

An analysis of the transformation of aerospace industry under the COVID-19 pandemic: Evidence from Rolls-Royce PLC

Lianyi He^{1,*,†}, Fengchi Xu^{2,†}, Jiarui Yao^{3,†}

¹Beijing Normal University - Hong Kong Baptist University United International College

²Hainan University

³University of Leeds

*Corresponding author: jiyay2021@yeah.net

†These authors contributed equally.

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Abstract: Taking Rolls-Royce PLC as an example, the analysis of the transformation of the aviation manufacturing industry under COVID-19 can help us understand the difficulties and crises faced by the aviation manufacturing industry, so as to help improve the industrial structure of the aviation manufacturing industry and achieve the upgrading of the capacity.

1. Introduction

1.1. Background

The aviation has a great impact on the aviation industry, including the drop on the air transport demand and the supplement of the aviation company. For the impact of COVID-19 crisis, the spread of the crisis restricts the travels and the demand for air services decrease, which closely related to the freight rates of the passengers. The uncertainty of the airline companies face include the cost of health-related measures and the shape of the variety for commercial flights. The cost of health-related measure increase include disinfection, temperature checks and vital tests. And the regulated social distancing will lead to the decrease of passenger load. Another reason is the shape of the recovery for commercial flight, which related to contraction of economic activity, also many passengers choose the substitute for the air.

1.2. Research Question

1.2.1. Accelerate the transformation of aviation industry

The digital transformation, especially the rapid development of contactless technology, has been applied in many aviation companies, including voice recognition, contactless control and identity scanning, the measurements has greatly reduced the risk of passengers spreading the virus due to contact with the same device. Also, the technology can also measure passenger's body temperature, respiration and heart rate. However, the current digital transformation of the aviation is still in its infancy, with limited digital investment and partially applied technology.

According to Russell Masters, the vice president of the Digital Services of Rolls Royce, the digital services are part of way to manage, the ranges from tracking the equipment regularly to know their health and their way to operate to track the life of maintenance, to forecast all of the activity about the flight. Although the cost of investment is huge, t to get complicated pieces of turbine machinery designed requires huge amount of data and manufacturing base at different parts of the world. Furthermore, the company is now moving from a manufacturer of equipment to being a provider of long-term services to move in the most efficient and sustainable way.

1.2.2. The development of aviation 2.0

The development of aviation 2.0 includes three aspects: the first is the development prospects of the aviation industry, that is, the relationship between supply and demand; the second is how the aviation industry creates value, that is, the profit model; the third is how to distribute the cake within the aviation industry, that is, the competitive structure. It is possible for Internet giants to enter the aviation industry across borders; competition between alternatives and the aviation industry still exists, but due to the role of the Internet, the cooperation model between alternatives and the aviation industry is more diverse, and competition and cooperation coexist; buyers have the greatest impact on the entire aviation industry, information is more transparent, bargaining power is gradually improved, and the personalized consumption orientation guides the entire industry to present more flexible products. Homogeneous services and products will lose their competitive advantage and be eliminated; suppliers are the original system is restricted and the upgrade is relatively slow, but the overall trend will be more market-oriented; industry competitors will be differentiated, and the successful transformation will evolve into an integrated service provider, and the failure of the transformation will completely become a transportation provider or be merged.

1.3. Contribution

Rolls-Royce pioneer cutting-edge technologies, which deliver clean, safe and competitive solutions to meet the vital needs, the core business include civil aerospace, power systems, defense and ITP Aero in 2018 (financial report of 2018). Rolls-Royce has officially opened Testbed 80, which is the world’s largest and smartest indoor aerospace testbed, according to Eat, chief executive of Rolls-Royce, testbed is smart and it will support the next stage of UltraFan program, it can continually improve the efficiency of the gas turbine and has the capability to test the UltraFan demonstrator.

1.4. Remaining Structure

The Board places the highest priority on corporate governance, and operates in the interests of all its stakeholders.

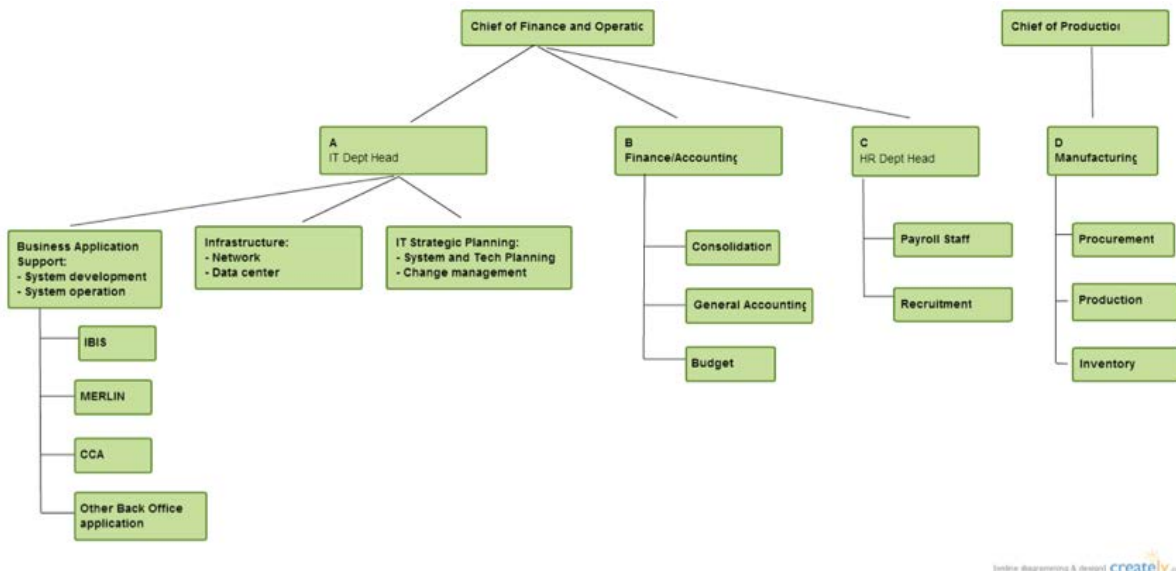


Figure 1. The highest priority on corporate governance

The rest of the essay will compare the aerospace industry before and after epidemic, and interpret different factors, the government policy and related customers. The third part of this essay will analyze the transformation of aviation manufacturing industry, including the strategy that a representative company choose to overcome the difficulties. The analysis of financial analysis will also be shown in the third third part, which give the prediction of after the epidemic and the potential development.

2. The analysis of the aerospace industry around the epidemic

This part of the essay will take the aerospace industry as an example to look at an industry that was hit by the Covid-19 epidemic, and to illustrate what effects the industry received from the epidemic and how it behaved. This essay will firstly clarify the performance of the aerospace industry in 2018 and 2019 as before the epidemic, which the WHO Representative Office in China was first informed of the case of "viral pneumonia" in Wuhan, the People's Republic of China, on 31 December 2019 [1]. Secondly, dividing the aerospace industry performance in 2020 and 2021 into the post-epidemic performance, and mainly focus on the aerospace manufacturer from the aerospace industry.

2.1. The introduction of aerospace industry

We divide the whole aerospace system into three parts. Firstly, the total number of passengers carried by aviation, which reflects the short-term movement of the global population between countries or regions; secondly, the number of flights landed and taken off, which reflects the operational prosperity of the aviation industry; and finally, the aircraft manufacturers, which are the basis of the entire aviation industry, providing spare parts, aircraft and the necessary after-sales services.

2.2. Aerospace industry before epidemic:

2.2.1. Overall performance

In figures published by IATA (International Air Transport Association) and ICAO (International Civil Aviation Organisation) in 2018 and 2019, a total of 4.4 billion passengers travelled by air in 2018, with 37.8 million aircraft movements, while 2019 was a year of slow but steady growth in demand, with a total of 4.5 billion passengers travelling by air, an increase of 3.6% compared to 2018, and an increase in the number of flights taking off and landing to 38.3 million, an increase of 1.7% [2-4].

2.2.2. Government policy

Compared to the growth rate in 2018, 2019 is defined by IATA as a slow-growth year and the first time since the global financial crisis in 2009 that the average annual growth in passenger demand is below 5.5% (4.2% in 2019). The Asia Pacific region, among others, is mainly affected by the trade friction between the US and China, as well as business confidence and economic downturn. The decline in passenger traffic by European airlines, which account for the second-largest market share, is due to the impact of the general economic slowdown, weakening business confidence, labour disputes, and the uncertainty over the UK's exit from the EU and airline closures [5].

2.2.3. Related customers and suppliers

Within the aviation system, we mainly focus on the performance of airlines and the aircraft manufacturing business. In the year 2018 and 2019, the airline in terms of total kilometres flown by scheduled passengers with the first prize was American Airlines Inc., with total operating revenue of US\$44,542 million in 2018 and US\$ 45,768 million in 2019 respectively [2,6]. In terms of the aircraft manufacturers, we use Airbus as an example, which is based on the European Union and displaces Boeing as the aerospace's industry largest company, has EU€63,707 million in 2018 and EU€70,478 million in 2019, showing a steady upward trend [7].

2.3. Aerospace industry after epidemic:

2.3.1. Overall performance – industry average selling performance

After the outbreak, we found through our research that the aerospace industry was hit hard by the Covid-19 epidemic. From the beginning of 2020, the Coronavirus began to spread internationally from just China, with countries in the Asia-Pacific region and Europe becoming new epicentres, followed by an increase in Coronavirus infections and deaths in the United States [8]. From March

2020 onward, countries cut off population movements to curb the spread of the coronavirus, with the aerospace industry bearing the brunt of the major stagnation.

Firstly, 2020 has been defined by IATA as the worst year in its history. The number of passengers carried in 2020 will be just 1.8 billion, down 60.2% from 4.5 billion in 2019; international air passenger demand (RPKs) will fall by 75.6% year-on-year; air connectivity will fall by more than half in 2020 and the number of routes connecting airports fell sharply at the start of the epidemic crisis, by April 2020. The number of routes connecting airports fell sharply at the start of the crisis, by more than 60% year-on-year in April 2020. At the height of the crisis in April 2020, governments closed their borders or adopted strict quarantine measures, with the subsequent grounding of 66% of the global commercial airline fleet. American Airlines, for example, the world's largest airline passenger carrier, will have flown 330.6 billion total passengers in 2019, and only a third of that in 2020, at just 124 billion [9].

2.3.2. Government policy

Following the international spread of the Covid-19 virus, governments have actively adopted various policies to limit the spread of the virus in their countries, including the closure of borders or quarantine of entry into the country, which has had an impact on civil aviation. China as an example, the Civil Aviation Administration of China (CAAC) implemented a policy of limiting international flights to one flight a week for one airline to one country on 29 March 2020. During the first week of the policy, from 29 March to 4 April, the number of international flights to China fell to 108, a drop of 85.3%, or just 1.2% of the number before the outbreak [10].

However, 2021 will be a year of recovery and countries will start to relax their policies. In 2021, the CAA has issued a new policy that changes from the strict policy of 2020 to a fusion system where the number of flights per month per route will be determined by the number of confirmed new crowns on that route [11]. With KLM's announcement, we find that even if the manned flights are cancelled, the flights will still depart on time, changing from manned to cargo flights. This is a positive policy for aircraft manufacture, as it is still an aircraft with a mission, and as long as the aircraft is sailing, carrying people or cargo does not have an impact on subsequent services such as engine maintenance [12].

2.3.3. Related customers and suppliers

Through the financial analysis about the airlines and the aircraft manufacturer, both airlines and aircraft manufacturers suffered large declines in revenue, and even though there is some improvement in 2021 compared to 2020, it is still far from the pre-epidemic level. For American Airlines Inc., the total operating revenue plummets to US\$17,337 million in 2020, only one-third of 2019, and the total operating revenue for the nine months of 2021, on the other hand, was US\$20,455 million, surpassing the US\$13,309 million for the nine months of 2020 [6,13]. Moreover, for the supplier of the aerospace industry, the Airbus Airline, also experiencing a plunge from 2020. In 2020, the revenue of Airbus is EU€49,912 million, down by almost a third compared with 2019 [14]. In 2021, the financial situation of aircraft manufactures start to pick up and according to the Airbus half-yearly results for 2021, Airbus' revenue for the first half-year of 2021 is EU€24,637 million, a 30% increase compared to the first half-year of 2020, when it was only EU€18,948 million in 2020 [15].

2.4. Result

By analyzing the revenue of airlines and aerospace manufacturing companies in the aerospace industry, we found that the impact on airlines' revenue was the greatest during the epidemic, and aircraft manufacturing business was the second, because even though the number of passenger flights plummeted, the number of cargo flights was being maintained in an effort to ensure the trade of imported and exported goods. Airline revenues are related to passenger flights, while aircraft suppliers are only related to aircraft flights. Therefore, the aircraft manufacturer acts as the back office and can provide after-sales service as long as the aircraft takes off and is not affected by passenger or cargo transportation.

3. The analysis of Rolls-Royce PLC

This paper aims to analyze the transformation of aviation manufacturing industry under the COVID-19 pandemic, so it is necessary to select a representative company for analysis. Therefore, this article chooses Rolls-Royce as an example to discuss the situation of COVID-19.

3.1. The introduction of Rolls-Royce PLC

Rolls Royce is a British engine company and the largest aero engine enterprise in Europe. Rolls Royce is active in the aviation manufacturing market. As the main engine supplier of large aircraft manufacturers, Rolls Royce occupies most of the global commercial engine market. Understanding the influence of Rolls Royce in the aviation manufacturing industry and its main business makes us realize that the analysis of Rolls Royce is very meaningful.

3.2. Rolls-Royce Holdings before Epidemic

Based on the analysis of relevant strategy and financial reports of Rolls-Royce before and after COVID-19, this paper explores the truth of COVID-19's transformation of aviation manufacturing industry. First, start before the outbreak of the epidemic.

3.2.1. Strategy

Before the outbreak of COVID-19, Rolls-Royce insisted on differentiation strategy in aviation manufacturing industry. Differentiation strategy means that Rolls Royce wants to convince customers that their products are unique and satisfactory, so as to persuade them to buy products. The differentiation strategy makes customers believe that Rolls Royce's products are worth spending money. Enterprises adopting differentiation strategy are more likely to produce loyal buyers, and Rolls Royce is no exception. In addition, Rolls Royce also focuses on pursuing product performance and after-sales guarantee in the aviation manufacturing industry in order to obtain a higher market share. The different strategies shown in Table.1.

Table.1. Different strategies

Strategies	Definition
Differentiation strategy	It refers to the strategy adopted to make the enterprise's products, services and corporate image significantly different from its competitors in order to obtain competitive advantage.
Cost leadership strategy	It means that the enterprise can improve its own cost control, reasonably reduce the cost expenditure of each operation link, finally improve the overall operation status of the enterprise, and gradually form a strong competitiveness in the industry.

3.2.2. Related customers and suppliers

Before COVID-19 started, because Rolls-Royce produced aviation products for large airlines, large airlines would buy large quantities of aircraft turbine engines to maintain the normal operation of the company's aviation flight. Therefore, Rolls Royce can successfully sell and profit from a large number of turbine engines every year.

In addition, because Rolls Royce produces its own aviation products, most of its suppliers are raw material suppliers. Rolls Royce will also buy some of the basic components that make up aviation manufacturing products, such as screws and nuts. The production process of these basic parts and raw materials is relatively simple and easy to obtain. Because Rolls Royce has a large demand for these materials, the purchase price is usually very favorable.

3.2.3. Financial analysis

The WHO officially named the virus "2019 New Coronavirus" in January 12, 2020, due to the appearance of COVID-19 at the end of 2019. Therefore, this paper selects the annual financial statements of Rolls Royce in 2018 and 2019 as the data source for analysis. This gives us a better

understanding of the operation of Rolls-Royce before COVID-19, and analyzes the problems faced by the aviation manufacturing industry.

In 2018, strategically and financially, Rolls Royce's basic financial results exceeded expectations, and its core free cash flow more than doubled to £ 641 million, with core revenue increasing by 10% and reported revenue increasing by 7%. The performance of large civil aviation engine sets is getting stronger and stronger. In particular, the flight time of Trent xwb-84 exceeds 3 million hours, and the flight hours of large engines increase by 14% [16]. In 2019, Rolls Royce's basic operating profit increased by 25%, the level of free cash flow was encouraging, and the operating cost was saved by £ 269 million. Civil aviation has significantly improved its basic profit, and the engine delivery volume has reached the highest record compared with that before 2019, showing a good market prospect [17].

Before COVID-19, Rolls-Royce was optimistic about the development of aviation manufacturing industry, and felt tremendous business opportunities from the sales and profit margins of the aviation manufacturing industry.

3.3. Rolls-Royce Holdings after Epidemic

After analyzing the operation of COVID-19's former Rolls-Royce's aviation manufacturing industry, we learned some of the basic conditions of the aviation manufacturing industry. In order to understand the transformation of aviation manufacturing industry under the epidemic situation, this article will analyze the relevant situation of Rolls-Royce company after COVID-19. This part of the analysis takes Rolls Royce's 2020 financial report and 2021 half year performance (before 5 August 2021) as the data source.

3.3.1. Strategy

After being influenced by COVID-19, the sales volume of Rolls-Royce's aviation manufacturing industry has declined. In order to solve this problem, Rolls-Royce has actively adjusted its strategy in order to better cope with the changes in the industry.

Rolls-Royce chose to take decisive and effective actions to deal with COVID-19's challenges and take different measures to reduce costs, such as selling some warehouses and fixed assets, so as to enhance financial flexibility and improve operational efficiency. In addition, Rolls Royce also saves money through layoffs.

On the other hand, Rolls Royce has always insisted on investing in developing market leading technologies and creating low-carbon opportunities, providing customers with high-quality products, ensuring that the sales of the company's aviation manufacturing products are in a favorable position, doing a good job in low-carbon transformation and looking forward to a low-carbon future. Rolls Royce also adopts sustainable fuels and develops new technologies with a view to achieving zero carbon emissions by 2050.

3.3.2. Related customers and suppliers

Because of the influence of COVID-19, the number of consumers in Rolls-Royce's aviation manufacturing industry has been reduced, and the sales volume of products has also been affected. Therefore, the sales volume of Rolls-Royce's products has also declined, but the potential customers of the industry still exist. Because COVID-19's influence is global and universal, Rolls-Royce's suppliers are also affected, but the extent of the impact is controllable.

3.3.3. Financial analysis

In 2020, Rolls Royce saved more than £ 1 billion through cash mitigation measures, increased cash liquidity to £ 9 billion through new debt and equity protection measures of £ 7.3 billion, and launched a financing plan of at least £ 2 billion.

Among all the business of Rolls-Royce, civil aviation business is most affected by COVID-19. This led to a free cash outflow of £ 4.2 billion from Rolls Royce. Therefore, Rolls Royce reduced its

losses by implementing a restructuring plan to save £ 1.3 billion and layoffs of about 7000 people, but its performance in 2020 was still seriously affected. [18]

Through the analysis of the performance in the first half of 2021, it can be seen that the cash flow and profit of Rolls Royce's continuous operation have improved. As of 5 August 2021, the basic operating profit of Rolls Royce is £ 307 million, higher than the loss of £ 1.630 billion in the first half of 2020, and the free cash flow (£ 1.174 billion) is also significantly better than that of the previous year (the first half of 2020: £ 2.862 billion) [19].

In terms of aviation manufacturing, Rolls Royce has reduced cash outflow and improved operational efficiency. Due to the company's cost base and strong liquidity, Rolls Royce is confident in its affordability. Moreover, due to the uncertainty of the recovery pace of international tourism and the great benefits brought by the final rebound of international tourism, Rolls Royce still maintains a more positive and optimistic attitude.

4. Conclusion

The general aviation industry is a sunrise industry. How broad the blue sky is, and how big the low-altitude economy market is. The entire general aviation industry chain is huge. Faced with such a heavyweight cake, it is even more necessary to consider how to consolidate the institutional foundation and market foundation from the industrial structure, and to make the cake bigger and consolidate the industry. With good industrial planning and clear steps to promote the establishment of the industrial chain, China's general aviation industry can usher in a soaring sky, can contribute to solving the current economic dilemma, and assist in the transformation of the economic structure.

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