RESEARCH ON THE DEVELOPMENT OF BUSINESS MODEL BASED ON MOBILE APPs

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Abstract. As the mobile Internet develops rapidly, it is playing an increasingly important role in people's daily life nowadays. Mobile ends such as mobile phones and pads lift the time and place limitations of applications (APPs) and APP users spend more time on mobile ends than on the PC end. This paper mainly studies the business models of mobile APPs. Firstly, the theoretical basis related to this study is described. Then, taking a reading APP-QQ reading as an example, we studies its business model from the aspects of industrial chain model, profit model, communication channels and market positioning and makes a multi - level fuzzy comprehensive evaluation on it. Finally, suggestions are put forward to solve the problems found by evaluation. The study of the business model of reading apps is conducive to the development of new functions of reading software to protect readers' loyalty.

Keywords: internet, mobile end, reading APP, business model.

1. Introduction

Today, the rapid development of mobile Internet has opened a new journey of the development of the Internet [1]. Mobile Internet brings mobile Internet operators, end manufacturers and software developers together to form a complex collaborative and competitive ecosystem which creates a large number of mobile APPs which are the research objects in this paper. On this subject, domestic and foreign scholars have carried out some researches. Luo Min et al [2] suggested that a business model was a set composed by the organization itself, employees, shareholders, customers and supply chain partners to obtain excess profits, providing explicit external assumptions and internal resources. Xia Yunfeng [3] divided products into two abstract parts of core and premium and proposed that the business model of an enterprise was composed of the potential energy model and the premium model. Magretta [4] believed that the business model and business process system was closely related and it solved the four basic questions about the business experience. After presenting the four constituent elements of a business model, Dubosson et al. [5] evaluated these quantitative indicators using a balanced scorecard. All the above researches were carried out based on the business model while this paper took a reading APP as an example to see big things from small ones. By learning form the

recommendations of the QQ reading APP, a new path can be directed for the future development of mobile APPs.

2. Related theories

2.1 Overview of business model

Business model integrates all the factors required in the operation of an enterprise [6] to realize the maximum value of customers and form a complete and efficient operation system with its unique core competiveness. By satisfying the requirements and realizing the values of customers through the optimal implementation form, it also enables the system to reach the goal of obtaining sustained profits. Usually, business models include operation model, profitability model, and advertising revenue model. Ostwald and Pinnie [7] held that the business model consists of four latitudes (customer, provider, infrastructure and financial viability) and nine elements (cost structure, revenue source, important cooperation, value proposition, core resources, channel access, customer relationship and segmentation, etc). This paper takes a reading APP as an example to describe the development process of mobile reading APPs.

2.2 Multi-level fuzzy evaluation method

Fuzzy comprehensive evaluation [8] is a comprehensive evaluation method based on fuzzy mathematics to solve fuzzy problems and the ones which are difficult to be quantified, which was first put forward in 1965 by an automatic control expert Chad. Also, it is an evaluation method that integrates both accurate and inaccurate analyses which is applied in various fields. In complex systems, there are different levels of factors to consider. Hence, the evaluation factors are divided into several categories according to their attributes. Firstly, evaluation is carried out on each category of factors. Then, all the evaluation results are combined for a comprehensive evaluation. The main steps are as follows:

(1) Establishment of evaluation factor indicator system [9]. According to a certain property, the evaluation factor is divided into multiple plates.

(2) Determination of the evaluation matrix. Evaluate each small factor by a single level to obtain an evaluation matrix.

(3) Determination of factor weight. Use the expert survey method to determine the weight of the evaluation index.

(4) Evaluation implementation. Calculate the final comprehensive evaluation value according to the relevant formulas and evaluation matrixes.

3. Business model of the QQ reading APP

3.1 Industrial chain model

3.1.1 Upstream of the industry chain

In the upstream of an industry chain are normally manufacturers who provide content of the APP. In the QQ reading APP, it mainly includes authors, publishers, intermediate agents, etc. Today's domestic publishers are divided into journal publishers and electronic publishers [10]. Journal publishers integrate the content into a database and provide readers with paid resources. Electronic publishers make paper books into e-books or audio books which are then uploaded to reading software for users to read. Original literature websites publish the network literature created by network authors and provide them on the website to authors with fees charged.

3.1.2 Midstream of the industry chain

In the midstream of an industry chain often locates the content publishers, who upload the final work to the releasing platform after getting digital licenses for copyright and content resources, pricing and integration. Located between content providers and service providers and vendors, content publishers play a mainstay role in the whole industry chain [11].

3.1.3 Downstream of the industry chain

In the downstream of the industry chain lie the vendors. Connecting service providers with consumers, content vendors are mainly engaged in service sales business. With the QQ reading APP itself a vendor, some film and television enterprises are also vendors. Readers can subscribe to the books or network literature works which they are interested in via the QQ reading APP. As for the film and television enterprises, they can select the works which they like to make them into TV series or films.

3.2 Profit mode

The QQ reading APP has the following profit models [12]: (1) free reading and advertising revenue. (2) part free and part charged with original price. (3) book download charges. (4) monthly service charges. Some books or their sections are free for users to read, which attracts more readers. Excellent literary works can guide readers to support the authorized editions which charge for fees. Once readers have a good impression on the APP, they will not easily quit. Thus, the loyalty of readers is improved.

3.3 Communication channel

(1) Interpersonal propagation. Readers share their feelings or thoughts about the books they read on social platforms such as QQ or Wechat APPs to reach the purpose of recommendation.

(2) Organization propagation. Information interaction between readers can be realized on the reviewing square of the APP by bringing readers who like the same type of works together to make the readers find a sense of belonging and thus improve their loyalty [13].

(3) Social propagation. By means of the functions of sharing and commenting of the APP, more readers can be attracted, which improves the popularity of the APP.

3.4 Market positioning

To have a good sales market, market positioning and customer segmentation [14] should be first carried out for the APP. According to the survey, people with different age, gender, income and class have different preference on literature works. Table 1 is a survey of the preferences of different people.

age	group	Reading preference	Percentage (%)
15-24	students	Art type novels	30
21-28	Female white collars	Novels and human and life class books	26
26-35	male and female book lovers with discretion ability	Art type novels and human and social science books	25
36-65	Mid aged book lovers	Human and social science and historical and military books	19

Figure 1: Reader segmentation

As shown in table 1, students, female white collars and male and female book lovers with discretion ability occupy a large percentage. Therefore, the market positioning of the APP is novels, art and human and social science books.

4. Evaluation on the APP with fuzzy evaluation method

4.1 Fuzzy evaluation results

An evaluation team with 10 members was selected to carry out evaluation on each project module of the APP. The satisfaction degree of evaluation is: very satisfied (95), satisfied (85), average (75), poor (65) and very poor (55). In

addition, score 55 indicates unqualified. The detailed evaluation results are shown in table 2.

Module evaluation/ weight (secondary comprehensive evaluation)	Project evaluation /weight (first comprehensive evaluation)	Degree of satisfaction				
		Very satisfied	satisfied	average	poor	Unqualified
Book town/0.21	Content quantity/0.18	1	9	0	0	0
	Book classification/0.08	1	2	7	0	0
	Updating speed/0.18	1	7	2	0	0
	Special topic recommendation/0.02	7	1	1	1	0
	Top list recommendation/0.02	1	3	4	2	0
	Search function/0.11	4	5	1	0	0
Business management /0.15	Free trial reading/0.12	6	3	1	0	0
	Payment convenience/0.09	0	1	3	6	0
	Bargain price/0.05	1	1	2	6	0
	Free in a limited time/0.15	1	1	7	1	0
Reading function/0.28	Text adjustment/0.173	3	6	1	0	0
	Night mode/0.14	1	7	2	0	0
	Brightness mode/0.14	7	1	1	1	0
	Background adjustment/0.115	3	3	2	2	0
	Page switch/0.041	7	1	2	0	0
	Screen switch/0.099	0	4	4	2	0
	Content search/0.041	6	3	0	1	0
	Note adding/0.066	3	6	1	0	0
	Audio book/0.033	1	1	7	1	0
	Eye protection mode/0.123	0	0	0	0	10
	Automatic page switch/0.024	8	1	1	0	0
bookshelf/0.08	Cover page display/0.08	0	3	6	1	0
	Book sorting/0.32	0	3	6	1	0
	Local book lead in/0.32	4	5	1	0	0
	Book searching/0.2	0	0	4	6	0
	Background change/0.08	0	2	6	2	0
Social function/0.2	Registration convenience/0.07	1	7	1	0	0
	Cloud synchronizing/0.121	0	0	0	0	10
	Personal growth system/0.111	8	2	0	0	0
	Note synchronizing/0.121	1	6	3	0	0
	Friend adding/0.09	0	0	1	9	0
	Book sharing/0.08	0	5	5	0	0
	forum/0.02	0	5	4	1	0
	Social app sharing/0.181	0	7	2	1	0
	Check in/0.181	7	3	0	0	0

Figure 2: Reader segmentation

According to the indicators, the proportion of evaluation modules was 0.21, 0.15, 0.28, 0.08, 0.2 and 0.08 respectively. Then, evaluation was performed based

on the secondary evaluation on the results of first evaluation on the matrix of table 2, with the formulas as follows:

$$E_p = \frac{\Sigma E}{n}, \quad n \in 1, 2, k, 10, \tag{1}$$

$$E_{pw} = E_p * W, \tag{2}$$

$$E_z = \Sigma E_{pw}. \tag{3}$$

E refers to the evaluation value, E_p refers to the average evaluation value, E_{pw} refers to the weighted average value, W refers to the weight and E_z refers to the comprehensive evaluation value. The calculation results are as below:

$$\begin{aligned} B_1 &= [0.18, 0.08, 0.18, 0.02, 0.11] \begin{bmatrix} 0.1 & 0.9 & 0 & 0 & 0 \\ 0.1 & 0.2 & 0.7 & 0 & 0 \\ 0.1 & 0.7 & 0.2 & 0 & 0 \\ 0.7 & 0.1 & 0.1 & 0.1 & 0 \\ 0.1 & 0.3 & 0.4 & 0.1 & 0 \end{bmatrix} \\ &= (0.12, 0.37, 0.18, 0.01, 0) \end{aligned} \tag{4}$$

$$\begin{aligned} B_2 &= [0.12, 0.09, 0.05, 0.15] \begin{bmatrix} 0.6 & 0.3 & 0.1 & 0 & 0 \\ 0 & 0.1 & 0.03 & 0.6 & 0 \\ 0.1 & 0.1 & 0.2 & 0.6 & 0 \\ 0.1 & 0.1 & 0.7 & 0.1 & 0 \end{bmatrix} \\ &= (0.09, 0.07, 0.13, 0.1, 0) \end{aligned} \tag{5}$$

$$B_3 = [0.173, 0.14, 0.115, 0.041, 0.099, 0.041, 0.066, 0.033, 0.123, 0.024]$$

$$\begin{bmatrix} 0.3 & 0.6 & 0.1 & 0 & 0 \\ 0.1 & 0.7 & 0.2 & 0 & 0 \\ 0.7 & 0.1 & 0.1 & 0.1 & 0 \\ 0.3 & 0.3 & 0.2 & 0.2 & 0 \\ 0.7 & 0.1 & 0.2 & 0 & 0 \\ 0 & 0.4 & 0.4 & 0.2 & 0 \\ 0.6 & 0.3 & 0 & 0.1 & 0 \end{bmatrix} = (0.29, 0.35, 0.16, 0.06, 0.12) \tag{6}$$

$$B_4 = [0.08 \quad 0.32 \quad 0.32 \quad 0.2 \quad 0.08]$$

$$\begin{bmatrix} 0 & 0.3 & 0.6 & 0.1 & 0 \\ 0 & 0.3 & 0.6 & 0.1 & 0 \\ 0.4 & 0.5 & 0.1 & 0 & 0 \\ 0 & 0 & 0.4 & 0.6 & 0 \\ 0 & 0.2 & 0.6 & 0.2 & 0 \end{bmatrix} = (0.13, 0.3, 0.4, 0.18, 0) \tag{7}$$

$$B_5 = [0.07, 0.121, 0.111, 0.121, 0.09, 0.08, 0.02, 0.181, 0.181, 0.02]$$

$$\begin{bmatrix} 0.7 & 0.2 & 0.1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 10 \\ 0.8 & 0.2 & 0 & 0 & 0 \\ 0.1 & 0.6 & 0.3 & 0 & 0 \\ 0 & 0.1 & 0.9 & 0 & 0 \\ 0 & 0.5 & 0.4 & 0.1 & 0 \\ 0 & 0.7 & 0.2 & 0.1 & 0 \\ 0 & 0.7 & 0.3 & 0 & 0 \\ 0.8 & 0.2 & 0 & 0 & 0 \end{bmatrix} = (0.29, 0.34, 0.14, 0.1, 0.12). \tag{8}$$

$$B_6 = [1][0 \quad 0 \quad 0.7 \quad 0.30] = (0, 0, 0.7, 0.3, 0) \tag{9}$$

$B_1, B_2, B_3, B_4, B_5, B_6$ refer to evaluation quantization values of each element in each section. Then, the first and secondary comprehensive evaluation values can be obtained:

$$B = (0.21, 0.15, 0.28, 0.08, 0.2, 0.08) \begin{bmatrix} 0.12 & 0.37 & 0.18 & 0.01 & 0 \\ 0.09 & 0.07 & 0.13 & 0.1 & 0 \\ 0.29 & 0.35 & 0.16 & 0.06 & 0.12 \\ 0.13 & 0.3 & 0.4 & 0.18 & 0 \\ 0.29 & 0.34 & 0.14 & 0.1 & 0.12 \\ 0 & 0 & 0.7 & 0.3 & 0 \end{bmatrix}$$

$$= (0.18, 0.28, 0.22, 0.09, 0.06) \tag{10}$$

$$E_1 = (0.12, 0.37, 0.18, 0.01, 0)(95, 85, 75, 65, 55)^T = 57, \tag{11}$$

$$E_2 = (0.09, 0.07, 0.13, 0.1, 0)(95, 85, 75, 65, 55)^T = 31, \tag{12}$$

$$E_3 = (0.29, 0.35, 0.16, 0.06, 0.12)(95, 85, 75, 65, 55)^T = 80, \tag{13}$$

$$E_4 = (0.13, 0.3, 0.4, 0.18, 0)(95, 85, 75, 65, 55)^T = 80, \tag{14}$$

$$E_5 = (0.29, 0.34, 0.14, 0.1, 0.12)(95, 85, 75, 65, 55)^T = 80, \tag{15}$$

$$E_6 = (0, 0, 0.7, 0.3, 0)(95, 85, 75, 65, 55)^T = 72 \tag{16}$$

$E_1, E_2, E_3, E_4, E_5, E_6$ refer to the first comprehensive evaluation values.

Then, the total value of secondary comprehensive evaluation can be obtained, as follows:

$$E_z = (0.18, 0.28, 0.22, 0.09, 0.06)(95, 85, 75, 65, 55)^T = 68. \tag{17}$$

5. Fuzzy comprehensive evaluation analysis

As shown in equation (13), (14), (15) and (16), the fuzzy evaluation values of "bookshelf", "social function" and "feedback" are high, with obvious advantages. Hence, only improvement is needed to strengthen the reading function

of the APP. As shown in equation (11), the "book town" function is yet to be perfected to meet the requirements of readers. As shown in equation (12), the "business management" function of the APP needs improvement on both discount scale and payment means. That is to say, there are more selections on payment means, which should be simplified as much as possible [15] to reduce the imitation on payment software. As for the discount aspect, the number of books which are free in a limited time should be increased. As shown in table 2, the "eye protection mode" function in the "reading function" module should be implemented; the "cover page display", "book assorting" and "background change" functions in the "bookshelf" part should be adjusted according to the readers' requirement; the "book searching" function should be perfected; The "cloud sync" feature can be turned on in the "social" section, and other not ideal features should be improved; as for the "feedback" section, its functions are not prominent and should be strengthened, which is helpful for the improvement of the software according to the opinions put forward by readers.

With the multi-level fuzzy comprehensive evaluation method, the advantages and disadvantages of the APP are displayed clearly. Therefore, new functions should be added to the APP to perfect it. Especially for the "business management" part, its score is only 31, which is far much lower than the average value and unqualified. The reason for this is that readers show resistance psychology [16] to paid reading because they previously enjoy free reading with no attention paid to the copyright problem. Meanwhile, the growing number of network writers has somehow caused the decline of the quality of network literature works, which makes the readers lose confidence to paid reading.

6. Conclusion

In order to study the business model of mobile APPs, this paper takes the QQ reading APP as an example and analyzes its reading characteristics and modules. Then, its business module is studied from the aspects of industrial chain model, profit model, communication channels and market positioning. For the problems existing in the APP, such as copyright issues, imperfect functions, undesirable page layout and book classification confusion, they will be solved in the near future considering Tencent's strong financial and technical strength.

In the future, the QQ reading APP will develops towards a diversified direction and rely more on advertising to profit, with perfected functions. For example, eye protection model is an inevitable trend. Under the current situation that mobile APPs are facing bottle necks, especially in profit mode aspect, the future trend of the QQ reading APP can be learnt by mobile APPs, i.e., they should rely more on advertising. Therefore, the emphasis on the studies of future business modes of mobile APPs should be put on their profit modes.

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