



Entropy characteristics and structural model in the process of entrepreneurship

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Abstract

The current national economy needs to foster a culture of entrepreneurship, encourage entrepreneurial initiatives, and create an entrepreneurial ecosystem. In the field of business studies, many scholars have applied various entropy theories to enrich and advance business knowledge. However, the current literature on entrepreneurship and entropy is sparse and disjointed. The previous research does not offer a coherent framework for integrating these two concepts. This research aims to propose a new concept of entrepreneurial entropy. The study uses the literature review, structural equation modelling, and case analysis to construct a preliminary model of entrepreneurial entropy. The study investigated the entrepreneurial performance of four different teams using entropy analysis. The researchers applied six key indicators of entrepreneurship that were developed by four groups of entrepreneurs. They used the structured equation of entropy to calculate the total entropy value for each group. By comparing the entropy values, they were able to draw quantitative conclusions about the effectiveness of the entrepreneurship process. The study will introduce entropy theory to the domain of entrepreneurship and establish a new direction and area of entrepreneurship research. Overall, the proposed concept of entrepreneurial entropy represents a significant step forward in the quest to enrich and advance our knowledge of business and entrepreneurship.

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*Dissipation theory
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1. Introduction

Entrepreneurship is the process of discovering and capturing future opportunities by building new products or services based on unique entrepreneurial characteristics. Entrepreneurs invest a lot of time, resources, and energy as well as they also bear the risks and pressures brought about by the internal and external environment. However, most of the existing models of the entrepreneurship process are linear and

deterministic as well as do not capture the complexity and uncertainty that entrepreneurs face in the dynamic and competitive environment. Therefore, this research uses the perspective of entropy and dissipation theory to explore how entrepreneurs can manage their resources and energy more efficiently and effectively in the face of challenges and opportunities.

The notion of "entrepreneurial entropy" remains elusive and undefined. Consequently, there is no way to examine how entrepreneurs can create a negentropic process that reduces uncertainty and increases order. Without a clear understanding of "entrepreneurial entropy", entrepreneurs cannot leverage the concept of "entropy" to enhance their chances of success. This is a significant gap in the field of entrepreneurship research.

This study aims to fill this gap by re-analyzing and interpreting the model and process of entrepreneurship from the perspective of entropy, which is a measure of disorder or randomness in a system. The research questions are: What is the relationship between entropy and entrepreneurship? How can we apply the concept of entropy to measure and improve the performance of entrepreneurs? The research contributions are summarized as follows:

1. Conceptual framework: For the first time, the concept of "Entrepreneurial Entropy" was established, which refers to the degree of disorder or randomness in the entrepreneurial process. The structural model of "Entrepreneurial Entropy" was also developed, which consists of six key links in the entrepreneurial process: entrepreneurial individual characteristics, entrepreneurial opportunities, entrepreneurial teams, entrepreneurial resources, strategic models, and innovation. This model lays a theoretical foundation for future research and development of "Entrepreneurial Entropy".
2. Causal relationship: For the first time, a causal relationship between entropy and entrepreneurship was established. Through the literature review, it was found that the entropy state of the six key links will directly affect the entrepreneurial results of entrepreneurs. Therefore, entrepreneurs need to manage and optimize these key links to reduce entropy and increase negative entropy flow.
3. Management implications: From the perspective of management, the scope of entropy is refined and expanded, and the characteristics of entropy in physical thermodynamics are well applied in the process of entrepreneurship. This expands the research scope of entropy and dissipation theory and enriches the research of entrepreneurship. Entrepreneurs can use this framework to identify their strengths and weaknesses in each key link and develop strategies to reduce entropy and increase negative entropy flow.

2. Literature Review

2.1. Entrepreneurship Process

Many researchers think that entrepreneurship is a form of creative activity (Wood & McKinley, 2010) and an important factor accounting for individual success (Antoncic & Hisrich, 2003; Davidsson, 2005). Parker (2015) pointed out that small and medium companies can be a good source of job creation and economic growth. These can push structural integration, and regional development (Morris, Kuratko, & Schindehutte, 2001) encourage job creation, innovation, competition, and stimulate economic growth (Chiles, Bluedorn, & Gupta, 2007). Therefore, Entrepreneurship is the process of realizing innovation by creating new products or services that meet the needs or wants of customers.

Some researchers also analyzed the entrepreneurial process of entrepreneurs from various aspects and established some related models. Representative studies include (Galbraith, 1982) entrepreneurial model, Churchill and Lewis (1983) entrepreneurial model, Robert, Michael, and Robert (2006) entrepreneurial model, and Bhave (1994) new entrepreneurial model. We expect that our study can contribute to the development of entrepreneurship theory and practice by providing a new instrument to understand and improve the entrepreneurial process. The research summarizes the key stages, elements, and links in the relevant entrepreneurial process model as follows:

Table 1. Summary of key stages/ Elements in the entrepreneurial process model.

Entrepreneurship model	Key stages/Elements	Model type
Galbraith (1982)	Proof of principle, prototype building, model sales, system launch, organic growth	Linear structure
Churchill and Lewis (1983)	Existence, survival, success, takeover, resource mature	Linear structure
Bhave (1994)	Opportunity identification, technology and organization, product exchange	Linear structure
Timson and Spinell (2003)	Opportunities, resources, entrepreneurial team	Dynamic structure
Robert et al. (2006)	Before entrepreneurship (Individual, group, society), during entrepreneurship (Individual, group, society), after entrepreneurship (Individual, group, society)	Linear structure

Entrepreneurship model	Key stages/Elements	Model type
Lin (2010)	Opportunity recognition (Weakened individual network), business creation (Strengthened individual network), business growth (Strategic composite network)	Dynamic structure
Ye, Wang, and Zhang (2011)	Entrepreneur characteristics, innovation achievements, entrepreneurial opportunities, entrepreneurial teams, entrepreneurial strategies, entrepreneurial resources, entrepreneurial results	Dynamic structure

The research uses the dynamic model presented above as the main starting point to identify the key links in entrepreneurship. Through an overview of the entrepreneurial process see Table 1, six important links that affect the entrepreneurial process can be extracted: entrepreneurial personal characteristics (Robert et al., 2006; Ye et al., 2011) entrepreneurial opportunities (Bhave, 1994; Lin, 2010; Timson & Spinell, 2003; Ye et al., 2011) entrepreneurial team (Robert et al., 2006; Timson & Spinell, 2003; Ye et al., 2011) strategic model (Lin, 2010; Ye et al., 2011) entrepreneurial resources (Churchill & Lewis, 1983; Timson & Spinell, 2003; Ye et al., 2011) and innovation (Ye et al., 2011). These six links in the entrepreneurial process of entrepreneurs all become the key links for future entrepreneurial success.

2.2. Entropy and Dissipation Theory

The term entropy has been used by many authors in various scientific disciplines, which has created different definitions of entropy and caused confusion (Faghih, Sarreshtehdari, & Bonyadi, 2021) The concept of entropy is often applied in various disciplines, but its definition is not universally agreed upon (Choe, 2016; Tribus & McIrving, 1971). Therefore, it is difficult to challenge new theories that use entropy.

The concept of “entropy” was first proposed by the German physicist Rudolf Clausius. It is the core concept of the second law of thermodynamics. Clayton and Giauque (1932) point out that entropy is a measure of the number of specific realizations. Clausius believes that in an isolated system, the thermal motion of molecules always changes from the original order, and the concentrated arrangement state tends to be scattered and messy. During the spontaneous process of a system from order to disorder, entropy always increases, and this increase is irreversible. Prigogine (1969) first proposed the dissipation theory. He believed that an open system far from the equilibrium state lies in the process of exchanging matter and energy with the external environment, through the process of energy dissipation and the internal nonlinearity of the system structure can make the entropy flow negative, and can form a new ordered structure through a dynamic entropy reduction process. To establish a dissipative process, four conditions must be satisfied: open system, far from equilibrium state, nonlinear effect, and fluctuation (Meng & Zhu, 2019; Shuwen, 2017). Ren, Zhang, and Song (2001) introduced the concept of entropy into management science and believed that any enterprise system’s organization, system, policy, method, culture, theory, technology, *etc.*, in an isolated system, always shows a gradual decrease in effective energy and a continuous increase in the ineffective energy process. The change in total entropy value is composed of the entropy increase produced by the production factor resources consumed within the enterprise, the negative entropy introduced by the enterprise from the external environment, and the management entropy produced by the process of human management and intervention (Ren et al., 2001).

3. Entropy of Key Links in the Process of Entrepreneurship

Entropy is a measure of disorder or randomness in a system, while dissipation is the loss of energy or resources in a system. We propose a new concept of “entrepreneurial entropy” and a new structural model of “entrepreneurial entropy” for the first time. We also analyze the characteristics of “entrepreneurial entropy” and how to establish a negative entropy process, which means a process that can increase order and reduce waste in the system.

Different key links in the entrepreneurial stage also reflect different attributes of entropy change. The six links can together form a comprehensive system of entrepreneurial entropy. The study combines entrepreneurial personal characteristics, industry opportunities, entrepreneurial teams, entrepreneurial resources, strategic models, and innovation to entropy the six key links respectively. They are defined from the perspective of entropy: characteristic entropy, opportunity entropy, team entropy, resource entropy, strategy entropy, and innovation entropy.

3.1. Characteristic Entropy

Entrepreneurial thinking is the beginning of the entire entrepreneurial stage. The thinking is always in the process of exchanging information with the outside world. This contact involves energy and exchange (Shuwen, 2017). Ideas and motivations are important manifestations of human traits, and changes in trait entropy are based on entrepreneurial thoughts and motivations. In the actual process of entrepreneurship, if entrepreneurs generate new entrepreneurial motivations to create a shock to the business environment, this

shock will be brought into the entrepreneurial system in the form of negative entropy. Entrepreneurial motivation forms an effective impetus to promote the continuous development of the entrepreneurial system in the future.

3.2. Opportunity Entropy

The emergence of opportunity entropy is more reflected in the selection of industry opportunities. Through an open business environment, different enterprises can effectively cooperate and share resources such as market information, resources, culture, and other factors (Shuwen, 2017). Enterprises can obtain more orderly negative entropy from the outside world and establish a new type of business model by looking for opportunity entropy. Through the development of industry sharing and cooperation, the new business model can be reflected in entrepreneurship, and a new type of industry opportunity selection can be completed.

3.3. Team Entropy

Entrepreneurial teams are often characterized by chaos and disorder when they are first established. During the early stages of entrepreneurship, the team experiences a dynamic development period (Shuwen, 2017). If the team expands the business on a large scale in a short period, the entropy value will increase sharply. This will cause the team state to continue growing in the direction of disorder, eventually leading to the failure of the entrepreneurial team establishment. Therefore, the vitality, work enthusiasm, and fighting spirit of team members will affect the change of entropy. Entrepreneurial teams need to establish an effective dissipative structure by satisfying non-linearity, open system, self-organization, etc., and form team entropy with obvious entropy reduction characteristics. This will provide more orderly and effective energy for entrepreneurial entropy.

3.4. Resource Entropy

The most effective way to obtain resources in the early stages of entrepreneurship is often through the external environment. This method of introducing effective resources through the external environment itself has the conditions to establish a dissipative structure, making it easier to obtain effective energy for entrepreneurial activities. Resource entropy can establish a negative entropy state by absorbing effective energy from the external environment to offset the natural increase in entropy within the enterprise. The formation of resource entropy through an open relationship platform can form the main source of effective energy, and the negative entropy state formed by resource entropy can be supplemented by the outside world at any time.

3.5. Strategic Entropy

Entrepreneurial enterprises can implement negative entropy through strategic models by creating a dissipative structure of market openness and corporate self-organization. Based on the characteristics of strategic openness, the strategic model of benefit sharing through resource integration and participants can promote and activate those strategic resources rich in negative entropy factors. This will form more effective entrepreneurial entropy and gradually reduce the entropy increase generated under the entrepreneurial strategy system through strategic entropy.

3.6. Innovation Entropy

From the perspective of dissipation theory, innovation is the process of implanting a new variable or behaviour into the original system, forming an interference state that makes the average value of the original system deviate. Innovation causes the original system to leave its original track and state, forming fluctuation disturbance in the dissipative structure. The fluctuations brought about by innovation entropy may jump the system from an unstable state to a new ordered state. Explained from the perspective of entropy, the fluctuating effect of innovation entropy may bring a steady stream of negative entropy to entrepreneurial entropy and promote entrepreneurial enterprises to reach new entrepreneurial heights.

Through the two-way replacement between the internal and external energies of the entrepreneurial system, it is manifested as the change of entropy in six different links of the entire entrepreneurial system, which together constitute the dynamic process of the change of "entrepreneurship entropy". From the perspective of entropy, it can be explained that before the formation of entrepreneurial behaviour, the entrepreneurial system itself was in a primitive state full of invalid energy. When entrepreneurship is approaching, the entrepreneurial thinking and motivation in the characteristics of entrepreneurs will first break this balance of the original state of transformation. The first to transfer the effective energy of individual entrepreneurs into the original state of the system. With the gradual establishment of the other five key links in the future and the continuous introduction of negative entropy flow with the outside world, negative entropy flow can continuously replace the initial entropy in the system. With the naturally formed increase in entropy in later periods, the entrepreneurial system will gradually turn into a reversible state of entropy decrease. Entrepreneurs have also gradually completed the initial stage of starting a business from scratch.

From a practical point of view, the six key links in the entrepreneurial stage can complete a continuous cycle of the entrepreneurial process. This cyclical structure is the driving force behind the continuous

development of entrepreneurship. First of all, entrepreneurship can be a process of “creating something out of nothing”. Entrepreneurship initially comes from the entrepreneurial psychology and motivation generated by the entrepreneur’s own characteristics. Secondly, entrepreneurs look for existing industry opportunities or research and develop innovations to form new entrepreneurial opportunities. Thirdly, entrepreneurs start a business by establishing an entrepreneurial team and preparing entrepreneurial resources. Finally, after a long-term entrepreneurial process led by entrepreneurial strategy, the company’s unique business model and competitive advantages will be formed. These advantages can create new industry opportunities, making new preparations for the second start-up and innovation of enterprises.

4. Constructing the Structural Equation and Model of Entrepreneurial Entropy

4.1. Methodology

The following formula can express the description of entropy in natural physics:

$$dS = \sum d_e S + \sum d_i S$$

dS represents the total entropy in the system, $d_i S$ represents the entropy increase generated by the resources consumed in the system, and $d_e S$ represents the negative entropy flow formed by introducing effective energy from the outside.

According to the comprehensive effects of characteristics entropy, opportunity entropy, team entropy, resource entropy, strategy entropy, and innovation entropy established in the six important links of the entrepreneurial process, it can be directly expressed in the physical entropy formula. Assuming that the entropy value of each of the six important links is the sum of the total negative entropy and the total entropy increase, it is assumed that:

$$f(\text{Characteristic; Opportunity; Team; Resource; Strategy; Innovation}) = f(X_1; X_2; X_3; X_4; X_5; X_6)$$

The total negative entropy value formed based on dissipation theory in entrepreneurial entropy is:

$$\sum d_e S = d_e X_1 + d_e X_2 + \dots + d_e X_6$$

Entrepreneurial entropy is based on the consumption of resources and the total entropy increase is:

$$\sum d_i S = d_i X_1 + d_i X_2 + \dots + d_i X_6$$

The total entropy value of entrepreneurship is:

$$dS = d_e (X_1 + X_2 + \dots + X_6) + d_i (X_1 + X_2 + \dots + X_6) \tag{1}$$

Entrepreneurs can also use the entropy method to solve the problem of horizontal comparison between different entrepreneurial teams in various important links of entrepreneurship and understand the weight of entrepreneurial teams in different entrepreneurial links and the negative entropy value based on the dissipation theory.

Assuming that there are “m” entrepreneurial evaluation objects in total, “n” is the key link index (according to the 6 key link in entrepreneurial entropy, n=6), firstly, the development index applied to each link by each entrepreneurial team is calculated through the entrepreneurial situation of different entrepreneurial teams, or the entropy value of each link is calculated by the entropy value method. Then, build the following matrix model:

$$X = \begin{bmatrix} x_{11}, x_{12}, x_{13}, x_{14}, x_{15}, x_{16} \\ x_{21}, x_{22}, x_{23}, x_{24}, x_{25}, x_{26} \\ \vdots \\ x_{m1}, x_{m2}, x_{m3}, x_{m4}, x_{m5}, x_{m6} \end{bmatrix}$$

Where X_{ij} is the development index or entropy value of the j -th key link of the i -th entrepreneurial team. Next, calculate the proportion of the j -th evaluation index value of the i -th evaluation object:

$$P_{ij} = \frac{x_{ij}}{\sum_{i=1}^m x_{ij}}, \quad i = 1, 2, \dots, m; \quad j = 1, 2, \dots, 6 \tag{2}$$

Then, calculate the entropy value of the object corresponding to each index of different objects:

$$dS_{ij} = K \times P_{ij} \times \ln(P_{ij}) \tag{3}$$

Where $K = \frac{1}{\ln(m)}$ is a constant. $\tag{4}$

dS_i of the j th evaluation index of the i evaluation object can be calculated

$$dS_i = -K \times \sum_{j=1}^6 P_{ij} \times \ln(P_{ij}) \tag{5}$$

Therefore, we can calculate the difference coefficient of the evaluation index, which reflects the degree of information provided by this index for the comprehensive evaluation. The larger the difference coefficient, the more prominent the effect of this index on the comprehensive evaluation.

$$d_j = 1 - dS_i \tag{6}$$

Finally, we can determine the weight coefficient of each index by normalizing the difference coefficient:

$$W_j = \frac{d_j}{\sum_{i=1}^m d_j} = \frac{1 - dS_i}{\sum_{i=1}^m (1 - dS_i)} \tag{7}$$

The weight coefficient W_j represents the relative importance or influence of each key link on the overall entrepreneurial entropy. This method allows entrepreneurs to compare and optimize their performance in different key links and reduce their total entropy.

$$dS = \sum_{j=1}^6 W_j \times dS_i \tag{8}$$

4.2. Constructing the Structural Equation of Entrepreneurial Entropy

A statistic is as follows: the research evaluates the different development indexes of each entrepreneurial link of four entrepreneurial teams in China. Table 2 presents the findings from a questionnaire administered to four entrepreneurial teams simultaneously. The survey included team members from diverse backgrounds, spanning age, gender, and race in China. Throughout the investigation, all four entrepreneurial team members contributed their perspectives. These viewpoints assessed the team’s current entrepreneurial status, considering factors such as entrepreneurial personal characteristics, entrepreneurial opportunities, entrepreneurial team, entrepreneurial resources, strategy models, and innovation. Research obtains the development indexes of different links of each team according to the Likert (1-7) scale, which is expressed as follows:

Table 2. Development index of different entrepreneurial teams.

Key link	Entrepreneurial personal characteristics	Entrepreneurial opportunities	Entrepreneurial teams
Team 1	5.3	6.2	6.1
Team 2	6.1	6.4	6.6
Team 3	3.4	3	4
Team 4	2	2.4	3.2
Total index	16.8	18	19.9
Key link	Entrepreneurial resources	Strategic model	Innovation
Team 1	4.4	5.5	5.6
Team 2	6	6	6.1
Team 3	4.2	3	3.5
Team 4	4.5	4	3
Total index	19.1	18.5	18.2

According to the formula (2), the proportion of the evaluation index value corresponding to the different evaluation objects of the corresponding X matrix model is established:

$$X = \begin{bmatrix} A_1 \\ A_2 \\ A_3 \\ A_4 \end{bmatrix} = \begin{bmatrix} 5.3 & 6.2 & 6.1 & 4.4 & 5.5 & 5.6 \\ 6.1 & 6.4 & 6.6 & 6.0 & 6.0 & 6.1 \\ 3.4 & 3.0 & 4.0 & 4.2 & 3.0 & 3.5 \\ 2.0 & 2.4 & 3.2 & 4.5 & 4.0 & 3.0 \end{bmatrix}$$

$$P_{ij} = \begin{bmatrix} 0.3155 & 0.3444 & 0.3065 & 0.2304 & 0.2973 & 0.3077 \\ 0.3631 & 0.3556 & 0.3317 & 0.3141 & 0.3243 & 0.3352 \\ 0.2024 & 0.1667 & 0.2010 & 0.2199 & 0.1622 & 0.1923 \\ 0.0588 & 0.1333 & 0.1608 & 0.2356 & 0.2162 & 0.1648 \end{bmatrix}$$

According to formulas (3) and (4), the entropy value of the object corresponding to each index of different objects is obtained:

$$K = \frac{1}{\ln(4)} = 0.7213$$

$$dS_{ij} = \begin{bmatrix} -0.2625 & -0.2648 & -0.2615 & -0.2439 & -0.2601 & -0.2616 \\ -0.2653 & -0.2652 & -0.2640 & -0.2624 & -0.2634 & -0.2643 \\ -0.2332 & -0.2154 & -0.2326 & -0.2402 & -0.2128 & -0.2287 \\ -0.1202 & -0.1938 & -0.2120 & -0.2457 & -0.2389 & -0.2144 \end{bmatrix}$$

According to formulas (5) and (6), the total contribution and difference coefficient of different evaluation indicators of the four teams are calculated:

$$dS_i = \{0.8813 \quad 0.9392 \quad 0.9701 \quad 0.9923 \quad 0.9752 \quad 0.9690\}$$

$$d_j = \{0.1187 \quad 0.0608 \quad 0.0299 \quad 0.0077 \quad 0.0248 \quad 0.0310\}$$

According to formula (7), determine the weight coefficient of each index:

$$W_j = \{0.4349 \quad 0.2227 \quad 0.1095 \quad 0.0283 \quad 0.0908 \quad 0.1138\}$$

According to formula (8), the weighted total entropy value of all objects is obtained, as shown in the [Table 3](#):

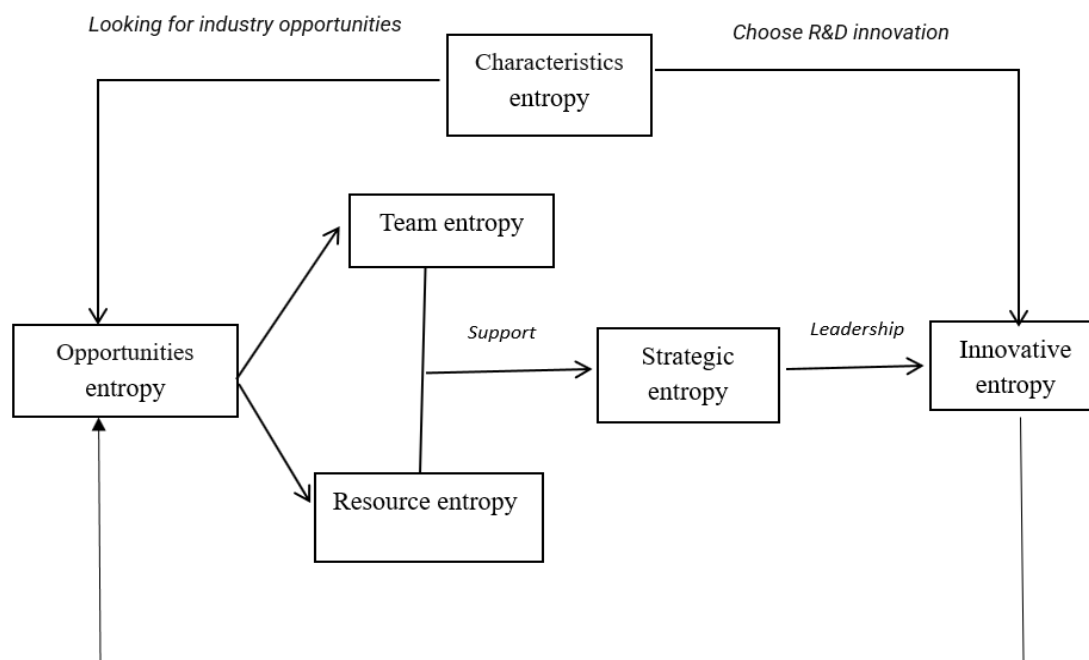
Table 3. Entropy values of different entrepreneurial teams after weighting index.

Entropy	Weighted ratio	Team 1	Team 2	Team 3	Team 4
Characteristic entropy	0.4349	-0.1128	-0.1141	-0.1003	-0.0517
Opportunity entropy	0.2227	-0.0583	-0.0584	-0.0474	-0.0426
Team entropy	0.1095	-0.0288	-0.0290	-0.0256	-0.0233
Resource entropy	0.0283	-0.0073	-0.0079	-0.0072	-0.0074
Strategic entropy	0.0908	-0.0234	-0.0237	-0.0192	-0.0215
Innovative entropy	0.1138	-0.0314	-0.0317	-0.0274	-0.0257
Total entropy	1.0000	-0.2620	-0.2648	-0.2271	-0.1722

Entrepreneurs can obtain from the above table analysis: Team 2 has the smallest total entrepreneurial entropy value, and the best performance in all six links of entropy, indicating that the order characteristics of each link of Team 2 are relatively satisfied. The performance of Team 1 is moderate. From a weighted perspective, entrepreneurial characteristics and entrepreneurial opportunity selection play a key role in the entire entrepreneurial process, accounting for 43% and 22% of the weight ratio of entrepreneurial entropy respectively; while entrepreneurial resources are less important in the initial stage of entrepreneurship, accounting for only 3% of the weight ratio of entrepreneurial entropy. Team 3 does not perform well in resource entropy and strategic entropy, and should consider supplementing resources and speeding up the cultivation of strategic models. Team 4 has the largest total entrepreneurial entropy and the worst performance. In each link, the entropy values of trait entropy, opportunity entropy, team entropy, and innovation entropy are all the highest, indicating that team 4's entrepreneurial ideas and motivations are not obvious, opportunity ability is not high, the team is characterized by strong disorder and lack of innovation, and it needs to implement more effective changes in the above links or input more external effective energy.

4.3. Constructing Entrepreneurial Entropy Structure Model

Overall, Entrepreneurial Entropy is a comprehensive reflection of the effective energy effect formed by each important link in the entrepreneurial process. Only when the external environment of the entrepreneurial enterprise has good potential effective energy and the internal environment can form dissipative structural conditions, can the internal and external relations be well connected and coordinated, and the entrepreneur can build a reversible negative entropy state of the entrepreneurial system, so that "Entrepreneurial entropy" maintains the existence of continuous negative entropy, and ultimately promotes the development of entrepreneurial behaviour continuously. A summary of the entrepreneurial entropy structure model is shown in the [Figure 1](#):



New industry opportunities are formed by research and development innovation

Figure 1. "Entrepreneurial entropy" structural model.

Entrepreneurship is a cyclical process that involves entropy. Entrepreneurs break the original silent balance of entrepreneurship through negentropic entrepreneurial characteristics. They implement innovation to form new industry opportunities or seek existing industry opportunities to establish negentropic opportunity entropy. They form effective entrepreneurial strategies through the strong support of team entropy and resource entropy for the entrepreneurial process. They carry out new innovations under the leadership of negentropic strategic entropy, re-creating the second entrepreneurial process. The entire entrepreneurial system continuously replaces energy with the external environment through the above six entropy cycles to maintain the sustainable negative entropy development of the entire system, ensuring the success of entrepreneurial activities.

5. Analysis of Entrepreneurial Entropy from the “Entrepreneurial Entropy” Structural Model

It can be seen that the key to the success of entrepreneurs lies in the state of the six entropy values. If the entrepreneurial entropy value is positive at a certain stage, it means that the entrepreneurial process currently has a positive development trend from an orderly state to a disordered state. Entrepreneurs need to know as soon as possible which one or several links have experienced an increase in entropy, and how to overcome and reduce the content of entropy increase. If the system is allowed to continue to develop, entrepreneurship will gradually enter a state of silence and lead to failure. On the other hand, if the entrepreneurial entropy value is negative at a certain stage, it means that the entropy values of the six links are comprehensively negative, and the entrepreneurial process will gradually develop from disorder to order, and the prospect of entrepreneurship is relatively optimistic. However, the total negentropy state of “Entrepreneurial Entropy” does not mean that the entropy value of each entrepreneurial link is negative. Entrepreneurs still need to constantly review whether the entropy numbers of different entrepreneurial links are all negative entropy, to ensure that they can function well in the entire entrepreneurial process. If the entrepreneur can ensure that the entropy values of the six key links in the entire entrepreneurial process are in a state of negative entropy, the entrepreneur can establish a successful entrepreneurial model with “entrepreneurial entropy” as the measurement standard.

In the process of entrepreneurship, if the conditions for the establishment of dissipative structure can be satisfied in the key entrepreneurship links, a reversible process can be formed and negative entropy entrepreneurship can be realized. According to the characteristics of entropy, in a closed environment, if there is no energy exchange introduced by the external environment, the entropy value in the system will continue to increase, eventually leading to an equilibrium state full of useless energy. The behaviour of entrepreneurship itself is precisely the process of transforming the entrepreneurial environment from a silent original equilibrium state to a negative entropy state full of effective energy. The study further believes that entrepreneurial behaviour belongs to the reverse conversion mode of entropy. Especially in the initial stage of entrepreneurship, entrepreneurs must obtain more effective energy from the outside world. The effective energy absorbed needs to be far greater than the ineffective energy formed by the natural consumption of the

system. This ensures that entrepreneurs have sufficient negative entropy flow to achieve entrepreneurial success.

6. Conclusion of the Research

This study introduces a novel concept of "entrepreneurial entropy" that integrates entropy and entrepreneurship in the context of entrepreneurial activities. It explores the features of "entrepreneurial entropy" and how to create a negative entropy mechanism in the entrepreneurial process. It also establishes a structural equation to evaluate the relative performance of the different entrepreneurial teams based on entropy. Furthermore, it proposes a structural model of "entrepreneurial entropy" and its implications for entrepreneurial success. The study hopes that the concept and model of "entrepreneurial entropy" can help entrepreneurs enhance their chances of achieving their goals and contribute to the advancement of entrepreneurship theory by applying entropy to entrepreneurship.

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