta}(M)=\frac{1}{12}\sum_{d=1}^{12}\delta(M_d) \tag{3}$$

$\delta(M_1)$ The overall compatibility evaluation value of 12 "Internet +" business models $\delta(M_2)$ is =11, =12.2, =11, $=\delta(M_3)$ 8.6, $=\delta(M_4)$ 10.8, $\delta(M_5)$ =11.2, $=\delta(M_6)$ 11, $=\delta(M_7)$ 11.4, =8.4, $=\delta(M_8)$ 10.8, $=\delta(M_9)$ 12.2, $\delta(M_{10})$=10.8, and the $\delta(M_{11})$ average compatibility evaluation value is $\delta(M_{12})$=10.78. $\bar{\delta}(M)$

2.4 Eliminate unreasonable models

According to the rules of business model generation, in the "Internet +" business model set, if the overall compatibility evaluation value is less than the compatibility evaluation value of the model, it means that the business model is not feasible, it should be removed from the model set, and the eliminated "Internet +" business model set number will be rearranged in turn. According to the above results, the overall evaluation value of compatibility of mode 4 and mode 9 is less than the average evaluation value of compatibility $=\bar{\delta}(M)$ 10.78.

Entity-driven strong user relationship-dependent business model has competitive advantages in user offline experience, physical marketing, and other aspects. Strong user relationship indicates that the enterprise business model should be in the growth and maturity stage, and the internal resources of the enterprise are relatively rich. Improving

the business model by relying on external partners will cause a waste of enterprise resources. The Internet-driven weak user relationship integrated business model has more competitive advantages for Internet enterprises in Internet technology development and application, brand influence, market appeal, Internet marketing resources, and their user base, etc. Weak user relationship indicates that the enterprise business model is in the initial stage, and it is difficult to improve the business model by integrating its resources. From the rational point of view and the model formation rules, both of these are not the best state for enterprises to innovate business models, and do not conform to the law of enterprise business model optimization. Therefore, these two business models are eliminated, and finally, ten "Internet +" business models are identified, and the model numbers are rearranged.

3 Data analysis

(1) Evaluation sample matrix calculation.

Five internal "Internet +" business model implementers were invited to score 10 "Internet +" business models according to the existing evaluation index grade standards and combined with the current situation of the enterprise, and the relevant evaluation matrix was obtained. This paper takes M1 as an example to demonstrate and get the evaluation sample matrix of M1

(2) Evaluation index grey evaluation coefficient and grey weight vector calculation.

The grey evaluation coefficient and grey evaluation weight of evaluation indicators are calculated, and the evaluation weights of different indicators in each grey grade are integrated. Taking the first-level index of value creation ability as an example, the grey evaluation coefficient and evaluation weight of the three second-level indicators are calculated respectively, as shown in Table 2 to 4. The grey evaluation weight matrix of all evaluation indicators is shown in Table 5.

Table 2. Evaluation coefficient and weight vector calculation results of C_1 secondary indexes

c_{11}	Grade	The expert score for albino power conversion					Evaluation coefficient	Weight vector component
	"Superior" g=1	0.555556	0.666667	0.555556	0.777778	0.666667	3.2222	0.2634
	"Good" g=2	0.714286	0.857143	0.714286	1	0.857143	4.1429	0.3387
	"Medium" g=3	1	0.8	1	0.6	0.8	4.2	0.3434
	"Low" g=4	0.333333	0	0.333333	0	0	0.6667	0.0545
	"Difference" g=1	0	0	0	0	0	0	0.0000
Comprehensive evaluation coefficient							12.2317	

Table 3. The Results of Evaluation Coefficient and Weight Vector of Secondary Indicators C_1

c_{12}	Grade	The expert score for albino power conversion					Evaluation coefficient	Weight vector component
	"Superior" g=1	0.666667	0.444444	0.666667	0.555556	0.555556	2.8889	0.2342
	"Good" g=2	0.857143	0.571429	0.857143	0.714286	0.714286	3.7143	0.3011
	"Medium" g=3	0.8	0.8	0.8	1	1	4.4	0.3567
	"Low" g=4	0	0.666667	0	0.333333	0.333333	1.3333	0.1081
	"Differ-ence" g=1	0	0	0	0	0	0	0.0000
Comprehensive evaluation coefficient							12.3365	

Table 4. The Results of Evaluation Coefficient and Weight Vector of Secondary Indicators C_1

c_{12}	Grade	The expert score for albino power conversion					Evaluation coefficient	Weight vector component
	"Superior" g=1	0.444444	0.333333	0.555556	0.333333	0.555556	2.2222	0.1790
	"Good" g=2	0.571429	0.428571	0.714286	0.428571	0.714286	2.8571	0.2302
	"Medium" g=3	0.8	0.6	1	0.6	1	4	0.3223
	"Low" g=4	0.666667	1	0.333333	1	0.333333	3.3333	0.2685
	"Difference" g=1	0	0	0	0	0	0	0.0000
Comprehensive evaluation coefficient							12.4172	

Table 5. Grey weight vectors for each indicator

M_1	1	2	3	4	5	M_1	1	2	3	4	5
r_{11}	0.2634	0.3387	0.3434	0.0545	0.0000	r_{33}	0.1923	0.2473	0.3132	0.2473	0.0000
r_{12}	0.2342	0.3011	0.3567	0.1081	0.0000	r_{34}	0.2134	0.2744	0.3521	0.1601	0.0000
r_{13}	0.1790	0.2302	0.3223	0.2685	0.0000	r_{41}	0.2342	0.3011	0.3567	0.1081	0.0000
r_{21}	0.3271	0.3958	0.2771	0.0000	0.0000	r_{42}	0.1717	0.2208	0.3091	0.2983	0.0000
r_{22}	0.2869	0.3689	0.3165	0.0278	0.0000	r_{43}	0.2065	0.2655	0.3394	0.1886	0.0000
r_{23}	0.3518	0.4020	0.2462	0.0000	0.0000	r_{44}	0.1496	0.1923	0.2692	0.3889	0.0000
r_{24}	0.2202	0.2831	0.3646	0.1321	0.0000	r_{51}	0.1578	0.2029	0.2841	0.3551	0.0000
r_{25}	0.3020	0.3640	0.3057	0.0283	0.0000	r_{52}	0.2000	0.2572	0.3601	0.1827	0.0000
r_{31}	0.1790	0.2302	0.3223	0.2685	0.0000	r_{53}	0.1502	0.1931	0.2704	0.3863	0.0000
r_{32}	0.1738	0.2235	0.3129	0.2897	0.0000						

(3) Comprehensive evaluation of secondary indicators.

The grey evaluation weight matrix obtained from the above respectively enumerates the evaluation weight matrix of different grey levels of each secondary index under the first index, calculates according to the corresponding secondary index weight phase, and obtains the comprehensive evaluation. Calculate the comprehensive evaluation of C_1 q_1 .

$$q_1 = b_1 \times r_1 = [0.1064, 0.0398, 0.0695] \times \begin{bmatrix} 0.2634 & 0.3387 & 0.3434 & 0.0545 & 0 \\ 0.2342 & 0.3011 & 0.3567 & 0.1081 & 0 \\ 0.1790 & 0.2302 & 0.3223 & 0.2685 & 0 \end{bmatrix}$$

=[0.0498, 0.0640, 0.0731, 0.0288, 0] By the same token, we get:

q_2 =[0.0805, 0.0976, 0.0842, 0.0125, 0] q_3 =[0.0565, 0.0727, 0.0972, 0.0765, 0]

q_4 =[0.0276, 0.0355, 0.0459, 0.0304, 0] q_5 =[0.0109, 0.0140, 0.0196, 0.0227, 0]

(4) Comprehensive evaluation of first-level evaluation indicators.

Calculate the weight matrix R of the first level evaluation index, calculate the weight of the first level index, and the corresponding evaluation result of the first level index weight matrix.

$$R = \begin{bmatrix} 0.0498 & 0.0640 & 0.0731 & 0.0288 & 0 \\ 0.0805 & 0.0976 & 0.0842 & 0.0125 & 0 \\ 0.0565 & 0.0727 & 0.0972 & 0.0765 & 0 \\ 0.0276 & 0.0355 & 0.0459 & 0.0304 & 0 \\ 0.0109 & 0.0140 & 0.0196 & 0.0227 & 0 \end{bmatrix}$$

$$Q_1 = W \times R = [0.2097, 0.3117, 0.2727, 0.1333, 0.0727] \times \begin{bmatrix} 0.0498 & 0.0640 & 0.0731 & 0.0288 & 0 \\ 0.0805 & 0.0976 & 0.0842 & 0.0125 & 0 \\ 0.0565 & 0.0727 & 0.0972 & 0.0765 & 0 \\ 0.0276 & 0.0355 & 0.0459 & 0.0304 & 0 \\ 0.0109 & 0.0140 & 0.0196 & 0.0227 & 0 \end{bmatrix}$$

=[0.0554, 0.0694, 0.0756, 0.0365, 0]

(5) Calculate the comprehensive evaluation value.

Calculate the value vector of each gray grade and the comprehensive evaluation result of the first level index, and get the comprehensive evaluation value of the final business model's competitiveness.

$Y_1 = Q_1 \times C$ =[0.0554, 0.0694, 0.0756, 0.0365, 0][100,85,70,55,40]$\times$ ^{T}=18.7423

According to the above calculation process, the comprehensive evaluation value of the competitiveness of the other nine business models is calculated as follows: Y_2=16.5223, Y_3=18.9512, Y_4=14.8669, Y_5=16.2413, Y_6=14.5892, Y_7=17.5441, Y_8=15.9564, Y_9=19.7389, Y_{10}=20.0446. t can be concluded that business model ten has the strongest competitive ability, and LS company should choose the network business model.

4 Conclusion

Construct the "Internet +" business model selection model: Based on the analysis of the value proposition, value realization, and user relationship characteristics of ten "Internet +" business models, this paper uses the multi-level grey evaluation method to construct the "Internet +" business model selection model and selects the business model with the strongest competitive ability.

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