

# How to Develop a Disruptive Technology?

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## Author Details

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**Abstract:** More and more countries realize that their competitive advantage is closely related to the development of disruptive technology. However, the main barrier to develop disruptive technology is the lack of cultivation mechanism. The purpose of this study is to investigate the cultivation mechanism of disruptive technology innovation. The study finds that the strategy selection, basic research, phased cultivation, seeking and finding limitists are important to the cultivation of disruptive technologies. The paper provides implications for firms or countries to develop disruptive technologies.

**Keywords:** Disruptive technology; Disruptive innovation; Competitive advantage; Limitists; Disruptive innovation institutions

## Introduction

Since Professor Christensen of Harvard Business School proposed the concept of disruptive technology in *The Innovation's Dilemma* in 1997, disruptive technology and disruptive innovation has gradually become the focus of innovation management research in academic and industrial areas. The world today is in the gestation period of a new round of technological revolution and industrial change, with continuously emerging disruptive technologies, such as Artificial Intelligence, Big data, Block Chain, Cloud Computing, Nanotechnology, Brain science, Driverless Technology, etc. [1,2], new forms of industrial organization and business models are being formed, providing human society with new momentum for leapfrog development, and providing new opportunities for emerging economies and developing countries to accelerate technological catch-up and achieve innovation-led development. However, disruptive technologies are like "hopeful monsters", which appear full of good and promising future. Compared with the mainstream technologies that hold a quite large market share, disruptive technologies are often difficult to immediately gain competitive advantage, thus falling into the "valley of death" between technology development and market application [3]. Therefore, how to cultivate and develop disruptive

technologies becomes the key for a firm or country to gain sustainable competitive advantage.

## What is a Disruptive Technology?

From the perspective of innovation's impact on the market, Christensen divides innovation into two categories, namely, sustaining innovation and disruptive technology innovation. Sustaining innovation refers to improving the functional properties of existing products and strengthening the existing capabilities of the firm through a certain degree of performance enhancement along the original technological track [4]. Disruptive technology innovations are those that provide portfolios of value and performance different from the original technology or product, creating appropriate value for lower-end consumers or emerging consumers in non-mainstream markets [5]. Christensen believes that as the performance of disruptive technologies improves, their products will gradually occupy the original mainstream market and eventually replace the original technology. A disruptive technology is a technology that changes the bases of competition by changing the performance metrics along which firms compete [6]. Later, the concept of disruptive technology was extended into a broader concept as disruptive innovation, which not only refers

to disruptions in technology, but also involves disruptions in other aspects such as products, business models and strategy [5,7,8]. But overall, the variants still follow the original connotation of disruptive technology [9,10].

## How to Cultivate a Disruptive Technology?

### Strengthen Strategic Design and Establish Disruptive Innovation Institutions

Disruptive technology is an alternative technology that has a disruptive effect on existing traditional or mainstream technologies. Disruptive technologies are strategically important for breaking the balance and establishing a competitive advantage for a firm or country. Therefore, it is of great significance for both firms and countries to focus on the development of disruptive technologies at a strategic level. For incumbent firms, one of the most popular strategies is that incumbent firms can set up separate business units to work on some potentially profitable disruptive technology innovation projects [5,11,12], so that they can reduce the threat of potential disruptive technology innovation projects and even proactively participate in the disruptive change. At the national level, the United States established Defense Advanced Research Projects Agency in 1958 to develop high technology for military use. Russia established the Defense Advance Research Foundation in 2012 to promote the birth and development of disruptive technologies. Japan launched the Japan Disruptive Technology Innovation Program in 2012, which is responsible for high-risk, high-impact R&D activities to achieve sustainable development. Most emerging economies and developing countries have not yet set up specialized institutions for disruptive innovation. Emerging economies and developing countries need to learn from developed countries and set up institutions dedicated to disruptive technology innovation to gain competitive advantage by seizing opportunities at difficult or crucial points or changing the way of development.

### Strengthen Basic Research and Promote the Generation of Disruptive Technologies

Basic research is strategic, pioneering, public and exploratory in nature, and is an important source of disruptive technological innovation. At present, with the continuous progress of scientific and technological means, human's cognition of the world has risen to an unprecedented new height. On the one hand, with the macro-expansion and micro-deepening of basic science research, a series of major scientific breakthroughs may be made and change and enrich mankind's basic perception of scientific principles and thus generate new disruptive technologies. On the other hand, the integration and development among various fields of basic science will most likely give rise to new major scientific ideas and theories, which in turn will promote the generation of new disruptive technologies. From the national level, the country should increase investment in basic research in areas of strategic importance to military security, industrial security, and scientific and technological security, with a view to making breakthroughs as soon as possible, giving rise to disruptive technologies and producing major original results.

### Follow the Growth Rules of Disruptive Technologies and Cultivate Disruptive Technologies in Stages

There are three key periods for the selection and cultivation of disruptive technology. The first is the cultivation period before disruptive technologies are generated. This period is crucial to lay the foundation for the growth of disruptive technologies. The scientific research forces and resources are guided to the field of disruptive technologies through original innovation and basic research, and promote the development of more disruptive technology nurseries. The second is the research and development period before the disruptive technology enters the market. This phase involves identifying

disruptive technologies from the nursery and devoting major resources to the research and development of disruptive technologies in order to make breakthroughs. The third is the incubation period before the industrialization of disruptive technologies. In this period, the focus should be on the development of supporting infrastructure and the establishment of new socio-technical mechanism.

### Cultivate and Discover the Limitists, and Promote Disruptive Technological Innovation

Talent is the first resource for disruptive technology innovation. Disruptive technologies are often generated or mastered in the hands of a few people, "wizards", "prodigy" and "eccentrics" have a different mindset. Their way and angle of thinking and problem solving are different from those of ordinary people, which is often contrary to common sense and similar to the way disruptive technologies are generated. In addition, a limitists can quickly discover the limits of traditional or mainstream technologies and find paths to breakthroughs. Therefore, discovering and training limitists and establishing a mechanism are crucial to the selection and cultivation of disruptive technologies. In the process of promoting disruptive technology innovation, we should focus on discovering "wizards", "prodigy" and "eccentrics" who have peculiar thinking and fantastic ideas, discover and cultivate limitists, and train such talents with a tolerant attitude and an inclusive mechanism to promote the generation, development and application of disruptive technologies.

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