



Analysis of the corporate entrepreneurship and innovation of Lenovo

Ziyi Yang

University of Nottingham, Ningbo, China

hmyzy12@nottingham.edu.cn

Abstract. The current global business environment demands that corporations whether they are large or small should have the capability to forecast the trend of development and respond to the changes of external. These variations could be opportunities or challenges for them. Corporate entrepreneurship is considered as one way to purchase such opportunities. This essay will focus on the performance of Lenovo, and explain it from four aspects: culture, source of innovation, external stakeholders, and learning of Lenovo. The analysis proves that Lenovo has demonstrated its innovation ability in most aspects, but there is still room for improvement in some aspects.

Keywords: corporate entrepreneurship, Lenovo, innovation, collaboration.

1 Introduction

Lenovo Group Co., Ltd, formerly known as the New Technology Development Company of the Institute of Computer Science, Chinese Academy of Sciences, was established in 1984. It successfully went public on the Hong Kong Stock Exchange in 1994. It is currently valued 112.9 billion Yuan ^[1]. The company boasts a wide range of products and operates across various business sectors. Today, Lenovo mainly focuses on three divisions: IDG (Intelligent Device Group), focusing on intelligent Internet of Things; ISG (Infrastructure Solution Group), specializing in smart infrastructure; and SSG (Services and Solutions Groups), concentrating on industry-specific services.

In the past two decades since its establishment, Lenovo developed its own business around PCs and in recent years, Lenovo has caught up with the development trend of technology and carried out some intelligent transformations.

From table 1, it could be seen that in the 22/23 fiscal year, the total revenue showed a significant decrease which could be seen in the following table, due to the decline in PC demand, market contraction, and the impact of exchange rate ^[8] While the revenue in the other two segments has increased, reducing some of the negative impact of the PC market and other factors on Lenovo ^[8].

Lenovo constantly innovates in its own field. By April 2023, Lenovo had accumulated more than 38,000 patents and patent applications worldwide, including more than 10,000 valid invention patents in China. The proportion of invention patents with higher

quality reached 85%^[11]. The annual statement of Lenovo illustrates that Lenovo's R&D investment in the past 10 years, from FY18/19 to FY20/21, rose slowly, and both of the ratio and expenditure increased significantly in FY21/22, which is shown in table 1, and Lenovo's transformation could be one of the reasons of this growth^[8].

Table 1. A portion of the comprehensive profit and loss and the expenditure on innovation of Lenovo^[8]

	Thousand dollar in 2023	Thousand dollar in 2022	Thousand dollar In 2021
Revenue	61,946,859	71,618,216	60,742,312
Cost of sales	(51,445,766)	(59,569,241)	(50,974,425)
Gross profit	10,501,093	12,048,975	9,767,887
Other income - net	0	0	0
Selling and distribu- tion expenditure	(3,285,126)	(3,746,290)	(3,044,966)
Administrative ex- penditure	(2,311,771)	(2,944,234)	(2,984,356)
Research and develop- ment expenditure	(2,195,329)	(2,073,461)	(1,453,913)
Other operating ex- penditure - net	(40,043)	(204,421)	(104,244)

According to the *Building an Entrepreneurial Organization*^[9] and *Managing Innovation: Integrating Technology, Market and Organizational Change*^[12] these two books, the Corporate Entrepreneurship can be shown in many ways, and this essay will focus on four directions among these ways, and analyze how they are reflected in the development of Lenovo.

2 The model of corporate entrepreneurship and innovation

Figure 1 is structured by these two books which can evaluate corporate entrepreneurship from approximately 9 perspectives: innovation strategy; organizational culture; sources and challenges; external stakeholders; organizational structure; decision-making under uncertainty; managing knowledge, learning and ambidexterity; processes; design thinking^{[9][12]} In order to ensure the scientific nature and accuracy of the analysis, the article will select four aspects with the most sufficient and the latest arguments. Therefore, the essay focuses on four dimensions: culture, sources and challenges, external stakeholders, and managing knowledge, learning and ambidexterity. This part would briefly introduce the concepts of these four dimensions.

First, the culture would show how the entire atmosphere of the company helps foster innovation, which can be divided into several aspects, including shared vision and leadership, key individuals, effective teamwork, high-involvement innovation, cultural environment, structure, and external focus. Two of these aspects will be discussed in the next section. Secondly, sources and challenges can be simply divided into two types:

knowledge push and needs pull. Both of these will be covered in the subsequent analysis. Thirdly, external stakeholders refer to collaborations between corporations and external entities. Collaborations with other enterprises in the industry and schools will be introduced. Fourthly, learning, companies promote and enhance their own innovative development by balancing exploratory and exploitative learning. The methods to achieve the balance could be classified into four types: contextual ambidexterity, organizational separation, temporal separation, and domain separation (inter-organizational). The last type will be used to measure Lenovo.

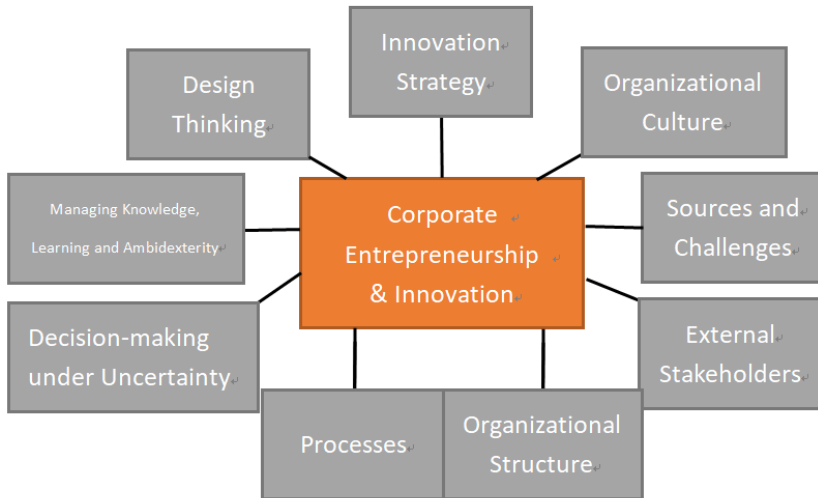


Fig. 1. The framework of corporate entrepreneurship and innovation behaviors ^{[9][12]}

3 The analysis of Lenovo - examples of analysis from four perspectives

3.1 Organizational culture

"Intelligence, for every possibility" is Lenovo's newly released vision in 2019. Lenovo sticks to its own vision and devotes itself to researching, designing, and manufacturing a comprehensive range of end-to-end intelligent devices and infrastructure products. The company aims to provide users and the industries with integrated applications, services, and exceptional user experiences through intelligent terminals. Additionally, Lenovo offers a robust cloud infrastructure with industry-specific intelligence solutions. At the 2019 Science and Technology Innovation Conference, the CEO of Lenovo emphasized that data intelligence has initiated an industrial revolution that no one can avoid ^[2]. Under the wave of shifting to intelligence, the company firmly embraces an intelligent strategy and actively promotes intelligent transformation to be the leader and agent of change ^[2]. Furthermore, in order to realize this vision, Lenovo's top managers

have been investing in the intelligent transformation plan. In 2019, Lenovo Venture Capital invested in around 110 enterprises according to the 3S strategy. The investment projects included internal incubation in core business areas, leading enterprises in the field of intelligent industry, and core components related to the Internet era ^[2].

To foster innovation among employees, Lenovo has set up “the Small Strong Innovation project” with various activities such as Innovation 24h. These activities were aimed at stimulating innovative thinking by engaging events and generous incentives and helping Lenovo to create a highly-involvement innovation environment. Since its inception in 2015 until 2019, “Small Strong Innovation” has successfully incubated eight entrepreneurial projects within Lenovo and valued at over ¥500 million^[3].

3.2 Sources and challenges

In the process of R&D, Lenovo's directions include two types: knowledge push and needs pull and these two types are the sources of innovation. Lenovo has been increasing its investments in R&D, and the amount of R&D investments continues to grow. The annual report for fiscal year 22/23 stated that Lenovo invested \$2.2 billion in research and development, representing about a 6% increase compared to the previous year ^[8]. Additionally, for technology accumulation, Lenovo holds innovation and technology conferences to exchange research and development results. At 2023 Lenovo Tech World, the company exhibited its revolutionary product AI PC that enabled natural AI interactions, further improved productivity with simplified processes and it also owns better privacy and information protection ^[6].

Meanwhile, needs-pull innovation cannot be ignored. Facing with ecological challenges, there is a growing demand for green research and development as well as low-carbon production. Lenovo actively responds to the challenges and focuses on developing environmentally friendly products. To meet the requirements of the current complex computing power infrastructure, Lenovo has established the Haishen liquid cooling technology system. This technology system encompasses two categories: liquid cooling auxiliary technology (such as wind-liquid hybrid liquid cooling) and direct liquid cooling technology. Researchers indicated that by direct liquid cooling technology, the heat exchanges through the liquid cold plate system ^[5]. This could effectively dissipate heat from both major power components or even all power components, which significantly reduces energy consumption resulting from fans and ambient air conditioners. The Power Usage Effectiveness (PUE) could be reduced to 1.0-1.2 units ^[5]. One of Lenovo's newly released servers also applied a hybrid design with air ducts combined with liquid cooling technology, compared to similar products, which is expected to reduce power consumption by approximately 10% ^[5]. The green technology research and developments of Lenovo satisfy the demands of customers and society for low-carbon products and technologies.

3.3 External stakeholders

Lenovo has done very well in the external stakeholder aspect, including cooperation with enterprises and schools. The company has successfully established cooperative

relationships with numerous enterprises, as can be seen from its recent Innovation Technology Conference. Lenovo announced that it will further deepen collaborations with NVIDIA, Intel, and other industry leaders in the areas of smart devices, infrastructures, and solutions ^[6]. For example, Lenovo developed a new hybrid AI initiative with NVIDIA. Based on the MGX framework brought by NVIDIA, Lenovo will offer new enterprise-class AI solutions and a fully integrated system ^[6]. The cooperation could help them spread AI-driven computing power to more industries.

Furthermore, Lenovo has also formed partnerships with various universities and established a diverse range of laboratories. For example, in 2022, Lenovo and Tsinghua University cooperated in intelligent manufacturing, integrated circuits, future computing, and other domains ^[13]. It acknowledged that it was insufficient to only rely on Lenovo's capabilities. Lenovo hopes to cultivate highly skilled professionals in technology management, operations and related fields with the help of Tsinghua University's exceptional educational resources ^[13]. The company also provided a donation towards talent cultivation at Tsinghua University. Besides that, supporting the development of Tsinghua University's student internship practice base and graduate employment is the commitment of Lenovo Group ^[13]. In the same year, laboratories from Lenovo established an intelligent equipment joint laboratory and an artificial intelligence joint laboratory with Shanghai Jiaotong University ^[10]. These collaborations not only enhanced Lenovo's pool of talents, but also promoted the further development and deepened the technological expertise of Lenovo.

3.4 Managing knowledge, learning and ambidexterity

Learning could be divided into two types: exploration learning and exploitation learning ^[12]. Lenovo mainly employs domain separation to balance these two and both of them can be carried out in multiple domains. In the highly competitive technology industry, Lenovo needs to continuously learn in order to maintain its competitiveness. Through collaborations with other enterprises, Lenovo can promote its learning process to optimize their own products and develop new technologies in emerging fields. Lenovo chooses the different partners playing different roles, some of them would help to innovate and others would distribute to further research and development of new results.

Lenovo demonstrated a groundbreaking concept intelligent cockpit system jointly developed with Chery Automobile at Tech World 2022. This invention could be the exploration learning of Lenovo. The system includes the multiple screens, an intelligent cockpit domain controller, a driver health monitoring system, and other smart products such as multi-device wireless charging ^[4]. Among them, the multi-screen integrated device enables voice control, 3D navigation, interaction between each screen and interaction between the car and the phone. This system has also successfully passed numerous car tests ^[4].

In 2023, Lenovo announced that it would develop the latest generation of in-vehicle domain controller platform based on NVIDIA's new generation DRIVE Thor system-on-chip (SoC) ^[7]. Lenovo is the first company to adopt NVIDIA's DRIVE Thor platform. According to Lenovo researchers' statements, this cooperation will effectively

integrate Lenovo's powerful heterogeneous computing technology, product innovation and delivery capabilities with NVIDIA's advanced artificial intelligence and accelerated computing technology [7]. Because of the efficient integration, it will also strongly promote Lenovo in creating advanced driver assistance systems (ADAS), intelligent driving solutions for cockpits as well as safe car computing products and solutions while significantly improving its car computing scheme powerfully by deepening relevant technologies related to intelligent driving and intelligent cockpits [7].

4 Conclusion

In recent years, Lenovo's financial performance was relatively stable and it basically maintained profitability. However, like other technology companies, its performance has been affected by the factors such as the global economic environment, market competition, and downturns. Lenovo's related business profit may recover if there is an improvement of the PC market [8]. Focusing on the development trend, Lenovo actively carried out intelligent transformation. During the transformation period, Lenovo is committed to seeking growth opportunities in smart devices and data centers, reducing dependence on the PC market from multiple aspects through the development of ISG and SSG to drive revenue.

The ISG server business is expected to maintain high growth rates and continue improving as operating margins turn positive and the PC shipments in IDG are expected to return to growth refers to that the PC market is expected to recover in the second half of 2023 [8]. Additionally, because of its stable supply chain system and mature delivery and execution capabilities, SSG also maintains steady growth [8]. Lenovo is expected to gain a higher operating revenue growth than last fiscal year, and the profit for Lenovo will be much better than the previous stage.

Based on the previous analysis, this essay also provides the suggestion. To maximize the benefits of innovation, Lenovo needs to make better use of the blue ocean strategy, opening up new sectors in artificial intelligence, Internet of Things, and other fields. It should actively carry out innovative research and seek for technological breakthroughs to gain the leading advantages. Most of the intelligent directions and service directions developed by Lenovo before were only new for its own business scope rather than the emerging business of the entire industry. It should combine technology accumulation with market researches, adopt the blue ocean strategy to develop the blue ocean market, and actively build itself as an innovation leader. Entering the blue ocean market provides Lenovo with a greater profit space which can help Lenovo relieve competition pressure from PC and other fields while expanding market share to attract more new customer groups.

Reference

1. East Money (2023), 'Performance of Lenovo Group Co., Ltd'. Available at: <https://so.east-money.com/web/s?keyword=%E8%81%94%E6%83%B3%E9%9B%86%E5%9B%A2>. (Accessed: 1 December 2023).
2. Lenovo's Official Website (2019), 'Lenovo Innovation Technology Conference 2019: The future of Smart China is coming'. Available at: <https://brand.lenovo.com.cn/brand/PPN00299.html> (Accessed: 10 November 2023).
3. Lenovo Official Website (2019), '24 hours of crazily creation, the Small Stong plan shocked'. Available at: <https://brand.lenovo.com.cn/brand/PPXD00161.html> (Accessed: 5 November 2023).
4. Lenovo's Official Website (2022), 'Tech World 2022/ Lenovo does not have a car producing plan, we want to do car computing'. Available at: <https://brand.lenovo.com.cn/brand/PPN01628.html> (Accessed: 28 November 2023).
5. Lenovo's Official Website (2023), 'At HPC China 2023, Lenovo warm water cooling server won the "Technology Innovation Award"'. Available at: <https://brand.lenovo.com.cn/brand/ppn02211.html> (Access: 15 November 2023).
6. Lenovo's Official Website (2023), 'Lenovo Tech World 2023: To create panoramic AI accelerate productivity revolution'. Available at: <https://brand.lenovo.com.cn/brand/ppn02317.html> (Accessed: 25 November 2023).
7. Lenovo's Official Website (2023), 'We're working with NVIDIA to build a super brain for car computing'. Available at: <https://brand.lenovo.com.cn/brand/PPN01868.html> (Accessed: 28 November 2023).
8. Lenovo's Official Website (2023), 'Lenovo Group Co., Ltd Annual Report 2022/23'. Available at: <https://doc.irasia.com/listco/hk/lenovo/annual/2023/car2023.pdf>. (Download: 10 November 2023).
9. Mosey, S., Noke, H., & Kirkham, P. (2017). *Building an entrepreneurial organization*. Taylor & Francis. [https://books.google.com/books?hl=zh-CN&lr=&id=_CQIDwAAQBAJ&oi=fnd&pg=PP1&dq=Building+an+Entrepreneurial+Organization+\(Mosey&ots=yMrr21PGKs&sig=0RWIW_CkWBDSctdGk_n8QZgpx_E#v=onepage&q=Building%20an%20Entrepreneurial%20Organization%20\(Mosey&f=false](https://books.google.com/books?hl=zh-CN&lr=&id=_CQIDwAAQBAJ&oi=fnd&pg=PP1&dq=Building+an+Entrepreneurial+Organization+(Mosey&ots=yMrr21PGKs&sig=0RWIW_CkWBDSctdGk_n8QZgpx_E#v=onepage&q=Building%20an%20Entrepreneurial%20Organization%20(Mosey&f=false)
10. Shanghai Jiao Tong University News Academic Website (2022), 'Lenovo Group - Shanghai Jiaotong University joint laboratory signing and opening ceremony was held'. Available at: <https://news.sjtu.edu.cn/jdyw/20221101/175784.html> (Accessed: 15 November 2023).
11. Sina Finance (2023), 'Lenovo Group has accumulated more than 38,000 patents and patent applications worldwide'. Available at: <https://finance.sina.com.cn/jjxw/2023-04-28/doc-imyxrfr2780447.shtml>. (Accessed: 15 November 2023).
12. Tidd, J., & Bessant, J. R. (2020). *Managing innovation: integrating technological, market and organizational change*. John Wiley & Sons. <https://books.google.com/books?hl=zh-CN&lr=&id=5w4LEAAAQBAJ&oi=fnd&pg=PA1&dq=+Managing+Innovation:+Integrating+Technology,+Market+and+Organizational+Change&ots=5KLNxAT0b5&sig=m2jXUGLcxIMQQLc782jb6kz7efA#v=onepage&q=Managing%20Innovation%3A%20Integrating%20Technology%2C%20Market%20and%20Organizational%20Change&f=false>
13. Tsinghua University News (2022), 'Joint Tsinghua University to promote the deep integration of industry, education and research and scientific and technological innovation'. Available at: <https://www.tsinghua.edu.cn/info/1182/98009.htm> (Accessed: 15 November 2023).

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

