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Analysis of Google's success factors and direction

Sang-Youn LEE [1], Se-Jin KIM[2]

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Abstract

Among the innovative companies leading the era of the 4th industrial revolution, the world's largest Internet company is Google. Google has grown by providing convenient services such as Internet search, Android smartphone operating system, and video. Now, Google is leading the global IT industry by continuing to develop in various new business fields based on open service platforms, artificial intelligence, and big data. In this study, an exploratory discussion was conducted on Google's success factors and future directions. The purpose of the research is to understand the development process of the IT field from the success factors of Google and to analyze the development direction of the future IT industry. Google's success factors were its open platform policy and successful acquisitions of external companies. In fact, most of the services Google offers come from companies that have acquired and acquired them. In addition, there was a corporate culture that values and supports the spirit of challenge and autonomy of members who are not afraid of failure. Based on this study's review of Google's direction analysis, the follow-up study will infer the direction of the IT industry in depth and look at the future technologies that IT majors need to prepare.

Keywords : Open Source, M&A, Challenge, AI, Self-driving Car

Major classifications: Artificial Intelligence Convergence, Case study

1. Introduction

The purpose of this study is to understand the development process of the IT field through Google's success factors, and to analyze the development direction of the future IT industry through Google's investment direction. 2. From the background of Google's birth, you will be able to grasp the development process of the IT industry to some extent through the process that Google has developed. There will be. And lastly, 4. Google's direction analysis will allow us to find out the future direction of the IT industry and to understand the future technologies that IT majors need to prepare.

2. Background of the birth of Google

Sergei Brin and Larry Page, who were students of Stanford graduate school in the late 1990s, were contemplating 'how can I efficiently classify a lot of data so that users can provide the information they want quickly and accurately?'

1 First Author. Professor, Department of Business Administration, California United University, USA, Email: rmi21lee@daum.net
2 Corresponding Author. Professor, Department of Business Administration, California United University, USA, Email: arzoo99@nate.com

You will develop an original search algorithm called. Based on this PageRank algorithm, a search service named 'Google' began in 1998, and this Google search service has become a unique search service that accounts for more than 90% of the world's search volume after 20 years of launching the service. Catch. Google started with the word googol, which represents the power of 10 to 100, and reflects the founder's spirit of 'systematizing information from all over the world so that everyone can use it conveniently.' Like all startups, Google's departure wasn't smooth. At the time, Yahoo already had a 50% share of the Internet search market, and there was not a lot of Internet traffic, so despite its technological innovation, Google was not properly valued in the market for a while. However, due to the rapid increase of Internet users, it was not long before Google became an indispensable core of Internet services, and after 20 years of its founding, Google became the most influential Internet service company in the world. In 2006, Google acquired YouTube, the world's largest video sharing site. In 2007, it acquired the leading digital marketing company 'DoubleClick', and in the same year, DoubleClick ran more than 17 billion ads a day. So, in an open document sent to the Securities and Exchange Commission in 2008, Google said, "We started as a technology company and evolved into a software, technology, Internet, advertising, and media company all in one." It occupied more than 40% of the US online advertising market, which is close to $23 billion, and the global online advertising market, which is worth $53 billion.

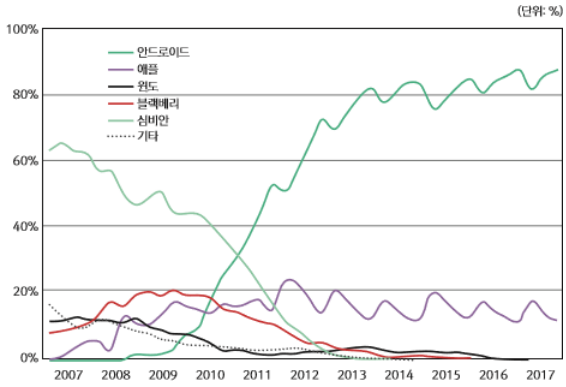
3. Success factors of Google

There will be a number of factors behind Google's success. Google's open platform policy and successful acquisitions of external companies played a major role, and it can be said that a corporate culture that values autonomy and a spirit of challenge that is not afraid of failure also played a role.

3.1. Open Service Platform (Open Source)

Google has opened up all the service platforms they develop to be freely available to all users and developers. Google's open source policy created a large number of allies in a short time, and played a key role in rapidly increasing the number of users and raising market share in the market entering the latecomer. One of the success stories of these open platforms is Android OS, which is the Android mobile operating system used by all Android phones around the world. According to data from market research firm Gartner in the first quarter of 2017, Android mobile operating system occupies over 86% of the total mobile operating system market, followed by Apple's iOS with 13% share. Although it was the latest to enter the mobile service operating system market, it has occupied an unrivaled market share of nearly 90% after 10 years of entering the mobile operating system market, beating Apple, Nokia, and Blackberry, which have pursued a closed-type policy through a platform open policy.

If Google entered the mobile operating system market as a latecomer and implemented a closed policy to monopolize the platforms it developed, such as Apple, Nokia, and Blackberry, there may not have been Google. In conclusion, if we say that Apple played a pioneer role in opening the smartphone era, Google's Android operating system, which opened an operating platform and made it easy for anyone to sell smartphones, is the top contributor to enabling the high smartphone penetration rate. I can tell.



Source: Gartner (2017)
Figure 1: Changes in market share of mobile service operating systems

Even now, when it comes to proposing new platforms, Google strictly adheres to the open platform principle so that all developers around the world can easily use it. This reflects Google's founding spirit of 'let's organize all information in the world so that all users can use it conveniently' by supporting more companies and developers to freely create and expand the ecosystem. Google did not run its own smartphone business to use its Android operating system exclusively. By opening the Android operating system, it became the owner of the big sea of open platforms with infinite scalability, and thus preoccupied the foundation of tremendous future businesses that are incomparable to the smartphone business.

3.2. Bold acquisition of external companies (M&A)

Google operates over 250 different services worldwide. Many of these services are not self-developed, but are acquired from outside. The Android mobile operating

system, which is now a core service of Android smartphones, was acquired in 2005 by an Android company run by Andy Rubin for 50 million dollars. Google Maps, the ancestor of mobile map support services around the world, was developed through the acquisition of Where2Technology, a map service company based in Sydney. In addition, YouTube, a service most used by Koreans, acquired a video sharing site founded by Steve Chen, an employee of PayPal, and expanded it into a mobile service. In particular, the acquisition of YouTube bought a startup that was less than a year old since its first service was launched for a whopping $1.64 billion, so it can be said that the foresight of Google's executives at the time was great. YouTube, which was acquired by paying a large amount of money, was struggling with a deficit for a while because it could not find a suitable profit model, but now it is a sign service that drives Google's advertising revenue. It has become the world's largest video sharing website with 2 billion monthly login users.

Excluding Google search, most of the Google services that are going well are services that have been transfused from outside. From the point of view of a Korean company that is not familiar with business expansion through mergers and acquisitions, the boldness of Google's investment method of acquiring a lush startup company that has not yet blossomed at an astronomical price of trillions seems great. In addition, it is clear that Google's ability to expand its business through acquisitions of external companies played a very important role in enabling Google today. Of course, not all Google mergers and acquisitions were successful. Motorola Mobility, which was acquired in 2011 for $12.5 billion, meant securing the intellectual property rights that Motorola had, but it was of no real benefit to the business.

3.3. The challenging spirit of enjoying failure

Google's third success factor is the spirit of challenge, not afraid of failure. Unlike Apple, Google has given up the business of devices such as computers and smartphones and is only doing business with service platforms, so it is rare that it develops, produces, and sells products independently. When a device is needed, hardware development or production is carried out in joint projects with major IT companies, including Korean companies. According to those who have experienced several projects with Google, Google is more experimental than other IT companies in the United States. It is said to be a strong and adventurous company. Although there are a lot of projects that start motivated and disappear in the middle of the market without seeing the light, they constantly put in expertise and not a small amount of money to start new project teams. For a general company, repeating this process may be quite painful, but Google is naturally repeating failures and new challenges, discovering new customer value for the future through various experiments. Thanks to that, it started as a small Internet search service and now continues to lead in various new business fields such as smart home, artificial intelligence, and autonomous vehicles. In particular, in the field of artificial intelligence, it has already demonstrated its capabilities through AlphaGo, which became famous through the Go game against Lee Se-Dol 9th grader. Furthermore, at the 2018 I/O conference, a leading company in the field of artificial intelligence presented an upgraded artificial intelligence platform that enables users to make reservations by calling restaurants or stores on behalf of users, or performing various tasks as if they were humans. He strongly expressed his determination to establish himself as a company.

4. Google's Direction

4.1 Artificial Intelligence (AI)

According to Choi (2016), artificial intelligence technologies that are currently attracting attention include genetic algorithms, artificial neural networks, and deep learning.

According to Stanford University's Artificial Intelligence Index Report 2019', the computational power of artificial intelligence followed Moore's Law until 2012 and doubled every two years. Then, from 2012, the computing power has doubled about every 3.4 months. Through this, it can be predicted that the pace of future AI development will be further accelerated (Perrault, R. et al., 2019).

Source: CB Insights

Figure 2: Structure of the affiliates under the alphabet

Google's “AI First” strategy has been in full swing to apply artificial intelligence to search and advertisement service

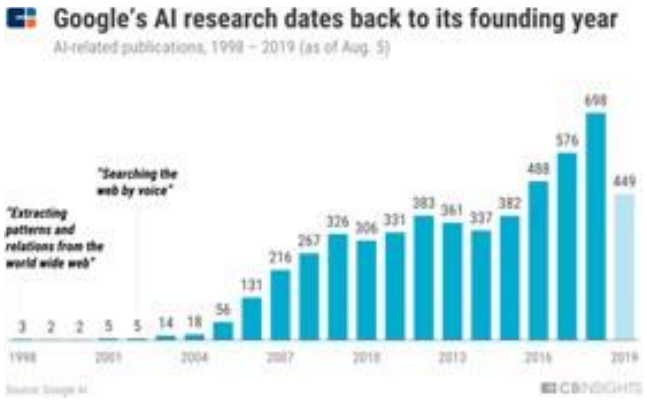
improvement, and to discover future foods using artificial intelligence in new business sectors. 'Waymo', a company specializing in artificial intelligence -based autonomous driving, 'Wing', which operates unmanned aerial vehicle business, 'Calico', a biotechnology affiliate that utilizes machine learning and machine learning, 'DeepMind', famous for AlphaGo, New businesses include Jigsaw, which detects online bullying and malicious comments using artificial intelligence technology. It is the so-called "AI vanguard unit" of Google.

Google's AI First strategy was also detected at the annual developer conference called "Google I/O," Google's largest event. The keynote message in 2015 was to make the world of Android (Google's smartphone operating system). And from 2016, AI came to the fore. In a letter to alphabet shareholders in 2016, Sundar Pichai, CEO of Google and Alphabet, said, "We are moving from the mobile-first era to the AI-first era."

Mehr (2017) argues that artificial intelligence is prone to bias according to the process of being programmed or trained or data contamination. Google is also accelerating the development of advanced algorithms to improve these problems.

Google's persistence in the field of AI can be seen by looking at the number of papers published. According to Google AI, Google's artificial intelligence research organization, the number of Google AI papers published in 2019 reached 712. Google published a total of three AI-related research papers in 1998 when the company was founded. In 2002, a paper about searching the Internet using voice was published. However, it wasn't until the 2010s that the number of AI papers published significantly increased. Until 2004, there were only 18 articles in total, but 326 articles were published in 2009 alone. Since then, about 300 papers have been published every year. After 2015, when Alphabet was launched, this trend became even more intense. 488 in 2016, 576 in 2017, and 698 in 2018, the number of published articles has increased exponentially. It has been steadily developing technology to meet the AI era, but recently, it has been increasing its speed.

It has also steadily carried out acquisitions and mergers of AI-related startups and recruitment of talent. A prime example is the acquisition of "DNN Research", a Canadian machine learning company, in 2013. The founder of DNN Research is a professor at the University of Toronto, Geoffrey Everest Hinton, called the "AI Guru", who acquired the entire company to recruit him. The background of the acquisition of DeepMind was to recruit AI talents such as Demis Hassabis, CEO of DeepMind.



Source: CB Insights (August 2019)
Figure 3: Number of Google AI papers published

4.2. Self-driving cars

Self-driving cars are the gold mine of the 21st century. The importance of social acceptance is increasing as new autonomous driving technology is applied to automobiles (Cho & Kim, 2020). Self-driving cars are expected to lead the innovation of future mobility and change human culture, life, and economic paradigms. Navigant Research, a U.S. market research firm, predicts that the global autonomous vehicle market will grow from $188 billion in 2020 to $1,125 trillion in 2035. IHS predicts that the number of global autonomous vehicles will increase from 51,000 in 2021 to 33.6 million in 2040.

However, the acceptance of autonomous vehicles, such as the accident that occurred due to the conflict between Google Cars and city buses in 2016 (Lee, 2016), will affect future commercialization. The reason that autonomous vehicles cannot completely replace human vehicles is due to complex variables in traffic conditions, problems in the communication environment, and a lack of belief in safety (Kim, 2019). According to a study by the National Highway Traffic Safety Administration (NHTSA), 94% of the causes of traffic accidents are caused by humans such as distraction, drinking, drowsiness, and inexperience in operation. It is predicted that the reason we take self-driving car accidents seriously is that the subject of action is artificial intelligence, not humans. Global competition to preoccupy the autonomous vehicle market is also very hot. Governments and enterprises in major countries such as the US, Europe, China, and Japan are concentrating large-scale resources and capabilities. In the autonomous vehicle, Google's parent company Alphabet is concentrating on strategic investments at the group level, which is expected to produce concrete results sooner or later. Autonomous driving technology is ultimately a big data fight. Data exchanged between self-

driving cars and external factors ensures safer autonomous driving. The company that is evaluated as having the most advanced autonomous driving technology is Waymo, founded by Google. Waymo has been testing autonomous vehicles in 25 cities in the United States since 2009. The mileage exceeded 32 million km. The breath of world-class automakers, centered on the joint market, is also strong. US company GM recently unveiled the first fully autonomous electric vehicle 'Origin' through Cruise, a subsidiary dedicated to developing autonomous vehicles.

It is true that self-driving cars still have points to be supplemented. Seo (2019) emphasizes that many variables such as road conditions, surrounding vehicles and objects, and weather, as well as vehicles, human drivers, and artificial intelligence, should be considered in the traffic accident variables of autonomous vehicles.

Source: GM
Figure 4: GM subsidiary Cruise autonomous vehicle

Google has already started commercializing self-driving taxis in some cities in the U.S., with more than 600 Chrysula minivan Pacifica being introduced since December 2018. It is planning to introduce more than 10,000 new driverless taxis into the market. Daimler began collaborating with Bosch in 2017 and has partnered with BMW in 2019. BMW also announced cooperation with Intel in 2016, and then announced joint development of an autonomous driving platform with Tencent in China around 2019. Toyota has invested in UBER after establishing a research center specializing in autonomous driving around 2018. Established Monet Technology, a joint venture specializing in mobility with SoftBank. After investing $1 trillion in Argo, an artificial intelligence autonomous driving platform company, Ford spun off the autonomous driving division. Volkswagen has also agreed to invest $2.6 billion in Argo AI. First of all, it is surprising that the leading company in the field of autonomous vehicle technology is not an automobile company, but an IT company, but it is also surprising that Google, a global IT company, has entered the taxi transport industry with autonomous taxis. Attempts to break down these industry barriers are a good example of Google's spirit of challenge to new businesses. The introduction of self-driving cars is expected to increase the efficiency of road operation (Shladover et al., 2012; Ghiasi et al., 2017).

5. Conclusion

By examining the factors and directions of Google's success, we identified the development of the IT industry and the future direction. As smartphones were released around 2010 and there have been many changes, artificial intelligence is expected to take charge of the development of the IT field by 2030. Among the businesses that Google is currently investing in the most, there are artificial intelligence deep minds and self-driving cars. What you can see here is that the promising fields in the future are artificial intelligence and big data. Google is now one of the most successful companies in the world beyond its status as an Internet search service provider, and is exerting a great influence on our daily lives. In the era of the 4th industrial revolution, companies contemplating future strategies need to take an effort to examine the future vision and capabilities of Google that leads the future.

In order to improve future technology development strategies for domestic companies that are slower than Google, this study looks back on the growth process of Google and examines its direction to establish practical implications and systems for fields such as platform construction, artificial intelligence, and autonomous vehicles. It focused on presenting implications in terms of policy and support. In the future, we will continue to conduct more extensive and in-depth research on leading companies related to domestic platforms, artificial intelligence, and autonomous vehicles.

References

Cho, S., & Kim, K. (2020). Socio-economic Factors Affecting Social Acceptance of Autonomous Vehicles in Korea. *Journal of Transport Research*, *27*(3), 51-64.

Choi, G. (2016). The Shock of AlphaGo: Possibilities and limitations of artificial intelligence. *KISDI Premium Report*. Sejong: Korea Information Society Development Institute.

Chung, G., Lee, T., Park, C., & Kim, P. (2016). Changes in the smart car market and automakers' response direction following the advent of Google/Apple/Uber/Tesla, *Information & communications magazine*, *33*(4), 3-9.

Kim, K. (2019). Artificial intelligence-based technology and relief. *Public Land Law Review*, *85*, 231-258.

Lee, D. (2016). *Google Self-driving Car Hits a Bus*. Retrieved February 29, 2016 from http://www.bbc.com/news/technology−35692845

Mehr, H. (2017). *Artificial Intelligence for Citizen Services and Government*. MA: Harvard Kennedy School Ash Center. 1-16.

Perrault, R., Shoham, Y., Brynjolfsson, E., Clark, J., Etchemendy, J., Grosz, B., Lyons, T., Manyika, J., Mishra, S., & Niebles, J. C., *The AI Index 2019 Annual Report*. CA: AI Index Steering Committee, Human-Centered AI Institute, Stanford University, Stanford. 48-71.

Seo, H. (2019). A Preliminary Discussion on Policy Decision Making of AI in The Fourth Industrial Revolution. *Informatization Policy*, *26*(3), 3-35.

Shladover, S. E., Su, D. & Lu, X. Y. (2012), Impacts of cooperative adaptive cruise control on freeway traffic flow. *Transportation Research Record*, *2324*(1), 63-70.