

The Exploration of Technology-Service Fusion in Financial Innovation Development

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Abstract

The study intends to know the technological development of the financial service industry and proposes policy suggestions to guide innovation for industry development. We empirically test the financial service industry given by the Organization for Economic Cooperation and Development (OECD), the study investigates Taiwan's listed and OTC financial service companies and analyzes their annual reports from 2014 to 2018 by the content analysis method to explore their innovative activities. The results show that, in the whole financial service industry, the most active innovative activities are product- technology innovation, technology-process innovation, and technology-organization innovation, indicating that the service-technology integration model as the coupling innovation of the financial industry is developing continuously. The study concludes that the changes in the business model in the financial industry to enhance the increase of versatile talents and knowledge-intensive in finance and technology. By doing so, the technology industry and the financial industry will jointly create a new emerging financial market as blue oceans. More specifically, the study also reveals that new service as innovation will provide not only pure financial services but also technology-services by the innovation context in which Fintech is part of industrial routine. The study extends the insights that the government should formulate appropriate technology policies and regulations to create the co-benefits between the financial industry and the technology industry.

Keywords: Fintech, Financial Service, Technology-Service Fusion, Innovation

JEL Classifications: O30, O32

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1. Introduction

According to the statistics released by the Directorate General of Budget, Accounting, and Statistics, Executive Yuan, the proportion of the gross domestic product generated from the service industry increases from 48% in 1981 to nearly 70% in 2020, indicating that the service industry, especially the financial service industry, plays a significant role in the national economy. The financial service industry, regarded as a knowledge-intensive service industry, can create high added value (Lin, 2022). If Taiwan's financial service industry can be guided to continue to develop knowledge-intensive professional service abilities, it will be of great help to economic development. The trend of Fintech integrates financial service and IT, thus driving industrial transformation, and Fintech development brings a great impact on the business model of traditional financial industries, such as banking, insurance, and securities. Studies on service innovation argue that technology is an important part of service innovation (Hendrikse et al., 2020). Nambisan (2013) described technology as a trigger for innovation. The accelerating technological development brings disruptive innovations to the financial industry, which reduces costs, provides service to customers faster and improves customer satisfaction. However, due to the fierce competition in the financial service industry, continuous innovation and value creation is a necessary strategy for companies to maintain competitive advantages and sustainable operation (Chung and Tan, 2022; Kandampully, 2002). Therefore, the integration of service innovation and technology is imperative in the financial service industry. However, Fintech is still immature in Asia; hence, this study intends to learn about the integration in the Fintech of Taiwan, attempts to understand challenges through analysis and provides suggestions on management and policies for developing countries.

Based on the above statement, the service industry is one of the important industries in Taiwan. Moreover, development of continuous service innovation is an important factor for the industry to maintain its market competitiveness, and becomes an important trend now with the integration of service innovation and technology (Wang et al., 2022). In addition, the relevant literature mostly explores the effects of service innovation on the overall service industry but pays less attention on the integration of technology and service innovation in the financial industry/ service industry (Chang and Yen, 2012; Chang and Chen, 2016; Wang et al., 2022). Therefore, it is important to discuss and conclude innovation models of the integration of service innovation and technology in the financial service industry.

Based on the service innovation framework concluded from the Oslo Manual of the OECD: (1) product innovation, (2) process innovation, (3) marketing innovation, and (4) organizational innovation, this study intends to discuss the innovative activities in Taiwan's listed, OTC and emerging financial service companies. The results of integrating technological innovation with above service innovation, and the development trend of technological service innovation in the financial service industry. According to annual reports of Taiwan's listed, OTC and emerging financial service companies from 2014 to 2018, this study analyzes innovative activities of the current year by the

content analysis method, concludes and organizes search results, and explores the results of integrating technological services with innovation, so as to conclude the items, differences, and trends of innovative service activities integrating financial service with technology for future reference, by showing the integration models of service innovation and technology in Taiwan's financial service companies.

The purposes of this study can be summarized below:

1. To explore the innovation activities of listed, OTC, and emerging financial service companies from 2014 to 2018.
2. To compare the service innovation and the frequencies of integration of service innovation and technology in financial service companies.
3. To provide suggestions for developing countries on management and policies of financial innovation in the financial service industry.

2. Literature Review

2.1. Trend of technological innovation

With the widespread use of data analysis and big data as well as the popularization of mobile devices, creating financial systems that benefit the public can provide many opportunities for financial markets. Fintech, by making use of big data and complex AI/ML algorithms, can make real-time decisions, reduce the advantages of transaction costs to make the banking gradually shift to online banking, and promote unprecedented changes in the financial service industry (Suryono and Purwandari, 2020). In the next ten years, Fintech development will greatly affect the world through the application of new technologies (Tsang and Chen, 2022; Jagtiani and John, 2018).

Service is the center of social economic activities, and technological progress will directly affect service delivery and value and become part of products and services. Nowadays, corporate competition is based on services rather than physical products, so the competitive advantage developed based on services becomes more and more obvious. From the perspective of customers, in terms of product differentiation, competitive products are not obviously different. For example, for general customers, there is no obvious difference between Sony TV and JVC TV. However, only differentiated services can create multiple values of products. Therefore, through IT development and application, the range and benefits of product differentiation are limited. However, the progress of IT reduces the product development life cycle, and its integration with services can change business development modes and create new performance (Kandampully, 2002).

Fintech, which is service-oriented, changes the service process of the traditional economic industry, provides faster and more professional services and thus improves customer service experience. As a result, traditional financial companies are facing a crisis of being replaced by Fintech companies. Therefore, traditional financial companies face challenges, including continuous service

innovation, and the integration of service innovation and technological innovation, to maintain their market competitiveness (Hung et al., 2020; Suryono and Purwandari, 2020).

Changes in the service economy can be divided into three stages. From the 1960s to the 1980s, service was a technology adopter. During this period, few companies had research and development departments. Hence, it is not only difficult to observe the role of technological innovation but also less likely to realize technological innovation in the service process. From the 1980s to the 2000s, technologies started to support services; it was the major stage of information society and the knowledge economy. Automatic systems were imported into the manufacturing and service industries to try to develop new services and service delivery methods, such as online banking and online shopping. Technology drove service evolution, became an important promoter of innovation, caused significant changes in service productization, and made the concept of service more and more important in innovation studies. In the 2010s, people enter into the era of the integration of technology and service, and service technology and knowledge intensity are becoming increasingly high (Chang et al., 2014). The integration of technology and service innovation becomes new products/services, which is an important driving force for enterprises, industries, and even national economic growth, but blurs the boundary between manufacturing and service (Chang et al., 2012).

According to many studies on service innovation, technology (such as information technology) is an important part of service innovation. Technology can help companies effectively create new service products, enhance and expand their service scope, improve the service delivery process and create new market value. Technology is crucial to the success of service innovation (Ryu and Lee, 2018). Some scholars found that technology can improve the overall productivity of service innovation (Froehle and Roth, 2007) and help generate ideas for new services or service enhancement (Nambisan, 2013), thus expanding the development of technology in any innovation. Therefore, service innovation and technology are now inseparable.

2.2. *Latecomer- Overview of innovation in the financial industry in Taiwan*

Taiwan as the prime latecomer country in high-tech industries with knowledge intensive innovations (Chou, 2015), is one of one of the Fintech development as well as financial innovations in a major emerging country (Wang et al., 2022). Latecomer country's catch-up and innovation strategies involve from evolution of absorptive capacity in original equipment manufacturer (OEM) further to the original design manufacturer and original brand manufacturer that increase the value in resource orchestration to enter the global market more easily (Mathews, 2002). In particular, the emergence of catch-up efforts by latecomer of Taiwan has launched radical innovations of technology–intermediary services as a niche for innovations in financial industry. Additionally, Taiwan is a latecomer country in terms of Fintech industry context, and developing multi-track practices reflect the state's active role in prioritizing the transplantation of the global Fintech experimentation and financial innovation framework to reduce the institutional distance between international financial centers and latecomer country.

Sustainable industrial development is a pressing issue that requires the joint forces of government, industry, and society, and innovation should drive a sustainable environment (Silvestre and Țîrcă, 2019). Innovation is the power for industrial development, the key to the sustainable growth of the national economy, and the core factor for companies to maintain their competitiveness and sustainable operation. The same is true for the financial industry. The development of the financial market has significant effects on national economic growth, and it is an inevitable trend to promote financial innovation. In Taiwan, the Financial Supervisory Commission proposed the “Fintech Development and Promotion Project” in September 2016, and implemented the “Financial Technology Development and Innovative Experimentation Act” on April 30, 2018 to create a secure environment for Fintech research, development and trial and to consider both financial market order and consumer protection (Tsang and Chen, 2022).

Now, Taiwan’s banks optimize and integrate their services and Fintech, to provide customers with convenient services, including technological payment mode, online lending, cloud remittance, and robo-advisors. According to the statistics of the Financial Supervisory Commission, payment services of the top 100 innovative Fintech companies take up the largest proportion. For example, mobile payment or online payment by credit cards is adopted to complete transactions quickly and reduce transaction costs. In addition, in the financial service industry, data are used to understand consumers’ using habits, and numerous innovative Fintech applications are developed to provide consumers with suitable products and services. Products will be customized according to the user demand, service time, and intended use by the future financial product model. Therefore, with the advent of the Fintech era, traditional financial service companies should keep the pace, accelerate innovation and reduce the possibility of being replaced by Fintech (Tsang and Chen, 2022).

3. Methodology

3.1. Content Analysis

Content analysis is an objective, systematic and quantitative description of the specific contents of an announcement. Objectivity means that steps in the research process must be carried out based on clearly defined rules and order; systematicness means that contents must be adopted and abandoned based on the principle of consistency; quantitation means that contents analyzed can be measured according to the proposed categories and analysis units, and the number of occurrences of symbols and words can be compared to meet the requirements of accuracy (Barelson, 1952).

Content analysis is mainly used in social sciences. In social sciences, many data and samples are presented as characters, words, or sentences, and quantitation will be difficult in studies carried out in a scientific way. Content analysis is a method to quantify text. Its research process is reading the text, coding based on set principles (text quantization procedure), and analyzing the encoded data. This study reads annual reports of listed, OTC, and emerging financial service companies from 2014 to 2018 by the content analysis method, calculates the number of innovations according to the innovation classification and technological integration types defined by OECD, and obtains the

development trend of technological service innovation through conclusion and quantitation. In the implementation of content analysis, in order to avoid omissions, verification is repeated to reduce errors. However, content analysis research process is reading text content, coding by rules, and analyze the coding data. Contents of the firms' annual reports to summarize the innovation activities of the financial service industries, which may overcome the limitations inherent in questionnaire such as questionnaire nonresponse and item nonresponse and panel data. The use of content analysis method is more conducive to us exploring the innovation activities behind the financial service industries.

3.2. Data Collection

This study takes listed, OTC, and emerging financial service companies from 2014 to 2018 as samples, including 40 in 2014, 42 in 2015, 43 in 2016, 45 in 2017, and 47 in 2018. This study intends to collect data from the annual reports of companies from 2014 to 2018 by data mining to improve credibility.

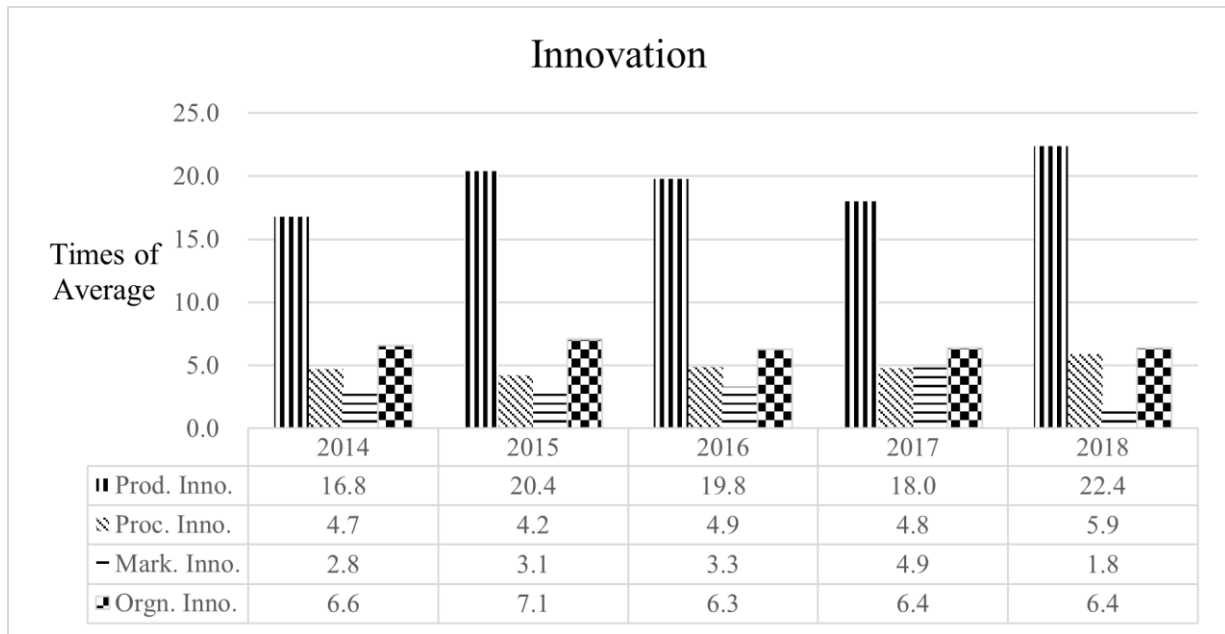
This study measures innovation activities with technology activities from the firms' annual report by using the content analysis method. In the content analysis method, the data is searched through keywords to obtain valuable content. Evaluation of innovation performance changes along with innovation connotation. The Oslo Manual is an important document in the field of international innovation measurement. This study shows the dynamic process of enterprise innovation connotation evolution. Through the collation of Oslo Manual, this study summarized the keywords that are representative of each innovation activity, each of keyword is independent, and use keywords to search the annual report. Annual reports are regularly disclosed documents and prepared once a year. Therefore, if used for data analysis, annual reports are easy to obtain and their disclosure formats are roughly the same. In addition to standardizing the regular disclosure of various statements by listed and OTC companies, the government stipulates disclosure items, so as to reduce the differences in the documentation of different companies, automatically differentiate all documents under a big framework and make research results objective. Moreover, the information in annual reports is highly accurate. As annual reports are public documents, the disclosed information must be detailed and clear, with simple and understandable text but without any deficiency or false record. In conclusion, all information and data provided to the outside world should be complete and correct, so as to ensure the high accuracy of the data obtained by researchers and enhance the value and credibility of studies.

4. Empirical Results

This study explores the models of service innovation and technological innovation in Taiwan's listed, OTC, and emerging financial service companies from 2014 to 2018. This chapter explains the research results in two sections. Section I concludes the overall financial service industry and analyzes the development of models of service innovation and technological innovation in the overall financial service industry. Section II concludes the categories of financial service industries and explains the innovation models and changes of various financial service industries to analyze their differences.

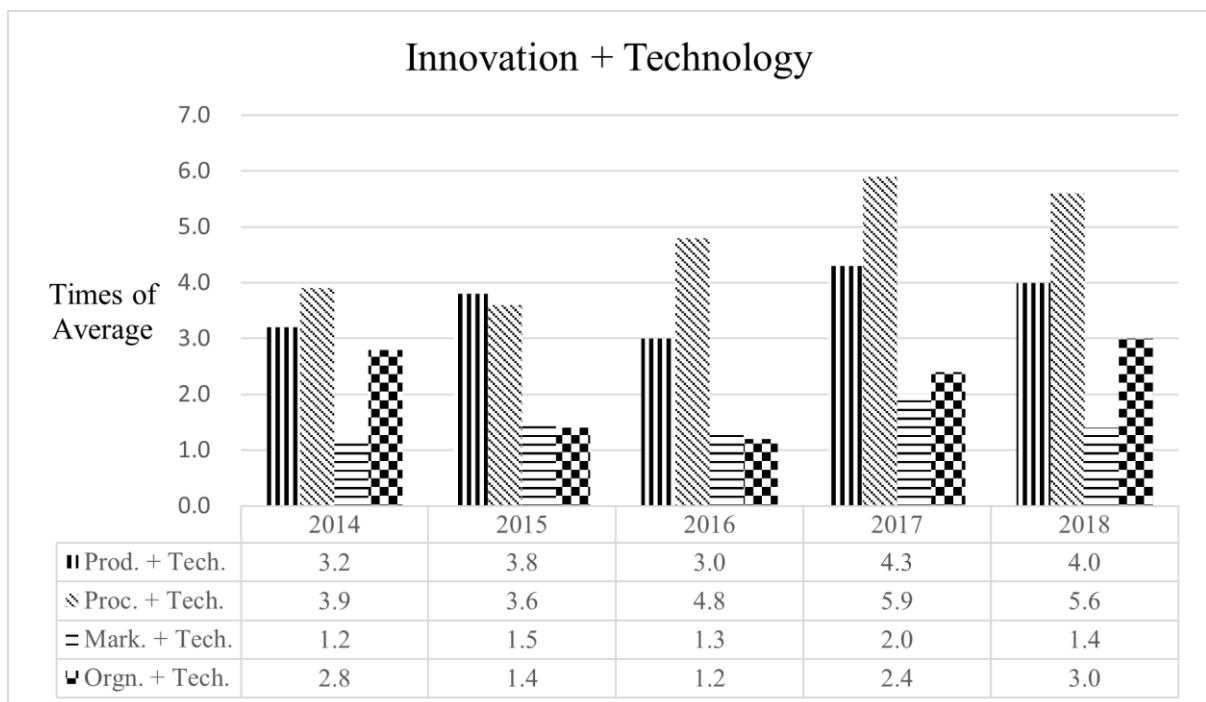
4.1. Innovation patterns in the overall financial service industry

A total of 47 financial service companies are taken as samples. From 2014 to 2018, the frequency of product innovation was the highest, followed by the frequency of organizational innovation. The frequency of pure process innovation and marketing innovation was low, while the frequency of process innovation and marketing innovation integrated with technology has increased after 2015. 2015 is the first year of Fintech, so the integration of service innovation and technology has gradually attracted attention in the overall financial service industry after 2015.



Note: Prod. Inno.= Product Innovation, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 1: Innovation Types of Financial Service Industry



Note: Prod. Tech.= Product + Technology, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 2: Types of Innovation and Technology Fusion of Financial Service Industry

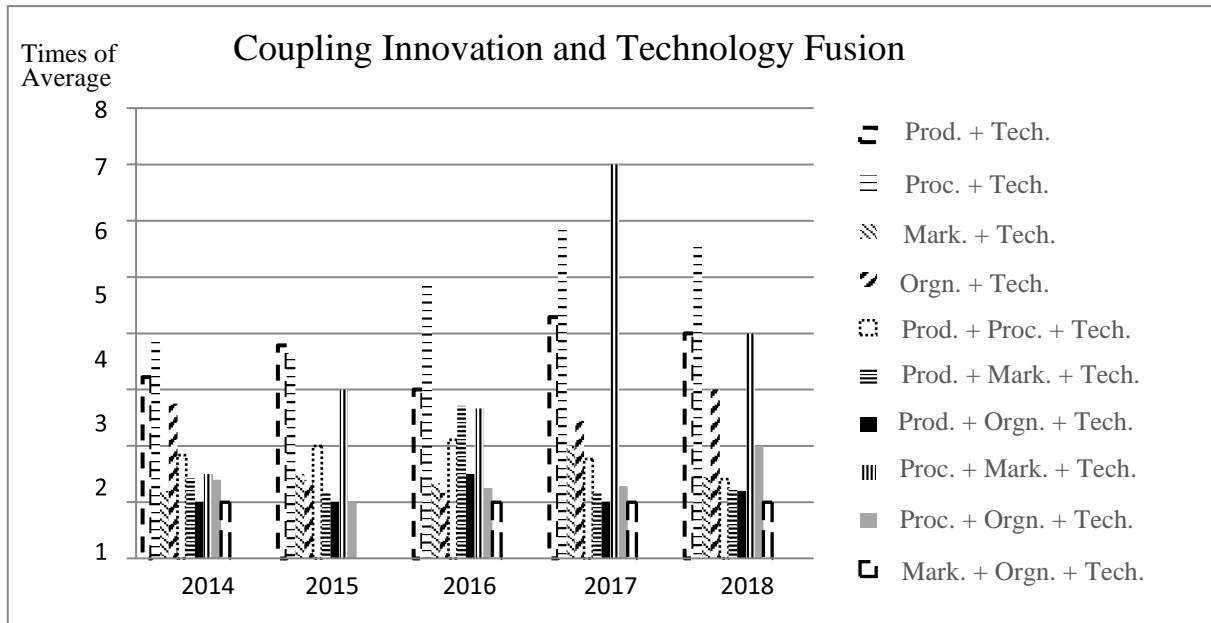


Figure 3: Types of Coupling Innovation and Technology Fusion of Financial Service Industry

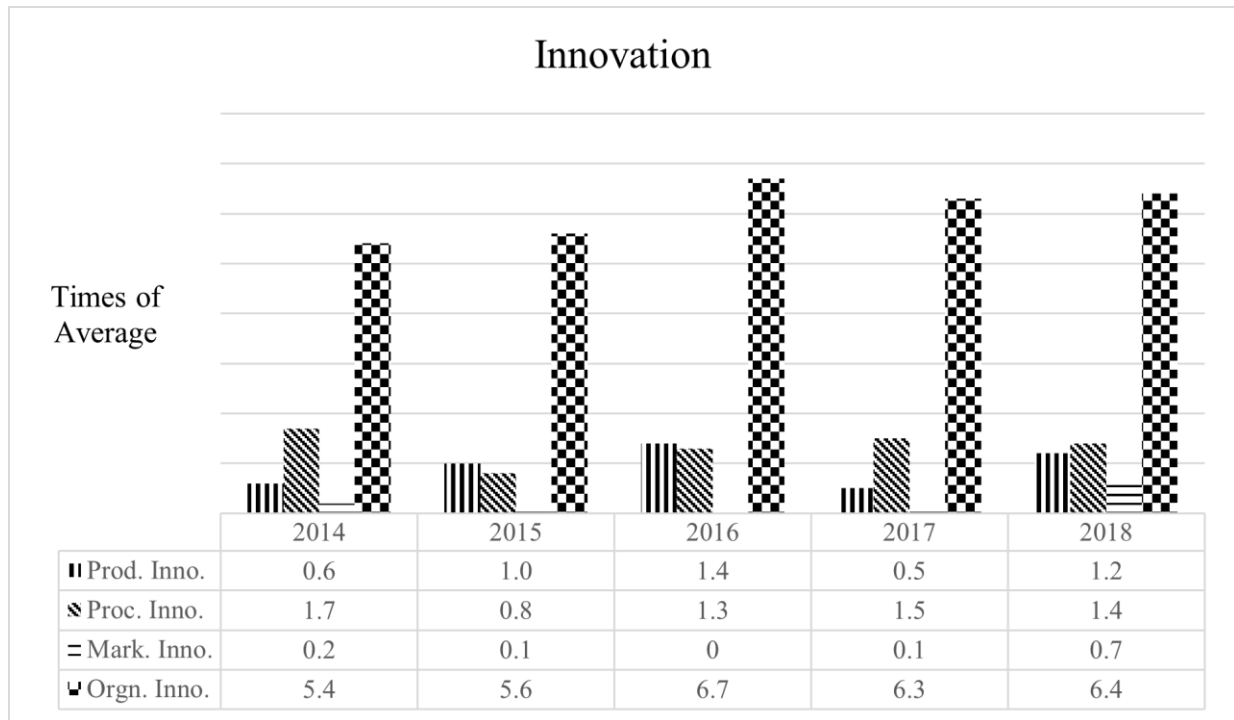
4.2. Innovation patterns in each financial service sections

This section shows the models of technological innovation and service innovation in various financial service industries: banking (11 companies), insurance (9 companies), financial holding (15 companies), and others (12 companies), among which, others refer to financial service industries other than banking, insurance and financial holdings, such as securities, futures, and notes.

Banking Section

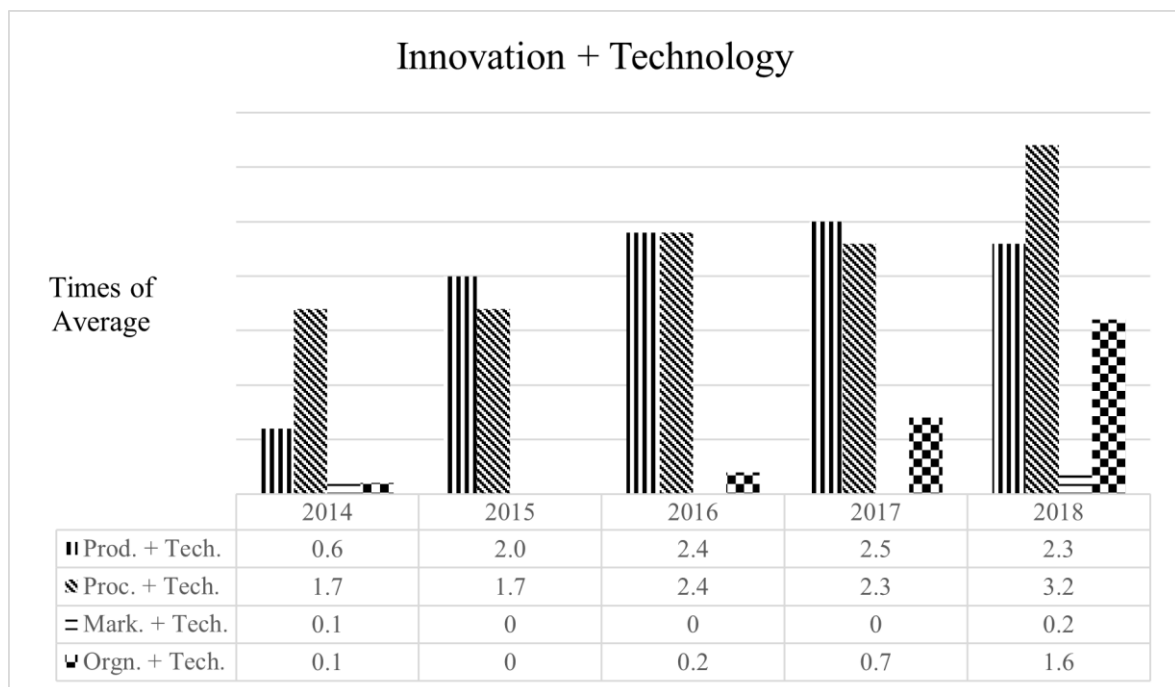
From 2014 to 2018, in banking, the frequency of organizational innovation was the highest, the frequency of product innovation and process innovation was low, while the frequency of technology integrated with product innovation and process innovation has increased year by year. The average frequency of technological product innovation was only 0.6 in 2014 and increased to 2 in 2015. While, the frequency of technological organization innovation increased year by year after 2016, and the average frequency of marketing innovation and technological marketing innovation is low. According to the above results, in banking, attention is paid to organizational innovation (such as staff training and department integration), technological organization innovation (such as online platform establishment), technological product innovation (such as mobile credit cards), and technological process innovation (such as system optimization or online payment platforms), while the frequency of marketing innovation is low. Maybe because existing marketing strategies in banking can maintain

good results, there is little innovation in marketing. In banking, importance is attached to both external technological product development and internal organizational training.



Note: Prod. Inno.= Product Innovation, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 4: Innovation Types of Banking Sections



Note: Prod. Tech.= Product + Technology, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 5: Types of Innovation and Technology Fusion of Banking Sections

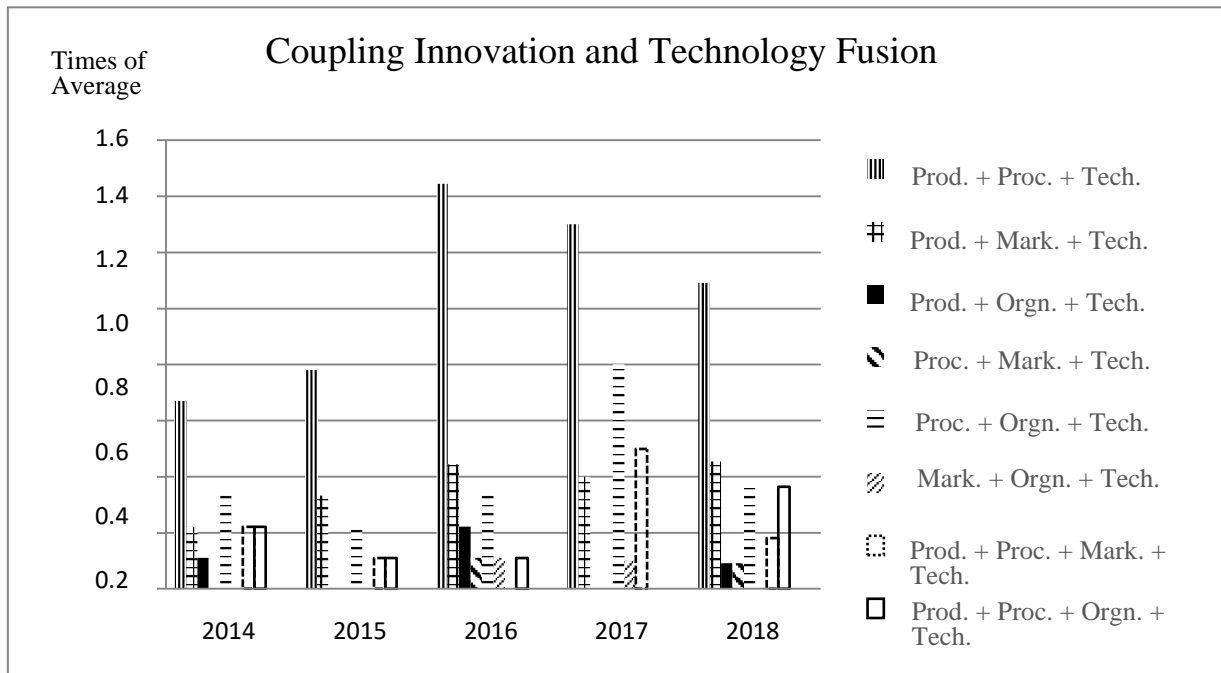
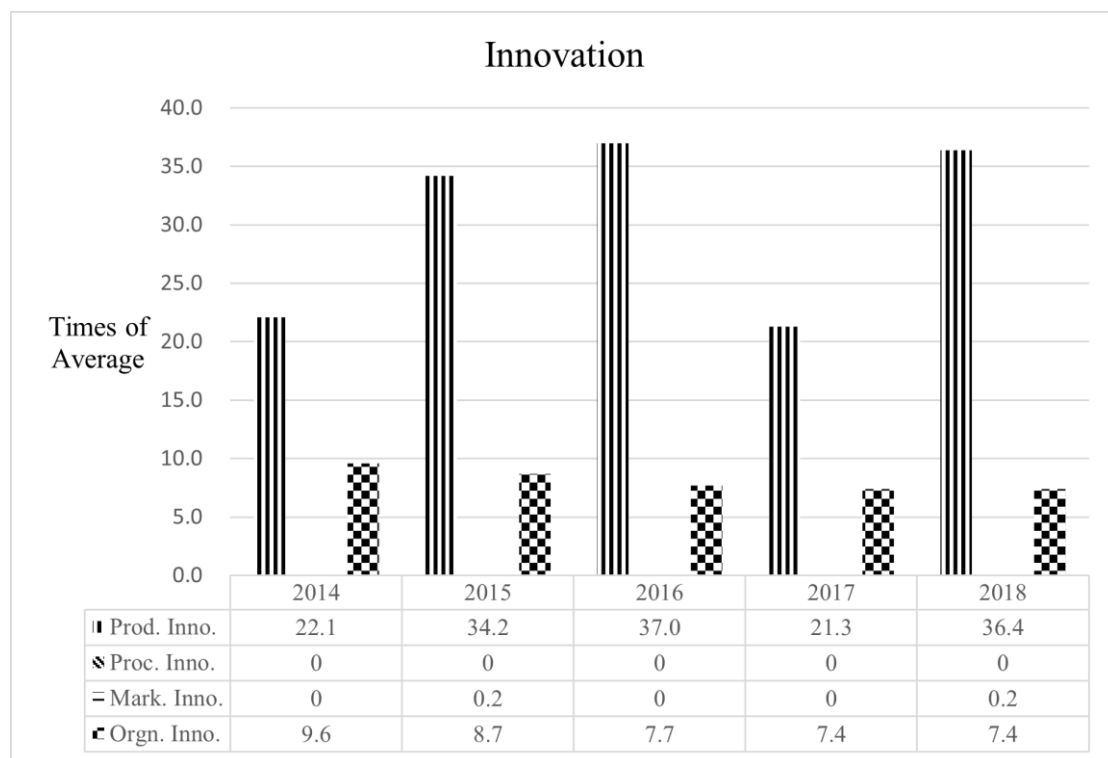


Figure 6: Types of Coupling Innovation and Technology Fusion of Banking Sections

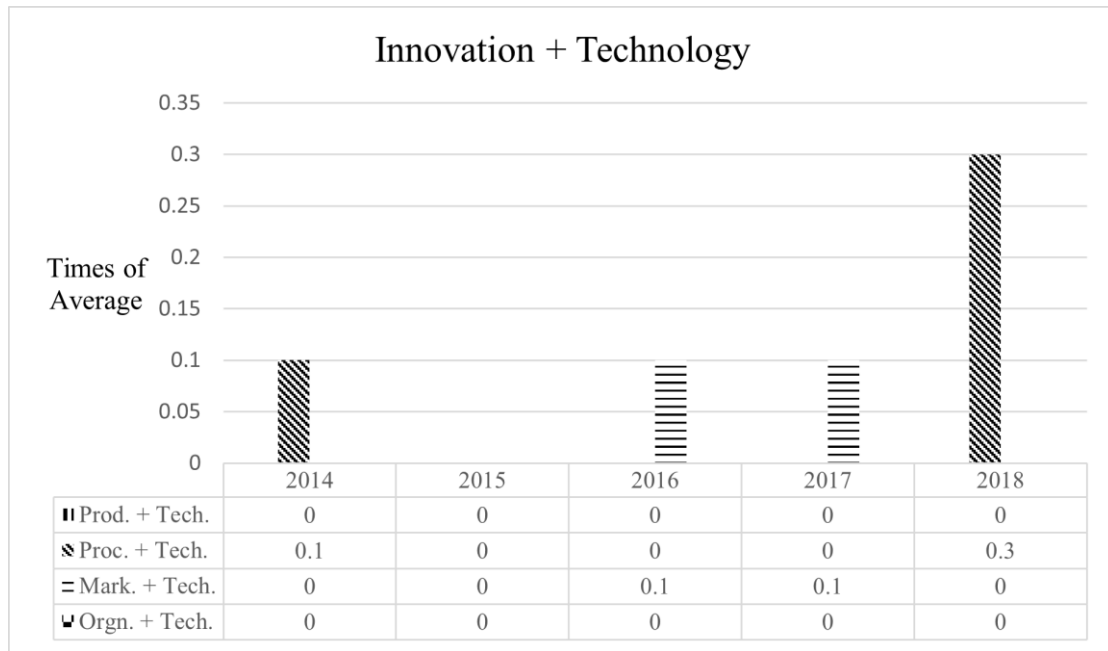
Insurance Section

During the same period, the average frequency of product innovation is the highest in the insurance industry. In addition to being the highest number in the insurance industry, the average frequency of product innovation is also higher than that in other financial service industries. As the main business in insurance is policy sales, the research and development of new policies or terms are of great importance. Besides product innovation, great importance is attached to organizational innovation in insurance. As salesmen are needed to expand the insurance business, the importance of professionals is beyond question, while the average frequency of process and organizational innovations is almost zero. Perhaps because insurance companies can develop stably in the market by integrating existing processes and marketing strategies with frequent product innovation, they attach much more importance to product innovation than process innovation and marketing innovation. However, regarding the integration of technology and service innovation, the average frequency of integrating technology with single-service innovation or integrating technology with multi-service innovation in the insurance is significantly lower than that of other financial service industries, indicating the slow Fintech development in the insurance.



Note: Prod. Inno.= Product Innovation, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 7: Innovation Types of Insurance Sections



Note: Prod. Tech.= Product + Technology, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 8: Types of Innovation and Technology Fusion of Insurance Sections

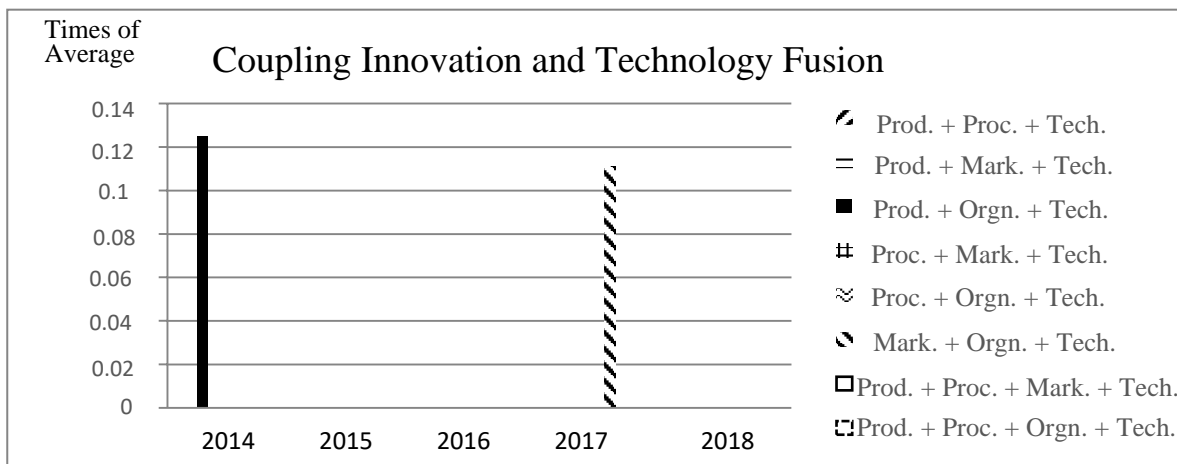
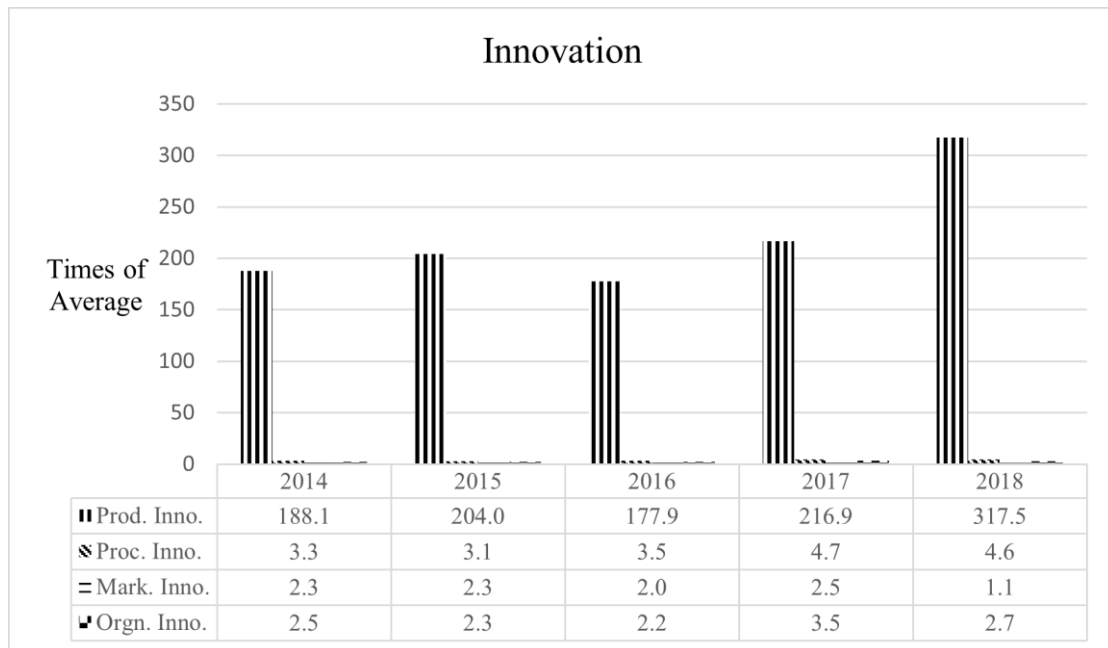


Figure 9: Types of Coupling Innovation and Technology Fusion of Insurance Sections

Financial Holding Section

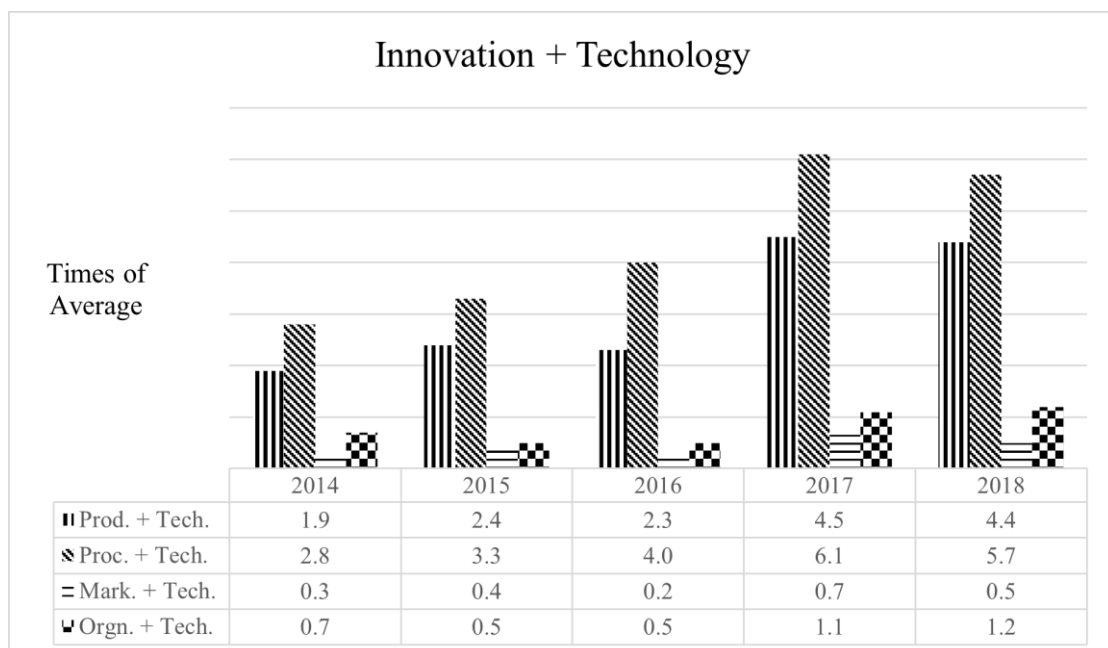
The frequency of service innovation in financial holdings is the highest among all financial service industries. The average frequency is high due to the large scale. The frequency of product innovation is significantly higher than that of other innovations because financial holding companies include various subsidiaries, such as insurance and securities, of which, both focus on product innovation. Hence, the frequency of product innovation is significantly higher than that of other innovations. The frequency of marketing innovation and technological marketing innovation is higher than that of other financial service industries. The integration of service innovation and technology

increased year by year from 2014 to 2018. The technological process innovation was the most frequent, increasing year by year from 2014 to 2017 but decreasing slightly in 2018. However, it was still the most frequent integration of technology and service innovation. The second is technological product innovation, which increased year by year from 2014 to 2018. The frequency of technological marketing innovation and technological organization innovation is higher than those of other financial service industries.



Note: Prod. Inno.= Product Innovation, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 10: Innovation Types of Financial Holding Sections



Note: Prod. Tech.= Product + Technology, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 11: Types of Innovation and Technology Fusion of Financial Holding Sections

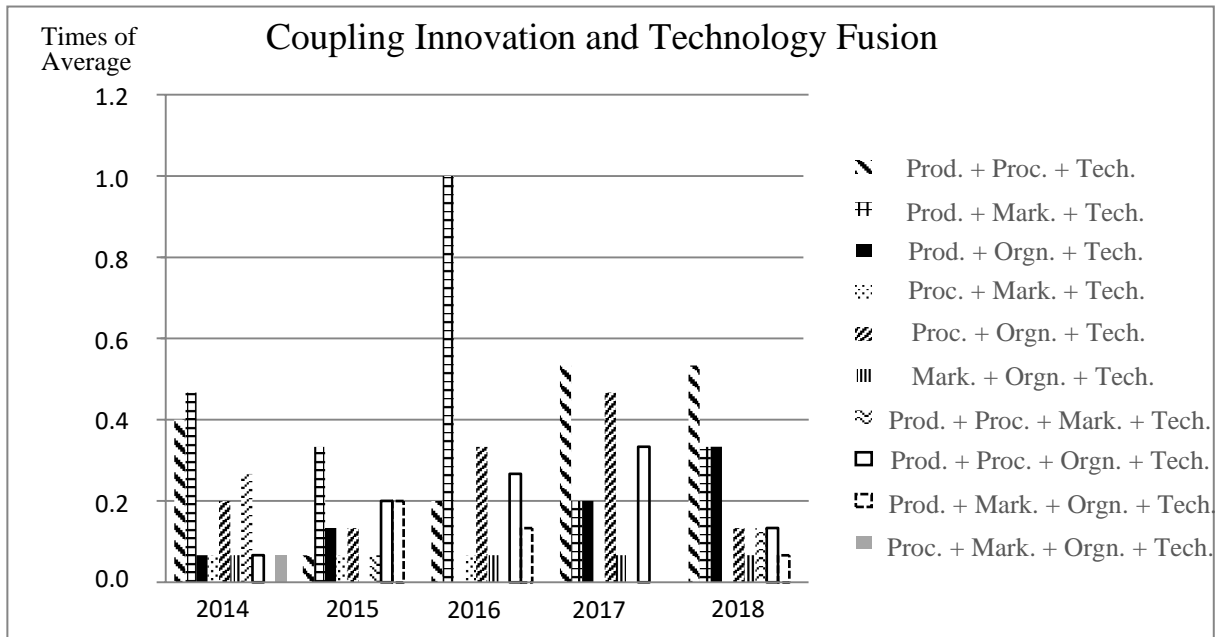
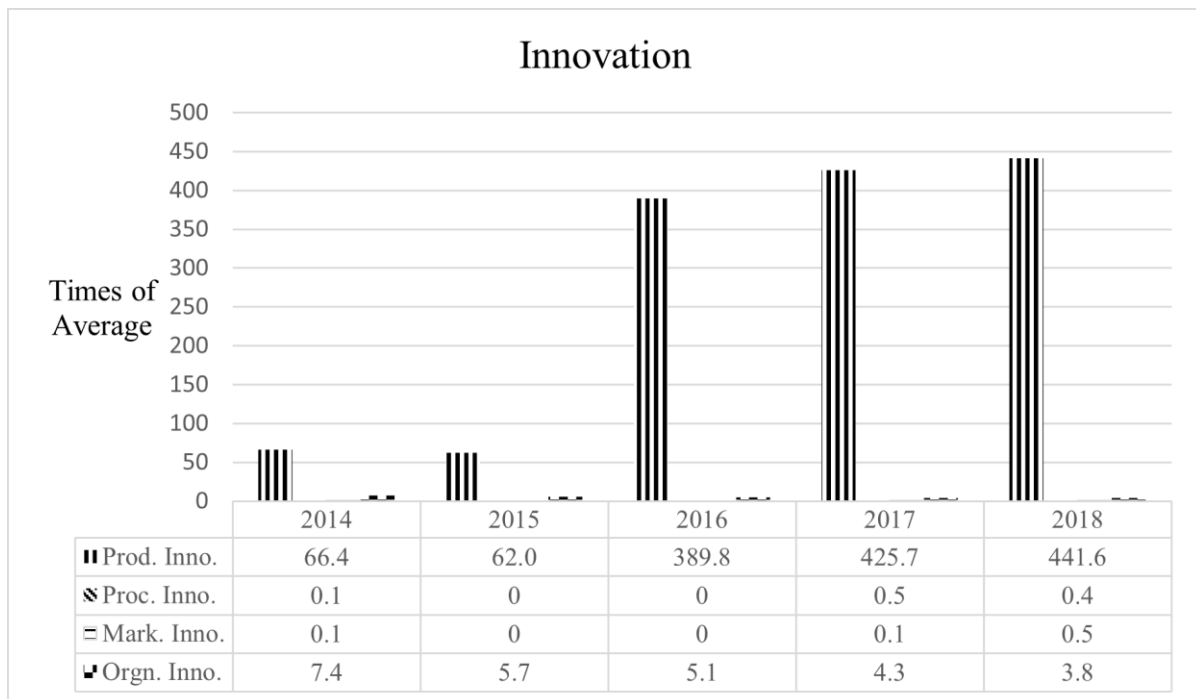


Figure 12: Types of Coupling Innovation and Technology Fusion of Financial Holding Sections

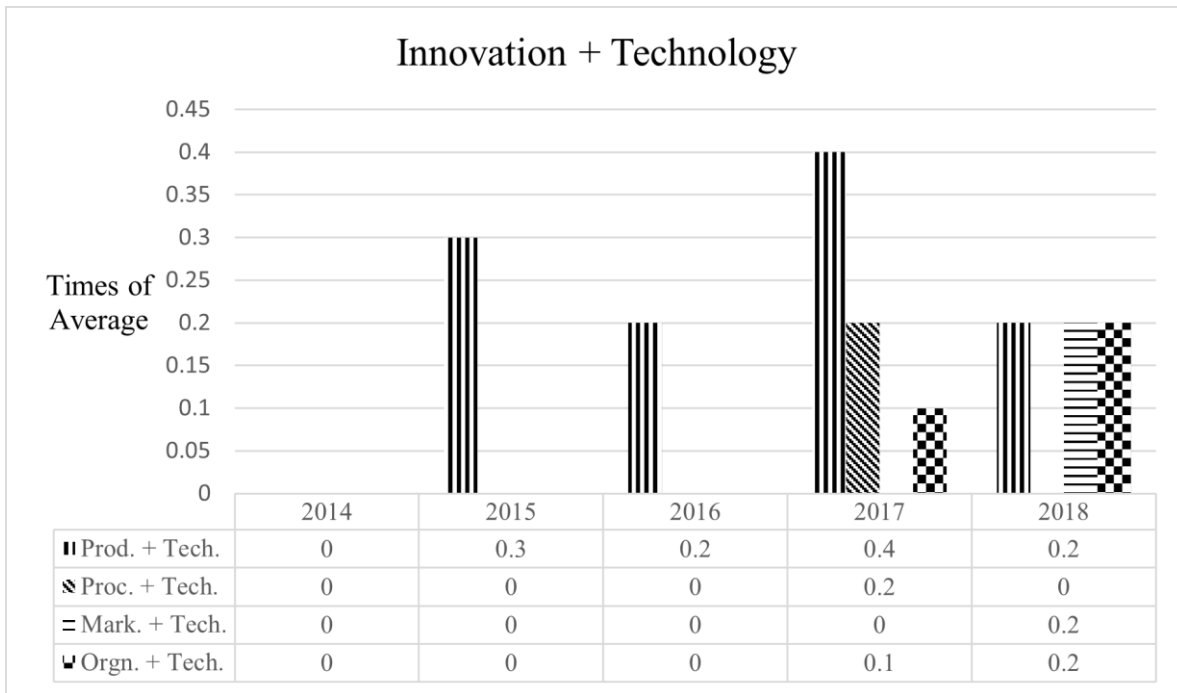
Other Financial Section

Other financial service industries include securities, futures, and notes, and service innovation accounts for the largest proportion in product innovation. The main business of securities underwriters is to offer securities, issue securities, and underwrite listed and OTC securities. Due to security issuance, the frequency of product innovation is much higher than that of other service innovations and increases year by year, while the average frequency of process innovation and marketing innovation is low and that of organizational innovation decreases year by year. About the integration of technology and service innovation, the frequency of technological product innovation is significantly lower than that of pure product innovation, and the frequency of technological service innovation is low and only slightly higher than the frequency of innovation in the insurance, indicating that its technological service innovation develops slowly but is still in continuous development.



Note: Prod. Inno.= Product Innovation, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 13: Innovation Types of Other Financial Sections



Note: Prod. Tech.= Product + Technology, Proc.= Process, Mark.= Marketing, Orgn.= Organizational

Figure 14: Types of Innovation and Technology Fusion of Other Financial Sections

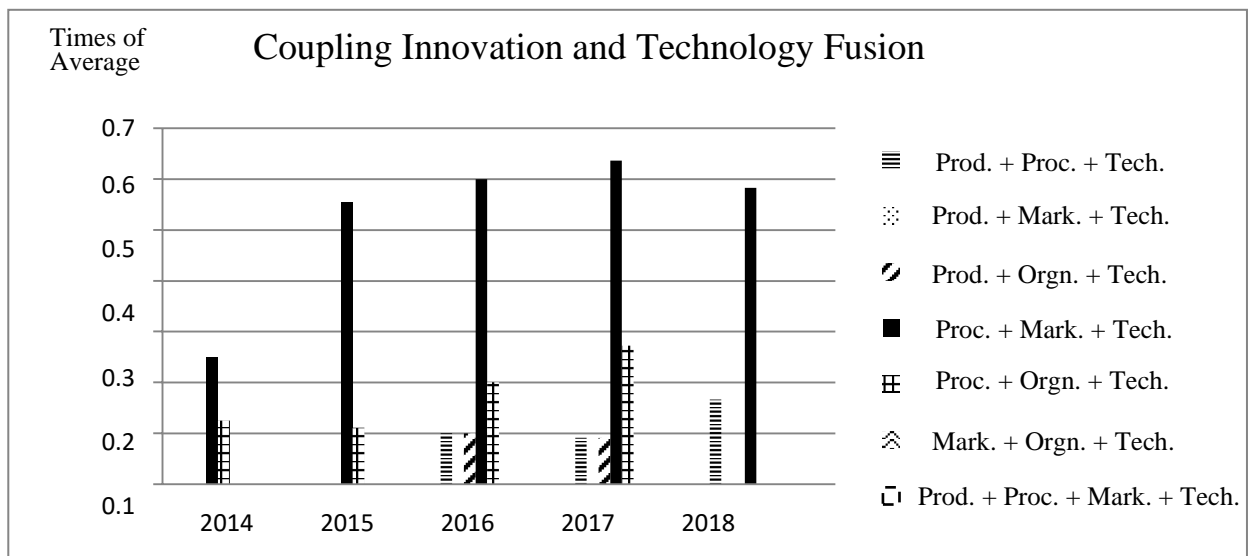


Figure 15: Types of Coupling Innovation and Technology Fusion of Other Financial Sections

5. Discussion and Conclusion

Service innovation is already a very important strategy in the financial service industry. Technology, as an important part of service innovation, can help companies effectively create new service products, enhance and expand their scopes of services, improve service delivery processes and create new market values. Technology is critical to the success of service innovation. This study mainly shows the innovation models of Taiwan’s listed, OTC and emerging financial service companies, explores the trend of the integration of technology and service innovation, and analyzes

the annual reports of 47 financial service companies from 2014 to 2018 by descriptive statistics. The conclusions of this study are briefly explained as follows:

Overall Financial Service industry

Product innovation, technological process innovation, technological product innovation, and integration of compound innovation and technology are adopted frequently. The chart shows that, in the overall financial service industry, the technological service integration innovation increases year by year, indicating that Fintech is gradually growing in the overall financial service industry.

Banking Section

More attention is paid to organizational innovation, technological process innovation, technological product innovation, and technological product process innovation, while marketing innovation is less. Maybe because existing marketing strategies in banking can maintain good results, there is little innovation in marketing.

Insurance Section

According to the findings in this study, in the insurance, product innovation and organizational innovation are frequent, with less innovation integrating technology, which is due to the fact that policy sales are the main business in the insurance and therefore new types of insurance policy and new policy terms will be developed. In addition, policies are mainly sold by salesmen, so education and training are important. Therefore, product innovation and organizational innovation are significantly more frequent than other innovations, the integration of technology and service innovation is less frequent than that in other financial service industries, and technology is adopted slowly.

Financial Holding Section

Product innovation, technological process innovation, and technological product innovation are adopted frequently. Because financial holding companies may include insurance and securities which both focus on product sales, product innovation in the financial holding may be more frequent than other innovations. Technological process innovation and technological product innovation are frequent in the financial holding, indicating that the integration of service innovation and technology is in progress.

Other Financial Service Section

Product innovation, technological product innovation, and technological process marketing innovation are adopted frequently. The main business of securities underwriters is to offer securities, issue securities, and underwrite listed and OTC securities, so that product innovation is more frequent than other innovations, the integration of service and technology is more frequent than that in the insurance, and technological product innovation and technological process marketing innovation are

frequent. Other financial service industries are innovated less frequently but in continuous development.

In a word, according to scholars, technology and service innovation are integrated as technology-service fusion in different ways in the service industry (Chang et al., 2014), as is the case in the financial service industry. Technological service innovation is adopted in all financial service industries, only with the difference in the number of financial service innovation types and innovation frequency. Due to the changes in the business models, more technical talents should be employed in the financial service industry. Future competitors will no longer be limited to companies in the financial industry. Moreover, financial companies will no longer just provide pure financial services, but technological services. The lack of Fintech regulations may create great uncertainties in the business environment and may make us fall behind the innovation curve. Hence, the government should formulate regulations to provide an environment for the development of the financial and technological industries and adjust regulatory policies, so as to avoid over-regulation or under-regulation. Fintech regulations should strike a balance between providing consumer protection and financial stability maintenance and providing incentive measures for Fintech innovation (Jagtiani and John, 2018).

For the theoretical implications and contributions, we found that technology fusion to enhance innovation development, and innovation activities constitute the keys to drive the technology involvement, and product innovation serves as a crucial context that amplifies the coupling innovation and technology fusion of financial service industry. Through internal resources for fusion of innovation and technology from financial firms, financial industry are able to acquire and leverage capabilities to perceive, seize opportunities, and restructure external and existing resources. We consider that using the innovation to gain knowledge and expertise gained through interaction with innovation to develop new solutions for new customers in markets, information exchange to solve problem and improve the convenience usage, utilize the knowledge from diverse sources to develop innovation quality that meets customer needs. And that financial industry provides various activities combine coupling innovation with technology development can provides customers a better experience, and make external resources to their advantages under the Fintech trends. Financial service firms offer diverse range of innovation with technology will demonstrate a better competitive by reconfiguring internal structures and processes, which allows them to gain spillover effects from related technology areas.

For the practices implications, in order to smoothly drive Fintech development for latecomer, promote the upgrading of the financial industry, construct an application environment for Fintech innovation, and provide a safe environment for Fintech research, development and trial, developing countries should relax the restrictions on financial investment and financial technology in terms of product research and development, promote financing institution staff transformation and cultivate Fintech talents in terms of talents cultivation, and promote mobile payment and open pure online

banking in terms of environment development. In conclusion, Taiwan, as an example of developing areas, should do a good job in Fintech, formulate perfect laws to provide protection or develop open plans, so that non-financial technical companies can participate in Fintech. The integration of technology and service innovation is unstoppable.

There are some limiting factors in this study, some of which are inevitable and some of which are temporarily inconsistent with current research resources and conditions. All of these factors are listed below and explained for reference by those who are willing to conduct relevant studies in the future.

1. In this study, the annual reports of financial service companies are analyzed by the content analysis method. If the annual reports fail to show whether innovations are made in the current year, existing products and new products may be excluded.

2. For any financial service company which may make innovations but does not know what it does is innovation and fails to disclose them in its annual report, those achievements will be excluded because judgments can only be made based on whether it makes innovations from the annual report.

3. Keywords and specific development results must be provided at the same time, and those achievements that the annual report only shows the number of cases without specifying the details will be excluded.

4. Some securities companies only disclose the fact of securities issuance in their annual reports, without specifying the total amount of issuance. In this case, their innovation frequency is considered as one.

5. A few financial service companies do not publish their annual reports online, so they are excluded.

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