

## Methodology Article

# A Study About the Evaluation Model of Growth for Internet SME

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**Abstract:** With the rapid development of Internet technology, Internet companies increase rapidly in all areas of the society, and have become a major economic way and also a new economic growth point in the modern era. This heralds the coming of network economy era. It is essential for both managers and investors to evaluate the growth of a listed company. Therefore, academics in China have been giving a lot of attention to the study about the growth of those Internet enterprises. First, on the basis of enterprise growth theory and entropy theory, this paper aims to recognize the factors which influence the development of small and medium-sized Internet enterprises by analyzing questionnaires. Then, the concept of entropy is proposed based on the entropy theory. Moreover, this paper determines the index weight of the growth entropy system and models the growth entropy model for the Internet SME (small medium enterprise) mathematically. This research provides a new method for growth analysis and also has a far-reaching significance for the development of the Internet SME.

**Keywords:** Internet SME, Enterprise Growth, Growth Entropy, The Evaluation Model of Growth Entropy

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## 1. Introduction

“Vinton Cerf, regarded as the father of the Internet, once said: On this planet, the Internet has unlimited potential undiscovered just as water, air and nuclear energy [1]. Internet is seen in an irreversible momentum of rapid development and growth. According to the data shown in the ‘39th Statistical Report on Internet Development in China’ [2]. (such as Figure 1. ). At the end of December 2016, the Internet users had reached 731million and Internet penetration had increased to 53.2%. Therefore, information and technology are becoming important factor in current development of society and economic development. Today, more and more Internet companies are listed on various Stock Exchange. it is nothing but the best witness of the development of china’s internet enterprises.

At present, the research of enterprise growth mainly focuses on manufacturing industry, service industry and other traditional industries. And it is very rare to see researches about the development of Internet enterprise. The SME have shortages of “high birth rate, high death rate” and the Internet

industry has an increasingly competitive environment and rapidly technological innovation. Nowadays, the Internet of SME is facing a complex environment and intensive competitive pressures, such as unstable affecting factors. However, how to protect the Internet small and medium enterprises and make them develop healthily, which has become the research hotspot.

At first, this paper chooses the Internet of SME listed companies as the object of study, identifies influencing factors for their growth, evaluate their growth ability and puts forward the concept of entropy growth. Then, this paper is to determine index weight of the growth entropy system, and to constructs the growth entropy model for the Internet SME (small medium enterprise) mathematically and to find the its influencing factors by Analytic hierarchy process.

This paper, based on the growth of influencing factors, put forward a growth model for the small and medium-size Internet listed companies to measure its current situation. Managers clearly understand the status of business growth and the key crux; Investors can also understand business performance and business trends; Not only can be reduced to

the current investment risk prevention benefits and help determine the future of enterprise development potential but also develop more long-term investment programs.

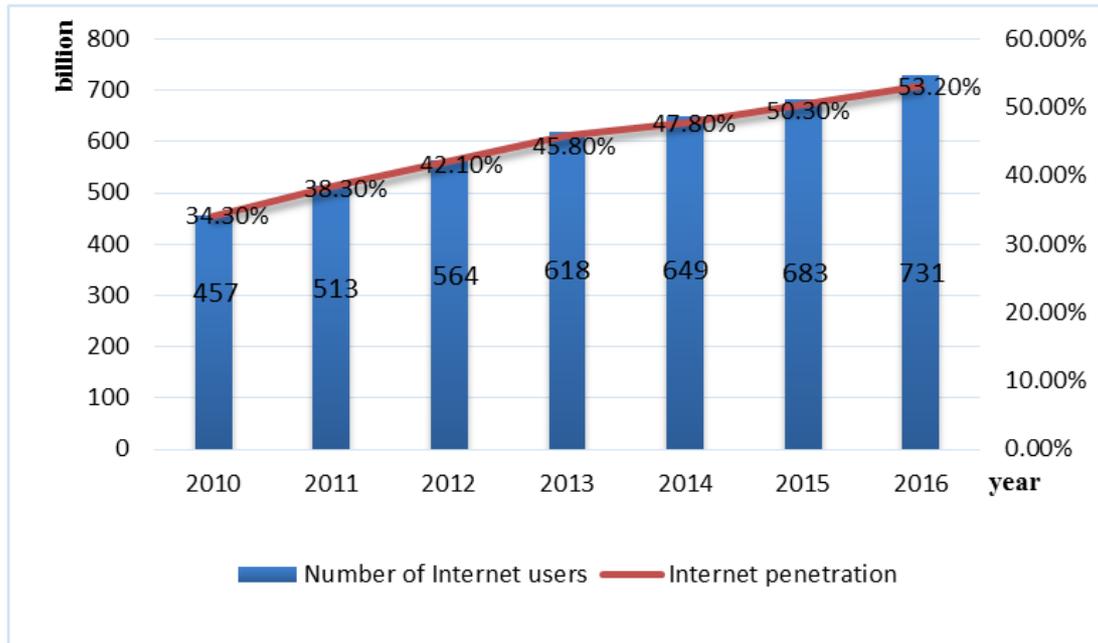


Figure 1. The chart of size of Internet users and Internet penetration rate.

## 2. Literature Review

According to the research about development of endogenous growth theory, this paper provides a definition: Growth is a process that regards the sustainable operation as the condition and regards the increase of the companies' value as its final objective [3]. The outward performance is the scale from small to large and the inherent performance is the improvement of the quality of enterprises, In other words, it is the ability to exist from weak to strong, the quality from low to high, and the competition from fragile to powerful, we consider some factors to define the growth, such as knowledge, information technology.

At present, research on the Internet for SME growth is extremely few. In summary, most scholars consider the important impacting factors in enterprise resources, human resources management, enterprise innovation and system suitability. While the financial situation [4] (Earnings per share, net profit margin growth, asset-liability ratio) are also

an essential indicator as well (Uddenberg, 2015). Tran (2015) his research was conducted by using a multiple single-case studies methodology to gain a deeper understanding of the adoption factors behind New South Wales (NSW) micro enterprises [5]. The research investigated the leadership role of the government's initiatives, the regulatory framework, financial, human and information and communications technology infrastructure to support micro businesses in adopting e-business. Cebula and Alraja (2015) they focused on examining the impact of organizational capabilities technology readiness, competition intensity and perceived benefits on adoption of e-business [6]. Zhang yu (2012) studied in eight aspects of Internet business marketing, operational capability to study the growth of Internet companies. We also summarized the growth factors for enterprise [7]. This paper also summarizes the influencing factors from the literature. (Table 1).

According to the above summed up the following (figure 2) Internet SME growth factors.

Table 1. Summary growth indexes for enterprise.

Academics	time	Factors
Storey	1994	Enterprise development strategy and Managers ability
Chenchunhua	2004	company culture, Company size, Enterprise Innovation
ZhangXiangjian	2003	Cost control ability, Capital operation ability, Financial capability, Current Ratio, Assets increased ratio
WangChuyan	2005	Profitability, Asset management efficiency, Property Safety, Main condition Amount, Investment, cash flow, Human Resources
RenShuqiang	2013	Business expansion speed, Capital Profitability, Development cycle length, R & D capability
LiBozhou	2014	Marketing capabilities, Product competitiveness, Sales Net Profit Margin
LiXiaoyin	2015	Human Resource Management Index, Scientific and technological innovation, The scale of business growth, Financial management capacity

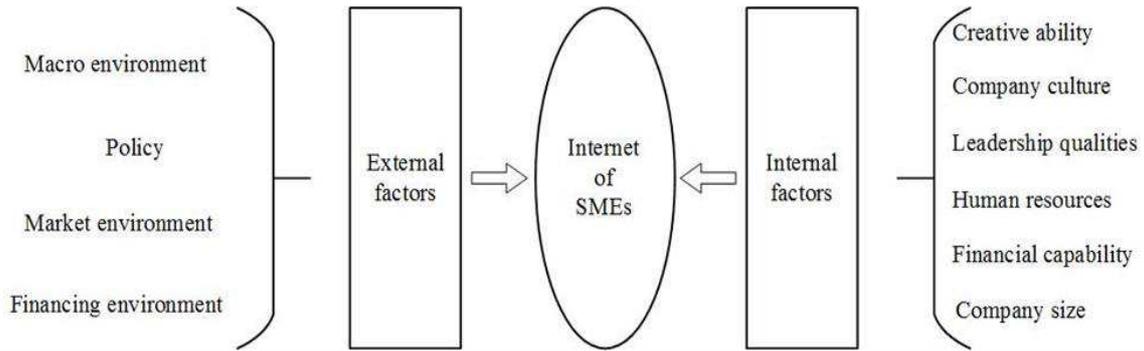


Figure 2. The influencing factors of Internet SME.

According to the literature summarizes about the growth factors of traditional enterprise, We distribute 167 questionnaires to staffs of the internet SMEs and take back 150 of them, from which we extracted 20 indicators from 30 ones. such as policies, R & D input-output ratio, Employee turnover, return on net asset, manager leadership and so on .In order to better assess the weighting for factors, which are divided into internal factors and external factors according to their characteristics (such as figure 2).

### 3. Construction of the Model

#### 3.1. Entropy Theory Application for SME

In enterprise systems, the entropy theory can largely optimize the system’s internal composition [8]. It can also help the emergency decision makers to take appropriate responses in a timely manner. (Yu and Wu, 2014). We also found that Entropy-TOPSIS analysis method in the supply chain management (James, 2015) [9] and the range of communication (Zhilin and Liu, 2016) [10]. Tavana and Rahmatian (2015) adopted on fuzzy method combine with entropy to measure the performance of the pharmaceutical industry listed companies [11]. Based on entropy theory and the theory of business growth, in the business system, the entropy theory refers to the situation that matters, energy and information which adapt to the previous enterprise, are consumed constantly, while the optimistic roles

those factors once played will recede gradually, which produces negative to the growth of the enterprises, and prevents them from further developmentthe growth of entropy put forward by the auther is to measure whether elements operates in an organized way in current condition within internal system. Without adding new elements, the energy will be invalid growing trend, further business growth entropy value will increase and growth rate will be done.

The growth of the Internet factors were divided into internal and external factors. The one Shown externally is called growth environment by us, which impact external reasons for businesses to grow. Another part has two aspects that ability of growth entropy and potential growth entropy, which are the inherent driving force for enterprise development. the ability growth entropy is the dominant external manifestation; while the growth potential entropy refers to the ponteial development of the Internet SME. Thus, the growth of SME Internet entropy evaluation model includes growth potential entropy, growth capacity entropy and growth environment entropy. To sum up, due to the interaction of the three aspect of entropy, enterprises will present different growth status. The external environment will affect the internal growth capacity and growth potential. Three levels of growth entropy affect and transform each other, which Can show the growth of different stages of the enterprise. (such as Figure 3.).

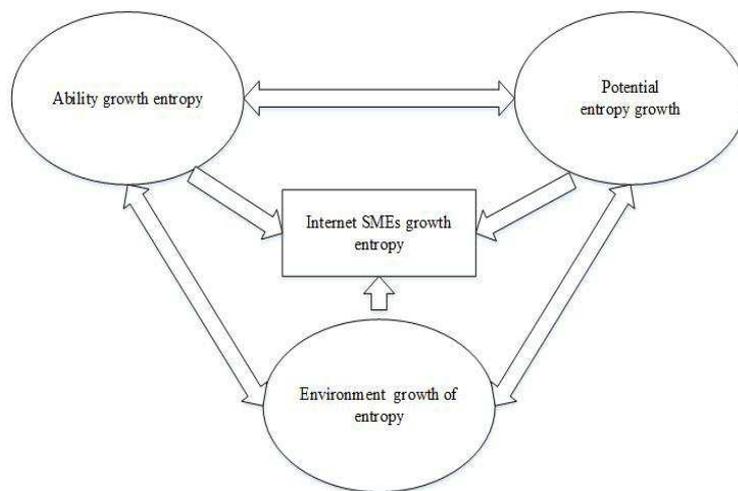


Figure 3. The growth entropy evaluation model of Internet SME.

### 3.2. The Growth Entropy Mathematical Model

In order to more intuitively verify and measure the growth entropy model, reference entropy theory and related papers [12], the formulas are as follows:

$$ds_n = \sum k_m ds_m \quad (1)$$

The letter K represents the weight of each index weight, the letter M represents three indicators;  $ds_m$  shows entropy index indicating the generated value.

$$ds_m = -K_\alpha \frac{Y_m}{\bar{y}_m} \ln \frac{Y_m}{\bar{y}_m} \quad (2)$$

The  $K_\alpha$  is entropy growth factor; the  $\bar{y}_m$  is Standard deviation indicator; the  $Y_m$  is the average of the sample.

Internet growth SME entropy is calculated as follows:

Based on the key factors of 150 questionnaires were extracted to build the evaluation system;

Calculate growing entropy an index matrix A

$$A = (ds_1, \dots, ds_n)$$

C. Based on 30 questionnaires and scoring Yaaph level analysis software, and finally calculate the weight of each factor weight and set up matrix C:

$$C_n = \begin{pmatrix} C_1 \\ \dots \\ C_n \end{pmatrix}$$

D. Finally, The total entropy of the resulting calculation formula is as follows:

$$ds_{sum} = A * C_n = (ds_1, \dots, ds_n) * \begin{pmatrix} C_1 \\ \dots \\ C_n \end{pmatrix} \quad (3)$$

Single application entropy model flow refers to data collected by its levels of selected indicators, By a mathematical model Calculated from index values of three levels value. Then, the corresponding weights weighting calculated single growing entropy value of each index objectof study. It indicates a substantially negative correlation between the values and the growth of entropy. Inother words, the smaller entropy value, the better business growth.

The comprehensive application of the model combines the results of calculation with the theoretical Raymond growth cycle. Based on the total entropy, we can impose what stage of business growth long period. And analyze the entropy flow show, the characteristic and the development trend of the stage.

## 4. Conclusion

In this paper, qualitative and quantitative methods are used to analyzed the growth of Internet SME. Firstly, The main conclusions that construct the evaluation system. On the basis of previous studies, we summarized the basic 30 factors in the growth of the Internet SME. Eventually, Among 150

questionnaires to obtain 17 Key factors serving as core indexes in the evaluation system. Secondly, This paper broadens the application range of entropy theory, proposes growth entropy, and selects the new Internet SME as the object of empirical research. In the study, we found that the entropy flow value produced in the development of enterprise elements can be measured by the enterprise's comprehensive ability [13]. Finally, we put forward the evaluation model to promote the growth of the Internet SME from the perspective of quantitative, operations and personnel training.

However, the growth evaluation factors are relatively subjective. On the one hand, the key factors are extracted from questionnaires on the basis of literature summary. In other words, during the process of model analysis, we analysehe influence of the three dimensions on the growth of Internet While the interaction between dimensions is not taken into consideration.

Although entropy theory is derived from the theory of thermodynamics, the entropy theory is generally applicable to the enterprise. In recent years, more and more theories of natural sciences have been introduced to management and it has been proved to be feasible. Meanwhile, the study growth of Internet SME has a profound impact on the management or investors and even the employment of people.

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