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## Research Article

# Fractal Characteristics of Discontinuous Growth of Digital Company: An Entrepreneurial Bricolage Perspective

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Digital companies exhibit discontinuous growth in the process of shifting from their existing core business to a newer and less familiar business. This pattern of growth often ends in failure mainly because companies invest most of their resources in maintaining the value network of their existing core business, which ultimately results in a "lock-in" effect. The fractal theory assumes that there are similarities among fractals within companies. These similarities may reduce the threats posed by the value network lock-in effect and increase the chances of successful discontinuous growth. In this study, we applied fractal theory to consider the following questions: (1) in what aspects does the successful discontinuous growth of digital companies exhibit fractal characteristics? (2) What strategy does digital companies use to ensure these fractal characteristics? We adopted an exploratory single-case study method and chose ByteDance as the case company to analyze its successful shift from Toutiao (a media platform) to Douyin (a short-video sharing platform). Our results show that (1) a necessary condition for the successful discontinuous growth of digital companies is that similarities exist (e.g., in technology or customer base) between the existing core business and the new business and (2) entrepreneurial bricolage is a strategy used by digital companies to ensure the existence of fractal characteristics of similarities. We discuss the theoretical contributions and practical implications of this finding.

## 1. Introduction

Disruptive innovation theory states that, to adapt to a dynamic environment, companies should pay attention to growth opportunities in emerging markets and create opportunities to grow new types of business [1]. Although these findings are very important, they do not explain how companies can successfully shift from the existing core business to the new business.

Fractal theory [2] can explain the successful shift from the existing core business to the new business. Fractal theory emphasizes similarity between the part and the whole: any relatively independent part of a fractal system can be considered a reduced-scale image of the whole [2], which can ensure overall stability. Scholars have put forward the concept of a "fractal company" based on fractal theory [3] and proposed that a fractal company develops fractals in response to its changing environment. The key to the successful development of such fractals lies in the similarities between the fractals and the whole company, including the structural characteristics of organizational design, how services are performed, and the formulation and pursuance of goals [4]. Discontinuous growth can be regarded as the successful development of fractals. The new business shares some fractal characteristics with the existing core business, which may reduce the threat posed by the value network lock-in effect in discontinuous growth [5].

We used an exploratory single-case study method to analyze the discontinuous growth of a digital company (ByteDance) to consider two related research questions: (1) in what aspects does the successful discontinuous growth of digital companies exhibit fractal characteristics? (2) What strategy do digital companies use to ensure these fractal characteristics? A "digital company" is a company that uses information technology as a competitive advantage in its business [6]. The growth of digital companies is

characterized by discontinuity [7], which provides an ideal research object for exploring discontinuous growth in a dynamic environment. Based on fractal theory, this study provides a new theoretical perspective to explain the discontinuous growth of digital companies, which has important theoretical value for understanding the shift from the existing core business to the new business and has important practical implications for digital companies aiming to realize discontinuous growth in a dynamic environment.

## 2. Literature Review

Theories about the growth of firms are divided into endogenous and exogenous growth theories, according to the different forces driving firm growth. Endogenous firm growth theories emphasize the logic that firms realize growth through the effective use of existing resources [8, 9]. Exogenous firm growth theories emphasize the integration of new resources for market expansion as a motivation for firm growth [10–12]. Although classical theories of firm growth are very important, they cannot explain the discontinuous growth of digital companies. Endogenous growth theories focus on explaining how companies use existing resources to achieve continuous growth [8]. Few studies have considered discontinuous growth. Theories of exogenous growth also cannot provide a complete explanation for discontinuous growth. Although these theories emphasize that the key to company growth relies on identifying potential growth opportunities [10], there is still an unresolved resource allocation conflict between the existing core business and the new business [13]. Organizational ambidexterity theory assumes that the integration of exploration and exploitation activities can achieve a smooth shift from the old business to the new business, aiming to provide an explanation for discontinuous growth [14, 15]. However, in a dynamic environment, companies experience rapid and unpredictable environmental changes [16, 17] and it is difficult for them to predict the future based on the past. In this context, an ambidextrous decision-making strategy based on prediction will fail [18].

Disruptive innovation theory suggests that it is difficult for companies to achieve discontinuous growth because the value network of the existing core business locks in resources [19]. First, the powerful customers of the existing core business require companies to invest more resources to meet their needs [20]. Second, to obtain a lasting competitive advantage, companies will continue to optimize the technological paradigms of their existing core business [21]. The more successful a company's existing core business is, the more likely it is that the company will encounter value network lock-in problems when it shifts to the new business [22]. The successful realization of discontinuous growth not only requires finding new businesses in emerging and fringe markets [23], but also realizing the shift from its core business to a new business. In a highly dynamic environment, how can a company shift from its existing core business to the new business and realize discontinuous growth? This question is a widespread concern.

In this study, we apply fractal theory [2] to explain the discontinuous growth. Mandelbrot proposed the novel mathematical concept of fractals to describe how parts are obtained from the whole by similarity. Fractals are widely used to explain the self-similarity of evolving objects in nature [24]. Scholars have also put forward the concept of "fractal company" based on fractal theory [3] and proposed that the main characteristic of a fractal company is the structural similarity between fractals and the whole company in terms of organizational design, how services are performed, and the formulation and pursuance of goals [4]. A fractal structure has many advantages for companies. First, self-similarity ensures that all support mechanisms are available to all fractals through the sharing of company resources. Second, although company fractals may enjoy a large degree of autonomy, self-similarity ensures that the goals of all fractals are similar; it is in fact guaranteed that all fractals can blend together to support the goals of the whole company, maintaining overall stability [3]. The problem of discontinuous growth is that the value network lock-in effect in existing core business limits the resources available to develop new businesses. The self-similarity characteristic emphasized by fractal theory can provide a useful perspective for addressing this problem. The new business retain some aspects of the value network that are similar to those of the existing core business, which means that to some extent the new business can leverage the resources of the existing core business. This can reduce the value network lock-in effect in the existing core business.

The second research question of this study asks, if discontinuous growth exhibits fractal characteristics, what kind of strategy do companies adopt to realize these characteristics? We introduce entrepreneurial bricolage theory [25] to answer this question. Although entrepreneurial bricolage emphasizes breaking through resource constraints to achieve innovation outcomes [26], bricolage solutions exhibit some underlying similarities [25]. First, entrepreneurial bricolage relies on the resources at hand rather than searching for new resources, meaning that although the output of bricolage is new [27], the input is similar [28]; as the company finds a new way to use existing resources, the solutions arising from entrepreneurial bricolage display similarities. Second, entrepreneurial bricolage is greatly influenced by the cognition of entrepreneurs [29]. An entrepreneur's use of the resources at hand to cope with environmental upheaval is not always improvisational behavior; there is also the possibility of planned action [25]. Although bricolage emphasizes make-do, the cognition of the entrepreneur plays a leading role in the content and direction of bricolage. Therefore, bricolage solutions are manifestations of the will of individual entrepreneurs, which may lead to similarities among solutions designed by the same entrepreneur.

Digital companies are suitable research objects to investigate the characteristics of discontinuous growth. First, the discontinuous growth of digital companies is prominent [7], and they are undergoing rapid and unpredictable environmental changes in terms of technology and market competition [30]. Relying on the development of digital

technologies and platforms, digital companies constantly find new opportunities to meet changing market demand [7]. Second, digital companies are good at resource integration [31]. They use low-cost and reusable information resources as factors for identifying and developing new entrepreneurial opportunities and the affordance characteristic of digital technology helps such companies to realize "technology + domain" resource reorganization [32].

## 3. Methods

*3.1. Research Setting.* This study explores the questions of why and how discontinuous growth occurs. We adopted a case study methodology because it is appropriate for this type of exploratory research [33]. Furthermore, research on how companies achieve discontinuous growth is still in the early descriptive and unstandardized stage [1, 34] and is not yet sufficiently developed to explain the complex phenomenon of discontinuous growth. In this context, a case study can provide new and key insights and suggest directions for more in-depth research [35].

We followed the principle of theoretical sampling to select our case company [35]. The selected case was required to meet the following three criteria. First, as our research questions concern the discontinuous growth of digital companies, the case company had to be a digital company. We chose Beijing ByteDance Technology Co., Ltd. (hereinafter referred to as "ByteDance"). Founded by Zhang Yiming in March 2012, ByteDance is now regarded as one of the most outstanding digital firms worldwide. ByteDance has set up its own artificial intelligence (AI) lab that focuses on machine learning and embedding technology learning into its products and services. ByteDance products are all based on AI technology. Second, the selected case company should have achieved discontinuous growth. The discontinuous growth of ByteDance is striking (see Figure 1). It created two successful digital products, Toutiao and Douyin, in 2012 to 2016 and successfully realized the shift from Toutiao (the existing core business) to Douyin (the new business). Founded in 2012, Toutiao, meaning "headline" in Chinese, was the first product of ByteDance. It is an online platform that aggregates, recommends, and delivers news and content based on users' interests. Douyin, released by ByteDance in September 2016, is an online short-video mobile application that allows users to create, post, and share self-created videos. It has become one of the leading social network applications in terms of downloads and active users. Third, the selected case company should be able to provide detailed evidence of discontinuous growth. ByteDance has attracted a lot of attention and relevant data are conveniently available from multiple channels for verification by data triangulation. Table 1 displays the basic information of Toutiao and Douyin.

*3.2. Data Collection and Analysis.* We opted for a case in which the phenomenon of discontinuous growth was present to a high degree and was easily observable. We had been tracking the case company since 2018. Based on the multisource data collection method [36], we collected extensive primary and secondary data related to the case company to form an evidence triangle [33]. The data came from a compilation of company information, semistructured interview, and field observations (see Table 2). First, we collected information from newspapers, periodicals, publicly released executive statements, websites, forums, social media, and some internal materials related to the research issue and transcribed them for coding and archiving. As the development of the case company had received extensive public attention, second-hand data from various sources were abundant, which made up for the shortage of in-depth interviews with the founder, Zhang Yiming. The main sources of primary data were field observations and semistructured interviews with main managers, employees in various departments, and key stakeholders. Semistructured interviews were divided into in-depth interviews and information interviews. Before conducting an in-depth interview, we sent an interview outline to the interviewees. We also conducted an online preparatory interview of no more than 10 minutes with each interviewee in advance to enhance familiarity and confirm the formal interview time. Each interview lasted for 1 to 2 hours. During the interview, we asked the interviewee to provide detailed information. If the interviewee did not consent to recording, we wrote up our notes soon after the interview and combined them with our on-site records. The interview records were compiled and completed within 48 hours of the interview and were mutually confirmed by multiple researchers. Informal interviews were also conducted with experts in this field of research (such as at academic conferences) and other relevant personnel of the case company. The core points made in the informal interviews were coded and archived.

We applied the inductive analysis method of Miles and Huberman [37]. The primary coding came from repeated combining of the original material and the secondary coding involved combining the primary codes; then, through cross-analysis of the original data, secondary coding, and existing literature, the aggregate dimensions were summarized. We established a four-person case study term, including two professors and two doctoral candidates. First, the two students sorted the original material and obtained multiple key sentences by clustering similar content. Then, the two professors each formed an independent analysis team with a student to analyze the key sentences, repeatedly comparing the key sentences against the reference theory. Each coding step was repeated and refined until a consensus was formed.

## 4. Results and Discussion

*4.1. Fractal Characteristics in Discontinuous Growth.* By coding the data related to ByteDance's shift from Toutiao (the existing core business) to Douyin (the new business), we revealed that the company's discontinuous growth exhibited fractal characteristics. Specifically, Toutiao and Douyin showed self-similarity characteristics in four aspects: organizational structure, technology, goal, and market.

As shown in Table 3, in technology, Douyin still uses Toutiao's recommendation engine algorithm (A1) and
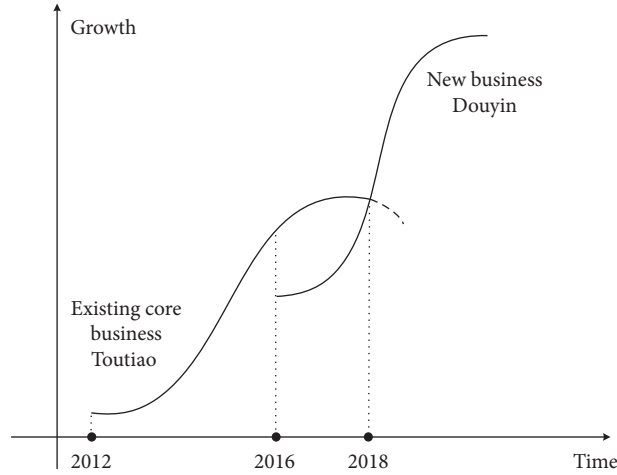
Figure 1: Discontinuous growth of ByteDance.

Table 1: Basic information about Douyin and Toutiao.

| Category | Toutiao | Douyin |
|---|---|---|
| Domains | Media information | Short social video |
| Release year | 2012 | 2016 |
| Business scale | 700 million registered users by 2016 By 2018, with fewer than 800 million users, the scale of growth was no longer significant | 250 million daily active users by 2018 Over 400 million daily active users as of early 2020 |

Table 2: Summary of the process used to obtain information about the case company.

| Data source | Data type | Interviewee/main content | Number of items |
|---|---|---|---|
| Company information compilation | Public interviews and external speeches by executives | Videos and textual material of ByteDance executives | 35,000 words |
| | Direct materials | Douyin and Toutiao's product development information, ByteDance official websites, forums, media reports, etc. | 10.1 million words |
| | Newspapers and periodicals | Search results from China Academic Journal's Network and China's Core Newspaper Full-Text Database (online version) | More than 600 studies |
| Semistructured interview | In-depth interview | Company executives, employees in various departments, and key stakeholders | 9 participants |
| | Informal interview | Experts in this field and other relevant people in the case company | Several participants |
| On-the-spot investigation | — | Observations of ByteDance's workplaces and project meetings | 2 times |

personalized recommendation algorithm to conduct the information distribution (A2). The user tags in Douyin and Toutiao are also shared (A3). In terms of organizational structure, Douyin and Toutiao both have a middle platform, which includes three key departments: technology, user growth, and commercialization (A4). A microteam is adopted when developing new products (A5). Douyin and Toutiao both take pursuing user growth as the primary goal (A6) and attach great importance to user experience (A7). The original intentions of Douyin and Toutiao were to develop functions that distinguished them from similar products (A8). In the market, Douyin and Toutiao both focus on the high-quality needs of customers (A9) and use immature technology to expand emerging markets (A10). Self-similarity characteristics emphasize the similarity

between the parts and the whole [3], which can explain the value network lock-in of a digital company when it shifts from the existing core business to the new business. Therefore, we propose the following.

**Proposition 1.** *A necessary condition for the discontinuous growth of digital companies is that similarities exist between the existing core business and the new business in terms of organizational structure, technology, goal, and market.*

*4.2. The Effect of Entrepreneurial Bricolage on Fractal Characteristics.* By coding the data of ByteDance's shift from Toutiao (the existing core business) to Douyin (the new business), we found evidence of entrepreneurial bricolage in

TABLE 3: Fractal characteristics of discontinuous growth.

| Evidence | Primary coding | Secondary coding | Aggregate dimensions |
|---|---|---|---|
| A1 Douyin benefits from Toutiao's recommendation algorithm, which is a notable known ability of Toutiao. Specifically, Toutiao's mature recommendation engine algorithm is directly used in the development of Douyin. Therefore, it can be said that Toutiao's recommendation engine algorithm supported the development of Douyin. Douyin had a solid technical foundation when it was launched, which quickly made it a hot product in the field of short video. | Douyin adopts Toutiao's recommendation engine algorithm | | |
| A2 Toutiao and Douyin both use the mode of "personalized recommendation algorithm + domain." Toutiao's mode is "personalized recommendation algorithm + text," and Douyin's mode is "personalized recommendation algorithm + short video." Both these modes address the issue of content distribution. | Douyin and Toutiao both use personalized recommendation algorithm to distribute information | Similarities in technology | |
| A3 User tags are shared in Toutiao and Douyin, supporting Douyin to conduct a cold start smoothly. Each app that splits off from Toutiao retains some similarities with Toutiao. Even so, Douyin, under the unified account system and user data tag mechanism, it continuously forms a huge app matrix with continuous internal segmentation together with other apps. | Douyin adopts Toutiao's accumulated user tags | | |
| A4 Like Toutiao, Douyin's middle platform has three key departments—technology, user growth, and commercialization—which are responsible for retention, acquisition, and monetization, respectively. Although the foreground system operates more than a dozen apps, at the same time, much of the research and development work is supported by the middle platform. | Douyin and Toutiao's middle platform both contain three key departments | Similarities in the organizational structure | Self-similarity |
| A5 A lean team can quickly trial and error different areas to find opportunities for growth. Douyin's development team is an entrepreneurial team of fewer than 10 people. Zhang Yiming spent more than three months developing the initial version of Toutiao with a team of a dozen engineers. | Douyin and Toutiao both use microdevelopment teams | | |
| A6 Toutiao attaches great importance to user growth at all levels. For example, at the product level, it pays attention to what functions can improve user retention and transformation. Douyin's strategic goal is to improve user retention, which is highly related to user scale. The ultimate goal is to improve daily active user (DAU), duration, and other scale data to achieve user's growth. | Douyin and Toutiao regard user's growth as a top priority | | |
| A7 ByteDance designs Toutiao and Douyin based on the logic of traffic realization, gives users more choice rights, increases their choice area and autonomy, and achieves the purpose of immersing users and occupying more of users' time. | Douyin and Toutiao attach great importance to a high-quality product/ service experience | Similarities in the goal | |
| A8 Douyin and Toutiao's teams both hope to develop something different. Toutiao's team wants to become a search engine and wants to let ordinary people use the internet. Douyin's team wants to develop it as a young, trendy, and fashionable creation and communication platform. | Douyin and Toutiao both want to differentiate themselves from competitors | | |
| A9 Douyin incisively and vividly shows the "essence and beauty" of life. Toutiao pays more attention to removing "low-brow" content from the platform than its peers and never actively pushes "low-brow" content. | Douyin and Toutiao both aim to meet users' high-level, high-style, and high-standard demands | | |
| A10 ByteDance used a new logic (namely, a recommendation engine algorithm) to distribute information. The founder of Yi-Dao and founder of Douban both thought they had seen the potential for personalized recommendation technology for a long time, but they thought the recommendation technology was not mature and there was not enough content for distribution. | Douyin and Toutiao both exploited immature technology to develop emerging markets | Similarities in the market | |

the discontinuous growth of ByteDance, including labor bricolage, physical bricolage, skills bricolage, market bricolage, and institutional bricolage (see Table 4). Entrepreneurial bricolage ensured the case company's fractal characteristics during its discontinuous growth. In the development stage of Douyin, ByteDance lacked labor and technical resources. In this situation, ByteDance used labor bricolage and physical bricolage to provide resources for Douyin. For instance, nonprofessional personnel and customers became labor to support Douyin's development (B1–B5). Toutiao used accumulated resources, including user tags, a recommendation engine algorithm, and a middle platform to support its development (B6–B8). In the update stage, the Douyin team used skills bricolage to learn

TABLE 4: Entrepreneurial bricolage in discontinuous growth.

| Evidence | Primary coding | Secondary coding | Aggregate dimensions |
|---|---|---|---|
| B1 Douyin team members were thrown together from the Toutiao team. Zhang Yi had been responsible for the operation for three years; he has no experience of being a product manager. Jia Liang, a new intern, has little knowledge of the content operation work. Li Jian, a junior majoring in broadcasting and hosting, has never worked in the internet industry.<br>B2 The startup team of Douyin was not strong. After the style of Douyin was determined, nearly 10 engineers were drawn from the Toutiao team in less than a week to develop this new product. Among them, the most senior had three years of work experience; the others were fresh graduates and intern students. | Organize nonprofessionals when developing Douyin | | |
| B3 At that time, similar domestic products generally had a music and image syncing problem. "Xue Laoshi," an early user, had made comments about these products, but they were unable to be changed. Douyin decided to solve this problem and organized a video conference with Xue Laoshi, adjusting the product version by version. They are constantly thinking about how to solve new problems.<br>B4 To improve the rate of demand response of users, the Douyin operation department set up a technical Q&A group to enable employees in the technology department to communicate directly with users. If the problem was unclear online, users were invited to the office to chat face to face.<br>B5 "We treat users well and communicate with them every day. We listen to their feedback, and it will eventually be reflected in the products." Early users contributed a lot to the product and grew together with Douyin. | Douyin integrates the customers of Toutiao into the labor force | Labor bricolage | |
| B6 In May 2016, the user retention rate of the Toutiao short-video column went beyond the graphic content column; then, ByteDance began to develop the short-video product, Douyin. With Toutiao's accumulation of customer data, Douyin adopted the same user tags as Toutiao and improved user traffic through Toutiao's recommendation.<br>B7 The daily active user (DAU) of Toutiao has just gone beyond 50 million...our accumulation in multimedia technology is weak, everything is still in the initial state. When developing Douyin, we used Toutiao's mature recommendation engine algorithm. The algorithm derived from Toutiao directly supported the incubation of Douyin.<br>B8 ByteDance adopted Toutiao's middle platform organizational form to operate Douyin, including the departments of user growth, technology, and commercialization. Different members were selected from various departments to form Douyin teams. | Develop Douyin to use resources previously accumulated by Toutiao | Physical bricolage | Entrepreneurial bricolage |
| B9 The early team members of Douyin were unfamiliar with video or photography skills. Everyone can quickly learn unfamiliar skills with patience. | Members of the Douyin development team try to learn unfamiliar things | Skills bricolage | |
| B10 The Douyin team established a creator conference to encourage creation. The short-video format of Douyin has brought innovation to a wide range of industries, including gourmet foods, make-up, beauty, tourism, and others.<br>B11 Douyin's live broadcast platform has helped more and more farmers out of poverty, enabling them to increase their income and get rich. | Douyin provides customers with products/markets that were previously unavailable | Markets bricolage | |
| B12 The trend of mobile live broadcasting appeared in 2016. Short videos were not yet popular at that time. There were many short-video products in the market. Most of them were in the horizontal format; portrait format was rare. Douyin displays a video in full screen and automatically plays as soon as it is opened.<br>B13 A group of young people gathered in the Douyin community, where they can find freedom of self-expression and self-identification. Douyin broke the fixed mindset that the original application was only used to watch videos. It has become a popular cultural social community. | The positioning of Douyin has broken through the conventional cognition | Institutional bricolage | |
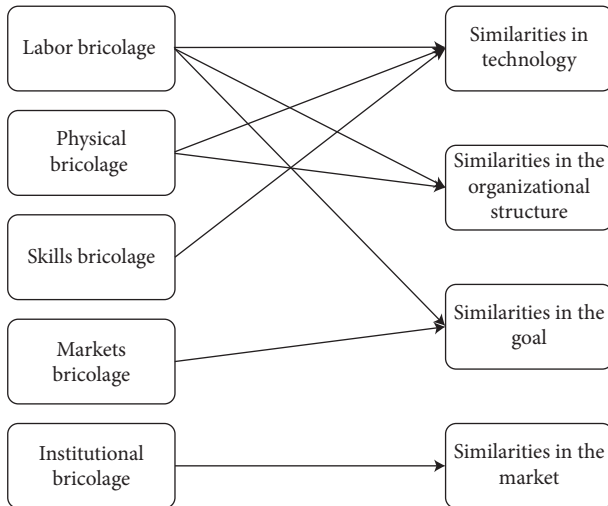
FIGURE 2: Entrepreneurial bricolage and its effect on fractal characteristics in discontinuous growth.

unfamiliar skills in the short-video field (B9). By using market bricolage, Douyin provided experience that had never been offered by other short-video platforms, attracting more users (B10-B11). By using institutional bricolage, Douyin broke through the existing impression of the short-video field and developed it into a popular cultural community (B12-B13).

Our analysis reveals that through physical bricolage, Douyin used Toutiao's recommendation engine algorithm and user tags to bricolage a personalized recommendation algorithm and short-video content, maintaining technology similarity with Toutiao. Douyin also used Toutiao's middle platform, transferring staff from Toutiao's technology, user growth, and commercialization departments to quickly form a microteam to develop Douyin. Therefore, Douyin and Toutiao have similar organizational structures. In terms of labor bricolage, ByteDance incorporated some of Toutiao's technical staff and old users into Douyin's workforce, ensuring that Douyin and Toutiao are similar in organizational structure, technology, and goal. Through skills bricolage, technicians from Toutiao learned short-video skills. This bricolage ensures the technology similarity between Toutiao and Douyin. Through market bricolage and institutional bricolage, Douyin and Toutiao have realized goal similarity (see Figure 2). Therefore, we propose the following.

**Proposition 2.** *Digital companies adopt entrepreneurial bricolage to maintain fractal characteristics in discontinuous growth.*

## 5. Conclusion

This study provides new insights into two important questions that are key to the underresearched issues of discontinuous growth. Research on the discontinuous growth of companies is still at the early descriptive and unstandardized stage [1, 34] and few studies have considered this issue in depth. Addressing the question of what aspects

of successful discontinuous growth of digital companies exhibit fractal characteristics, we first identified that a necessary condition for discontinuous growth of digital companies is that fractal characteristics are shared between the existing core business and the new business. Specifically, these fractal characteristics are reflected in similarities between the existing core business and the new business in organizational structure, technology, goal, and market, which can reduce the threat of a value network lock-in effect brought by the existing core business. A technology lock-in effect in the value network will lead a company to continuously strengthen its technological paradigms [38], making it difficult for it to achieve discontinuous growth. The case company, ByteDance, fully developed and optimized the technology of its existing core business to support the development of the new business. The technology of the new business shares some similarities with the technology of the existing core business. Technology similarity gave the case company two advantages during the process of discontinuous growth. First, technology similarity enabled the low-cost development of technology suitable for the new business. Second, technology similarity prevented the new business from being completely separated from the technological paradigm of the existing core business, which reduced the switching cost of technological paradigm transformation. This solves the technology lock-in problem in the value network of the existing core business. Some industry-leading companies aiming at a customer lock-in effect have suffered because their major decisions are influenced by their powerful customers, meaning it is difficult to make changes. The case company integrated customers of its existing core business into the labor force when developing the new business and directed user traffic from the existing core business during the user acquisition stage of the new business. All of these factors make the new business similar to the existing core business in terms of customers. The similarity of customers enables the customers of the existing core business to accept the new business, reducing the resistance to the transformation of old to new business caused by customer demands.

Addressing the question of what kind of strategy companies adopt to realize fractal characteristics in its discontinuous growth, we propose that entrepreneurial bricolage ensures that companies possess such characteristics. Entrepreneurial bricolage is an important pathway by which digital companies can use the resources at hand to achieve novelty while maintaining some underlying similarities in outcomes [26]. From the case company, we find that a digital company can find a new way to use existing resources such that the solutions arising from entrepreneurial bricolage show similarities. We therefore propose that entrepreneurial bricolage is a strategy that a digital firm can use to obtain fractal characteristics in discontinuous growth. Importantly, we identify the necessary condition for the discontinuous growth of digital companies (answering the first question) and reveal the entrepreneurial bricolage process through which digital companies can foster fractal characteristics (answering the second question). Although some classic theories of firm growth and the theory of

organizational ambidexterity have paid attention to discontinuous growth, they fail to provide an adequate explanation for the successful discontinuous growth process. We are the first to use fractal characteristic and entrepreneurial bricolage to reveal the process of successful discontinuous growth. We also respond to the "black box" problem of discontinuous growth of companies raised by Christensen [1] and Handy [34].

In addition, our findings expand entrepreneurial bricolage research by providing insights into a new function of entrepreneurial bricolage. The literature on entrepreneurial bricolage describes recombining resources for new or novel purposes for which they were not originally planned [27]. It emphasizes that entrepreneurial bricolage may create some unexpected results [28]. By studying the fractal characteristics in the discontinuous growth of companies, we find that, due to entrepreneurial bricolage, there exist similarities between the existing core business and the new business. This finding provides a new understanding of the entrepreneurial bricolage function. The solutions brought about by entrepreneurial bricolage can not only be unpredictable and novel but also similar.

Finally, this study also provides the following contributions to fractal research in two important ways. First, we apply fractal theory to explain the firm growth problem, addressing the problem of discontinuous growth from the perspective of fractals. Such interdisciplinary approaches are still rare [39, 40]. Second, we explain how to realize fractal characteristics from the perspective of entrepreneurial bricolage. Previous studies have defined the characteristics of fractal companies, including self-similarity, self-organization, dynamics, and goal-orientation [3], but they have not provided in-depth explanations of how companies should form these characteristics in the development process. This study considers the manifestation of fractal characteristics during the discontinuous growth of digital companies. We discovered that, due to entrepreneurial bricolage, companies can successfully shift from the existing core business to the new business, during which fractal characteristics are embodied.

Our study has some limitations, which offer opportunities for future research. The first limitation of this study lies in our research object. The phenomenon of discontinuous growth is relatively common in digital companies [7], so we chose a typical digital company as our research object. However, discontinuous growth does not occur only in digital companies. Future studies could analyze companies in other industries, broadening the applicable conditions for discontinuous growth. The second limitation is the research content: we focused on research questions and conducted process exploration research, but lacked attention to the dynamic environment. Nowadays, companies in all industries are experiencing dynamic environments marked by strong competitive pressure [41]. In the future, the dynamic environment faced by companies, as well as the mechanisms of effects of the dynamic environment on the discontinuous growth of companies, should be further described. Moreover, we conclude that the results of entrepreneurial bricolage exhibit similarity characteristics, but this conclusion is based on a single case. Various data from different companies, industries, or counties can be exploited to replicate our findings in future studies to improve the generalizability of these findings.

## Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

## Conflicts of Interest

The authors declare that there are no conflicts of interest.

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