

# A Case Study of DJI, the Top Drone Maker in the World<sup>1)</sup>

**Fangqi Xu**

*Kindai University, Japan*

**Hideki Muneyoshi**

*The Institute for Creativity Education, Japan*

## **Abstract**

In recent years, the number of news articles on drones (small unmanned aircrafts) in newspapers has been increasing quickly. We might not have a positive image of the flying machine, however, because its bad news has been sometimes reported on TV, such as an incident where a drone crashed on the White House grounds in the U.S. (January 2015), or a drone fell on the roof of the Prime Minister's Office in Japan (April 2015). Yet, the world market of drones is expanding by \$4 billion every year. A driving force for the expansion is not Japanese companies; it is Chinese companies. Of them, the leading company is DJI (Da-Jiang Innovations Science and Technology Co., Ltd.)

DJI is located in Shenzhen, which is one of the emerging cities and is called the Silicon Valley of China. DJI was established by Frank Wang, whose Chinese name is Tao Wang, and his two colleagues when they were graduate students at the Hong Kong University of Science and Technology in 2006. At first it was manufacturing a control system for drones, but later it began to manufacture a drone that had a control system for itself. The company's history is just short and it has not carried out IPO yet. Today, however, it enjoys about 70 percent of the market share in the world.

So far, so-called global Chinese enterprises such as Haier, Lenovo, and Huawei, all started their business in traditional industries. They followed the same pattern: first catch up with rivals, and then take them over. On the other hand, DJI was a pioneer in the drone industry and has been always the leading company.

As there is little information about DJI, this paper is a case study to examine its business process and success factors.

**Keywords:** *DJI, student venture, Chinese enterprise, drone, innovation*

## INTRODUCTION

### *What is the drone?*

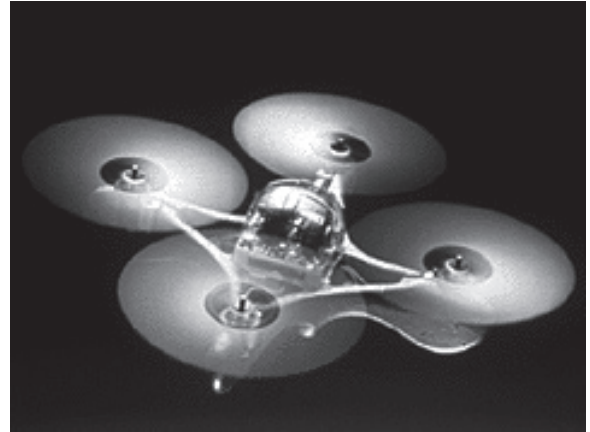
According to the *Random House English-Japanese Dictionary*, a drone is a “remote control machine (such as radio-controlled airplanes and ships) and unmanned flying object (such as a target for missiles and shooting training.)”<sup>2)</sup> This definition tells us the role of the drone. That is, the drone has been used mainly for military-purposes. It is said that its history dates back to the 1930s. In addition, recreational radio-controlled machines can be considered the drone in a broad sense.

However, the drone discussed in this paper is used neither in the military nor for a hobby. It is a small unmanned aircraft (multirotor) for the consumer industry that has emerged in the 21st century. Why do the authors mention that it was born in the 21st? It is because the top three companies in this industry were established after 2005. For example, DJI, the leading company in this field, was established in 2006. 3D Robotics, a drone venture in the United States, was born in 2009. The oldest company of the industry is Parrot that is located in Paris, but has a history of 23 years.

According to Yano Research Institute, a market research company in Japan, the market size of the drone industry in the world in 2015 was \$10.33 billion and will be \$19.01 billion in 2020. It means that the average annual growth rate will be 12.9%.<sup>3)</sup>

### *The drone in Japan*

For a long time, the development and use of the drone in Japan has occurred only in the field where radio control has been used for recreational purposes. Keyence, a leading supplier of sensors, measuring systems and other electric devices in Japan, launched “Gyrosaucer” which was the first radio control drone in the world in July 1989. It was able to fly to 10 meters indoors and made the prototype of the current drone’s speed controller. (See photo.) But they stopped their business at the area of hobby. As a result, they missed the big business opportunity as they were unable to see the potential possibilities of drones. Therefore, Nikkei Business, a famous business weekly magazine in Japan, took up the drone as one of the missed “Big Fish” by Japanese



Source: Keyence’s Home Page

companies in the feature article “Inventive Power of Japan” in July 2016.<sup>4)</sup>

With technological advances, radio control has become closely associated with the robot. In 1988, the First Robot Contest of College Students was launched by the call of Masahiro Mori, who was then a professor at Tokyo Institute of Technology (now, he is an emeritus professor at the university.)

The contest was born in Japan, later developing into the Robot Contest of Universities and ABU Robot Contest. In spite of these international contests, the drone in Japan has not become a bigger industry yet. It is worth mentioning, however, that a certain graduate student of the Hong Kong University of Science and Technology was awarded the third place at an ABU Robot Contest. Later, this achievement led him to play a major role in the formation of a drone industry. Although the drone is used in agriculture to spray pesticides in Japan, technically it is no different than a conventional radio controlled machine. The drone used for the purpose has no functions such as a video camera and image transmission.

## A GRADUATE STUDENT’S VENTURE

### *The founder*

Frank Wang (his Chinese name is Tao Wang) was born in Hangzhou City, Zhejiang Province, in 1980. He is 37 years old as of 2017. His father was an engineer and his mother was a teacher of an elementary school, but both left their jobs and started their

business after the reform and opening-up in China. Therefore, they were too busy to take care of their son's education. Wang's academic performance at school was not so good, because he devoted himself to a hobby of radio control. So, his parents promised to get him a radio-controlled helicopter as an incentive for him to study. In order to get a machine that he had never seen, Wang studied hard. As a result, he made his wish come true. The expensive helicopter, however, crashed just after it flew several times. The reason is that its control was difficult. Making a radio-controlled helicopter that can be controlled easily, therefore, became Wang's dream.

Wang spent his high school days at the Hangzhou Foreign Language School. Since he learned to speak English there, this education would pave the way for him to do business overseas from the beginning.

Wang was accepted by the East China Normal University in Shanghai in 1999. Although the university is a famous national university, its educational goal is basically to prepare its students to be future teachers. It was not consistent with what he wanted to do. Therefore, he applied to some famous universities overseas (for example, MIT, Stanford, etc.), but was rejected by all. Fortunately, Hong Kong University of Science and Technology (HKUST) accepted him. Eventually, he dropped out of the East China Normal University and enrolled in HKUST, starting to learn as a freshman at the Department of Electronic and Computer Engineering in 2001. Four years later, he conducted a senior-year research on radio-controlled helicopter's hovering in the air. Unfortunately, his presentation of graduation was failed, because the helicopter crashed for his mistake. But Professor Zexiang Li, who was Wang's supervisor, recognized the value of the research and encouraged him to continue the research at the graduate school. So, graduating from the department, he went on to the graduate school of HKUST in 2005.

In January 2006, Wang created a prototype with it based on his senior-year research at the department. Once he provided the information on the prototype on a website called RC forum, he received an order from the United States and sold it at 50,000 RMB (\$7,575), although the cost was 15,000 RMB (\$2,272). Wang saw a business opportunity in this

transaction and immediately took an action. He established a company with his two classmates in Hong Kong, renting a studio in Shenzhen where is near Hong Kong and starting their business of selling the flight control system of a radio-controlled helicopter. This was a common practice among college student entrepreneurs in Hong Kong.

### *Da Jiang Innovation (DJI)*

Now, the formal name of DJI is Da Jiang Innovation Science and Technology Co., Ltd. Da Jiang in Chinese was from Wang's belief (Da Jiang Wuxian). This means that one's ambition is so vast as to have no boundaries. In China, the company is called Da Jiang Innovation.

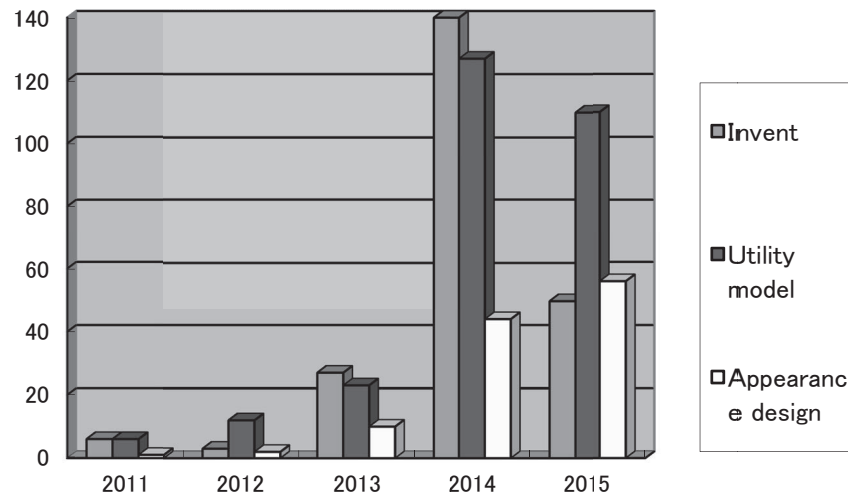
Today DJI is a 12-year-old company which has not been taken public yet. Although we were unable to get the detailed financial data, we have learned from media reports that its business performance has been developing steadily. Now, the following three statements can be presented as facts here with certainty.

- 1) DJI has a 70 percent market share of the global market for drones in 2015.<sup>5)</sup>
- 2) By the end of 2015, the number of DJI's employees had exceeded 4,000.<sup>6)</sup>
- 3) According to American business magazine "Forbes," Wang ranked #48 among Chinese mainland billionaires with personal assets of \$3.6 billion.<sup>7)</sup>

## THE COMPETITIVE STRATEGIES OF DJI

### *Establishment of competitive advantages in the technology*

DJI has the word "science" in its name while Huawei (Huawei Technologies), which is located in Shenzhen as well, doesn't. The authors think that DJI carrying "science" in its name stems from the education that Wang had received until graduating from HKUST. He succeeded in the development of a new drone because he was able to make an important discovery by conducting theoretical research at HKUST. Therefore, DJI has been doing theoretical research and making technological developments simultaneously from the beginning. The results can be seen in the number of its patent



**Figure 1. The change in the number of national patent applications by DJI**

Source: Created by the first author based on the data from SIPO.

applications. According to SIPO (State Intellectual Property Office of the P.R.C), DJI submitted 679 applications by December 2015, including Wang's own 31 applications and 58 applications with him as the first inventor. Figure 1 shows DJI's change in the number of national patent applications.

Under the policy, DJI's drone technologies have enabled the drone maker to be the leading company in the industry on the technical aspect. For example, problems, such as hovering and turning in the air, avoidance of obstacles, prevention of image blurs while flying and taking a picture, immediate transfer of photos and videos, automatic return before the battery runs out, are all regarded as worldwide problems. However, DJI had quickly resolved them, and has maintained the competitive advantages in the technical aspects.

In May 2013, when DJI released "Phantom" (the Chinese name is Jingling) which was developed under the concept of "a flying camera," the company drew the attention of the world as a leader role of the drone industry. People such as film directors of Hollywood, professional photographers, and aerial lovers knocked on the doors of DJI one after another. Through three model changes, "Phantom 4," launched in March 2016, reached the highest level of quality ever. Its main features are as follows:

- a. Weight that it can carry: 1,380 grams
- b. Flying height: 6,000m

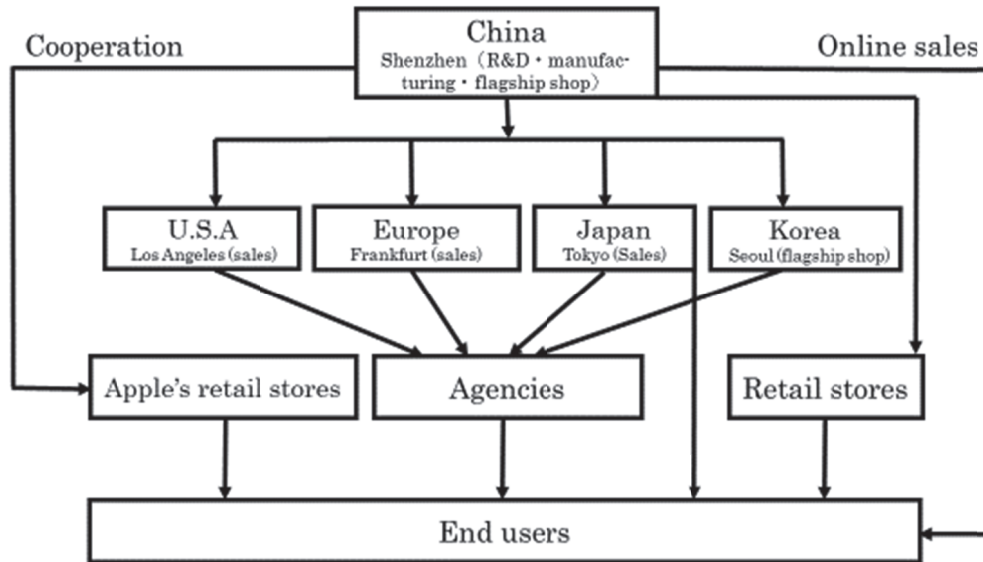
- c. Flying time: 28 minutes
- d. Temperature condition: 0°–40°
- e. Usage of satellites: (GPS/GLONASS)
- f. Obstacle sensing range: 0.7–15m
- g. Image transmission distance: 5km

In addition, the machine also features functions such as easy operation, vertical rise, 360-degree turn and return to the location where it started. The machine's price is 8,999 RMB (about \$1,363 when converted at 1 US\$ to 6.6 RMB).

#### *The business process centered on the overseas market*

Most of the Chinese companies expand their business to overseas after their success on the domestic market. But DJI was different. In 2008, the company just started to sell their drone control system on the Chinese market. Unlike other Chinese companies, however, it did not wait to succeed on the domestic market; it quickly expanded the business to overseas, especially to the markets of Western developed countries in the next year. Currently, DJI's sales are in North America, Europe, Asia including China, each of which accounts for 30% of DJI's global share respectively. The remaining 10% comes from South America and Africa. In fact, the sales in the Chinese market only account for 20% of the total.

The business process of the DJI is shown in Figure 2. DJI does R&D and manufacturing in



**Figure 2. The Business Process of DJI**

Source: Drawn by the first author

Shenzhen headquarters. The products are sold in its own retail stores in China and sold by sales companies or at flagship shops in the United States, Europe, Japan and Korea. Also, DJI's drones are sold at Apple's retail stores in the world. Why was DJI able to establish a relationship of cooperation with Apple? It is because if DJI's users utilize Apple's smartphone, it is easier for them to control DJI's drone, which, in turn, will contribute to sales of Apple's smartphones. DJI has also launched online sales in the world market.

#### *Funding and configuration of the shareholders of DJI*

When DJI was established in November 2006, the initial fund came from Wang's self-funding including his scholarship that he had received from the university. One month later, Wang accepted an investment of \$90,000 from Di Lu, who is one of Wang's relatives. Now, Lu is vice-chairman and vice-president of DJI and owns 16% of the company's stocks. He is a major shareholder after Wang, who holds 45% of the shares.

Jia Xie, who is Wang's close friend from his junior high school days, joined in DJI as CMO in 2010. In order to support Wang, he sold his house and invested in DJI. Now, he holds 14% of the shares.

The fourth shareholder of DJI is Professor Zexiang Li, who was the supervisor of Wang at HKUST. He has invested two million RMB into DJI in 2010. Now, he is one of the board members of DJI and holds 10% of its shares.

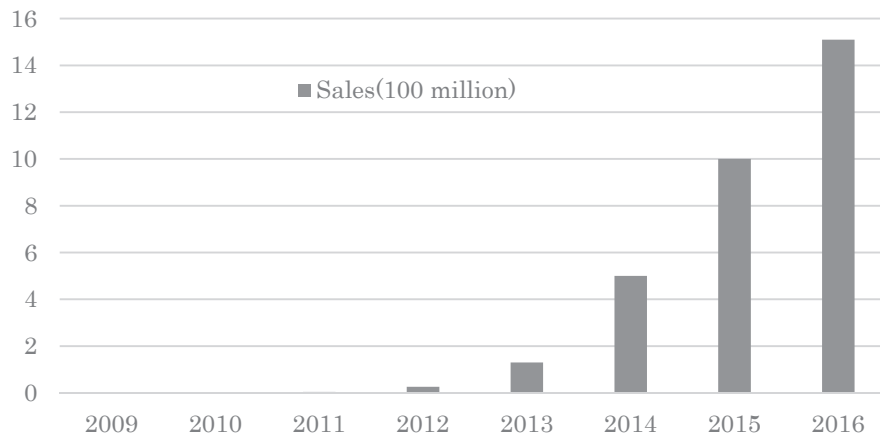
In around 2014, Sequoia Capital, the world's largest venture capital, invested \$30 million into DJI. Its corporate value at that time was estimated to be \$1.6 billion.

In May 2015, Accel Partners, another venture capital in the United States, invested \$75 million into DJI. The corporate value was highly estimated as \$8 billion.

However, unlike Xiaomi, a smartphone maker, DJI does not seek external funding actively, and takes a cautious stance to IPO. The media has reported that DJI will not carry out an IPO in the future, at least not during the next five years.

#### *The amount of sales*

Until 2008, DJI had posted a deficit of one or two million RMB every year. In 2009, DJI got \$1 million in sales, and achieved a turnaround. The great sales of "Phantom" reached \$130 million in 2013. In the following year, the sales soared to \$500 million with an increase of 385%. Media predicted that the sales amount will be \$1 billion in 2015 and be \$1.5 billion in 2016.



**Figure 3. Changes in sales**

Source: created by the authors from the data of WSJ. The data of each year excluding those of 2011 and 2013 are estimated. The data of 2016 was cited from internet site.<sup>8)</sup>

According to CIWEEK, a semimonthly magazine in China, the ranking of drone companies in the world in 2015 is as below.

Ranking	Name	Establishment	Country
1	DJI	2006	China
2	GoPro	2002	U.S.A
3	Robotics	2009	U.S.A
4	Parrot	1994	France
5	Zerotech	2007	China
6	AscTec	2002	Germany
7	Xaircraft	2007	China
8	Microdrones	2005	Germany
9	PowerVision	2012	China
10	Beihang University's Insitute	1964	China

Source: CIWEEK<sup>9)</sup>

## ANALYSIS OF SUCCESS FACTORS

### *The founder with visions*

Wang has been interested in radio-controlled machines since his childhood and had a dream of making a radio-controlled helicopter that can be freely controlled. After he entered East China Normal University, he kept determined to realize his dream. When his determination got strong enough, Wang took an action and dropped out of

the university, starting all over again at HKUST. His strong will to make the dream happen was manifested in his actions to choose a drone-related study as the topic for his senior-year research and to set up a student venture company later. In particular, when the other two of the founding members left the company after the second consecutive year of deficit, Wang continued researching with the vision of creating the new drone which people had never seen. Such a vision, in other words, the intrinsic motivation is the necessary condition for success in venture business.

### *Spirit to compete with technology*

So far, no Chinese companies except DJI compete with their technical capabilities. Almost all of the Chinese companies started their business by imitation. But unlike them, DJI tried to compete on its own technology from the beginning. As mentioned above, by March 2016, DJI had applied 686 national patent applications. Also, the number of its patent applications in the United States is about 80. These patents not only show the technical strength of DJI, but also make it possible for the company to prevent the entry of new rivals. For example, when Yuneec International and Yuneec USA sold their drone in the United States, DJI sued it to the United States Court in the Central District of California for U.S. patent infringement in April 2016.<sup>10)</sup>



### Management philosophy to value engineers

Since DJI is a technology-driven venture, the engineers play an important role for the company. Currently, DJI has about 4,000 employees including 1,500 engineers by the end of 2015.<sup>11)</sup> Because Wang himself is CEO and CTO (Chief Technology Officer), he knows well what his engineers want (he sometimes works on a technological problem long enough to end up sleeping in the bed in his office.) He values his engineers so much that he himself makes decisions from employment to appointment and promotion of engineers.

For example, DJI has given its excellent employees rewards (cars) as the year-end bonus since 2012. The first time, 10 units of “Golf,” which cost 100,000 RMB per unit, were awarded. In 2013, 10 excellent employees received a “Mercedes-Benz,” which cost more than 200,000 RMB per unit. 30 units of expensive “Tesla” were awarded in 2015. DJI has the ownership of the cars for five years, after which the ownership will be transferred to the winners. Needless to say there have been many engineers among the winners.

Not only does Wang provide material rewards for engineers, but also he often mentions in public that he considers engineers important. For example, in his speech at the RoboMasters, which is National University Student Robot Contest held by DJI in July 2015, Wang said, “There are many movie stars and sport stars in our society. But there is no case which a person became a star because he/she works firmly. Even watching TV, there is no program about an engineer or inventor who became a star.”<sup>12)</sup> His aim is to make engineers and innovators become stars.

### CONCLUSION

The drone is becoming a new industry. Teal Group, an American market research firm, predicted that the market scale of the drone in the world will increase from the current size of \$4 billion annually to \$14 billion, totaling \$93 billion (including military market of \$30 billion) in the next ten years.<sup>13)</sup> Chinese companies have been fighting a good fight in this industry. DJI is a representative of those Chinese companies. In the beginning of 2015, “Time” magazine chose the “Phantom 2” of DJI as

one of the “Top 10 Gadgets 2014,”<sup>14)</sup> and the “New York Times” also selected “DJI Inspire 1” as the “2014 excellent high-technology products.”<sup>15)</sup> These recognitions play a part as just a tailwind for the global expansion of DJI. Unfortunately, Japan is lagging in the development of a drone industry. It is said that the slow development of a Japanese drone industry is caused by Japan’s regulations such as the aviation law. Is it true? There are various regulations in China too, but they have been loosened gradually through the efforts of Chinese companies. So, the authors think that the issue is related to entrepreneurship among Japanese people.

So far, so-called Chinese global enterprises, such as Haier, Lenovo, and Huawei, all took a pattern of growth which is to catch up to rivals in the existing industry and then overtake them. However, DJI is different. The company has created a new industry and become the driving force. Therefore, as the innovator that changed the growth pattern of the Chinese enterprises, DJI will leave its name to the Chinese industrial history.

### NOTES

- 1) The early version of the paper was presented at the 15th IEF conference in Venice, Italy, in December 2016. And we got permission from the organizer to publish in this journal.
- 2) Shogakukan (ed.) (1994). *Random House English-Japanese Dictionary* (Second Version) p.812, Tokyo: Shogakukan.
- 3) <http://www.yanoict.com/report/12358.html?gclid=CNCL3Y381tECFYaYvAodXw0B-A>
- 4) Nikkei Business, July 4, 2016, pp.24–43.
- 5) Siqi Wang (2016). “Da Jiang Wang Tao: An informal CEO” The First Financial APP, March 9.
- 6) Jinhong Wang (2016). “Where did the founding members go?” leifeng Net, April 8.
- 7) “Forbes”, China’s Billionaires of 2016. <http://www.forbes.com/china-billionaires/#61d26bfc14fd>
- 8) [http://www.thepaper.cn/newsDetail\\_forward\\_1578199](http://www.thepaper.cn/newsDetail_forward_1578199)
- 9) <http://news.163.com/air/15/0409/11/AMOOIC4600014P42.html>
- 10) DJI’s press release, April 2, 2016.

- 11) See 5).
- 12) Hong Jin (2015). "Da Jiang Wang Tao: We want make the engineers become stars", Leifeng Net, July 21.
- 13) The company's press-release, August 19, 2015. <http://www.tralgroop.cm/index.php/teal-group-news-media/item/press-release-uav-production-will-total-93-billion>.
- 14) <http://time.com/3582115/top-10-gadgets-2014/>
- 15) Shenghe Yan (2015). "Wang Tao: Create a global drone maker". *Guangming Daily*, May 7.

#### REFERENCES

<http://www.dji.com/cn>  
<http://www.dji.com.jp>

Dr. Fangqi Xu is Professor of the Faculty of Business Administration at Kindai University, Japan. Email: [fqxjo@bus.kindai.ac.jp](mailto:fqxjo@bus.kindai.ac.jp).  
Mr. Hideki Muneyoshi is Founder and Director of the Institute for Creativity Education, Japan. Email: [hdk.muneyoshi@gmail.com](mailto:hdk.muneyoshi@gmail.com).